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**Poverty reduction  
with high inequality and growth:  
Evidence from post-independence Namibia**

Thesis presented for the Degree of  
DOCTOR OF PHILOSOPHY  
in the School of Economics  
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## Abstract

This thesis examines poverty reduction and inequality changes in Namibia following the country's independence in 1990. Having emerged from decades of South African rule and Apartheid policies, Namibia presents an interesting case for this kind of applied research. The country is defined by widespread poverty and one of the highest degrees of income inequality in the world. While there is much speculation regarding the trends and underlying drivers of inequality and poverty after independence, little rigorous analysis has been done in this regard. This research aims to provide a better understanding of welfare changes following the liberalisation after independence. The research is based on the only two available Namibian household expenditure surveys from 1993/94 and 2003/04. To this point they have not been subjected to a detailed comparative analysis.

Following careful adjustments of the two datasets in order to ensure comparability, and establishing a common cost-of-basic-needs poverty line, it is found that consumption poverty decreased significantly over the ten year period under review. Inequality, on the other hand, remained largely unchanged. This is contrary to previous findings. Based on a range of measures, it is furthermore shown that growth favoured the poor over the ten-year period following independence, having had a significantly larger impact on poverty reduction than on inequality. Decomposing households by the different economic sectors highlights the dominance of within-sector welfare changes, in particular among subsistence farmers.

Two potential drivers of poverty reduction are examined in more detail: firstly, changes in the returns to household assets, including human capital; and secondly, internal migration. In order to assess how changes in household assets and their returns may be related to the observed pattern of poverty reduction and inequality, both parametric and semi-parametric regression analyses are employed. The findings point, among others, towards the strong and growing link between educational attainment and welfare, while also providing evidence that ethnicity continues to be a strong predictor of welfare more than a decade after the end of apartheid policies. Finally, vast regional inequalities and evidence of large-scale rural-urban and interregional migration are traced. It is nonetheless shown that intra-regional changes are dominant as determinants of the national patterns in poverty and inequality. I test the hypothesis that the returns to movable household assets converged between regions over time as a consequence of migration using an Oaxaca-Blinder decomposition analysis. While differences in mean welfare between regions continue to be largely due to differences in mean household endowments, there is indeed strong evidence for convergence of returns between leading and lagging regions.

The thesis concludes by synthesising the findings and discussing their collective implications.

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# Contents

	Page
List of Figures .....	v
List of Tables.....	vi
1. Introduction.....	1
1.1 Objectives.....	2
1.2 Namibia: Socioeconomic Background.....	3
1.3 Outline of Structure and Methodology.....	10
2. Data description and issues.....	13
2.1 Limitations of the NHIES data .....	13
2.2 Issues of data comparability.....	16
3. The measurement of poverty in Namibia .....	21
3.1 Measuring the poor: Poverty lines in Namibia.....	23
3.2 Assessing the food-share approach .....	24
3.3 The cost of basic needs approach .....	27
3.3.1 Improving comparability of the 1993/94 and 2003/04 CBN poverty lines .....	29
3.3.2 Identification of consumption poverty by the food-share method .....	32
3.4 $P_{\alpha}$ Class of Poverty Measures .....	33
3.5 Namibia: Changes in poverty over time.....	34
3.5.1 Poverty dominance testing .....	39
3.5.2 Testing the robustness of the poverty profile.....	42
3.6 Chapter summary.....	50
4. Inequality in Namibia .....	52
4.1 Description of inequality measures.....	52
4.2 National inequality estimates .....	55
4.3 Urban and rural inequalities.....	58
4.4 Chapter summary.....	60
5. The impact of growth and inequality on poverty reduction .....	61
5.1 A brief description of the linkages between growth, inequality and poverty .....	61
5.2 Growth incidence and its pro-poorness.....	63
5.3 The relative impact of growth and redistribution on poverty reduction.....	68
5.4 Chapter summary.....	70

6.	Sectoral breakdown of poverty, growth and inequality .....	71
6.1	Population shares and mean expenditure by main income source.....	73
6.2	Poverty incidence by main income source.....	75
6.2.1	Intra-sectoral and inter-sectoral effects on poverty reduction .....	76
6.3	Inequality by sector.....	81
6.4	Chapter summary.....	85
7.	Determinants of household expenditure and poverty .....	87
7.1	The basic model of household welfare .....	88
7.2	OLS regression findings .....	91
7.3	The probability of being poor.....	96
7.4	Testing for heterogeneity of coefficients: quantile regression.....	100
7.5	Chapter summary.....	105
8.	Regional inequality and poverty: the role of population shifts .....	106
8.1	Rural-urban migration: evidence from the data .....	108
8.2	The impact of regional migration on poverty and inequality .....	110
8.2.1	Regional decomposition of poverty changes .....	110
8.2.2	Regional decomposition of inequality.....	112
8.3	Oaxaca-Blinder decomposition .....	115
8.3.1	Detailed decomposition: the importance of education.....	122
8.4	Chapter summary.....	124
9.	Summary and Conclusions .....	125
	References.....	130
	Appendix .....	140

## List of Figures

	Page
Figure 1: Real GDP Growth in Namibia per annum, 1990-2010 .....	7
Figure 2: Gross Domestic Product by Sector, Percentage contributions .....	8
Figure 3: Unemployment in post-independence Namibia .....	9
Figure 4: Kernel density estimates of per capita consumption expenditure (1993/94) .....	19
Figure 5: Food-share by total consumption expenditure, 1993/94 and 2003/04 .....	25
Figure 6: Kernel density estimates of consumption expenditure, 1993/94 and 2003/04 .....	35
Figure 7: Poverty incidence curves for Namibia, 1993/94 and 2003/04 .....	40
Figure 8: Urban and rural poverty incidence curves for Namibia, 1993/94 and 2003/04 .....	41
Figure 9: Poverty incidence curves for Kavango, 1993/94 and 2003/04 .....	42
Figure 10: Lorenz curves for Namibia, 1993/94 and 2003/94 .....	55
Figure 11: Difference between Lorenz curves for Namibia, 1993/94 and 2003/94 .....	56
Figure 12: Lorenz curves 1993/94 and 2003/04, for urban and rural areas .....	58
Figure 13: Growth Incidence Curve for Namibia, 1993/94 – 2003/04 .....	65
Figure 14: Growth Incidence Curve for urban and rural areas, 1993/94 – 2003/04 .....	66
Figure 15: Poverty and mean expenditure by main source of income, 1993/94 .....	79
Figure 16: Changes in poverty against changes in mean expenditure by mean source of income .....	80
Figure 17: Enrolment rate by expenditure decile, 1993/94 – 2003/04 .....	99
Figure 18: Quantile regression estimates and OLS for log welfare model, 2003/04 .....	102
Figure 19: Quantile regression estimates and OLS for log welfare model, 1993/94 .....	103
Figure 20: Mean monthly p.c. expenditure by region, 1993/94 and 2003/04 .....	106
Figure 21: Share of urban in total households by expenditure decile .....	109
Figure 22: Contributions of endowments and returns effect to urban-rural welfare differences .....	119
Figure 23: Contributions of endowments and returns to mean welfare differences: Khomas .....	120
Figure 24: Contributions of endowments and returns to mean welfare differences: Erongo .....	121
Figure 25: Urban-rural Oaxaca-Blinder detailed decomposition – Endowments effect .....	122
Figure 26: Urban-rural Oaxaca-Blinder detailed decomposition – Returns effect .....	123
Figure A1: Geographical Map of Namibia .....	140
Figure A2: Political map of Namibia: The 13 regions. ....	140
Figure A3: Gini coefficient (1993/94) against changes in mean sectoral expenditure .....	150
Figure A4: Gini coefficient (1993/94) against rate of poverty reduction .....	150

## List of Tables

	Page
Table 1: Poverty incidence based on food-share measure, 1993/94 and 2003/04 .....	24
Table 2: Cost of Basic Needs Poverty Lines for NHIES.....	31
Table 3: Identification rates between Food-share and CBN poverty measure.....	32
Table 4: Population identified as food-share poor .....	33
Table 5: $P_{\alpha}$ poverty measures for Namibia, 1993/94 and 2003/04 .....	36
Table 6: Poverty levels by region in Namibia, 1993/94 and 2003/04 .....	37
Table 7: Poverty shares and number of poor individuals by region in Namibia .....	39
Table 8: $P_{\alpha}$ measures for separate CBN poverty lines for urban and rural areas.....	44
Table 9: $P_{\alpha}$ poverty measures with different adult equivalence scales .....	47
Table 10: $P_{\alpha}$ poverty measures with different adjustments for economies of scale .....	49
Table 11: Inequality measures for 1993/94 and 2003/04, Namibia .....	57
Table 12: Inequality measures for 1993/94 and 2003/04, urban and rural areas.....	59
Table 13: Absolute differences in inequality measures between periods and locations .....	60
Table 14: Growth elasticity of poverty in Namibia, 1993/94 to 2003/04 .....	64
Table 15: Decomposition of poverty reduction in Namibia .....	69
Table 16: Decomposition of poverty reduction in rural and urban areas.....	69
Table 17: Population shares and mean expenditure by sector, 1993/94 – 2003/04.....	74
Table 18: Poverty incidence by main source of income, 1993/94 – 2003/04.....	76
Table 19: Decomposition of poverty reduction by sector, 1993/94 – 2003/04.....	78
Table 20: Inequality by sector, 1993/94 – 2003/04 .....	82
Table 21: Within-group and between-group components of inequality, 93/94 – 03/04 .....	83
Table 22: OLS regression of household expenditure on characteristics, Namibia.....	92
Table 23: Marginal effects after logit of probability of being poor.....	98
Table 24: Decomposition of poverty reduction by rural/urban, 1993/94 – 2003/04.....	111
Table 25: Decomposition of poverty reduction by region, 1993/94 – 2003/04 .....	112
Table 26: Inequality changes within regions, 1993/94 – 2003/04.....	113
Table 27: Within-group and between-group inequality by rural / urban .....	114
Table 28: Within-group and between-group inequality by regions.....	114
Table 29: Urban-rural Oaxaca-Blinder decomposition results, 2003/04 and 1993/94.....	119
Table A1: $P_{\alpha}$ Poverty Measures by Urban and Rural Sector, 1993/94 and 2003/04.....	141

Table A2: Regional $P_{\alpha}$ Poverty Measures for common CBN Poverty Line.....	142
Table A3: Regional $P_{\alpha}$ Poverty Measures for common CBN Severe Poverty Line.....	143
Table A4: $P_{\alpha}$ measures for separate CBN poverty lines for rural and urban areas – S.E. and C.I.....	144
Table A5: Regional $P_{\alpha}$ poverty measures for separate CBN poverty lines in urban and rural areas...	145
Table A6: $P_{\alpha}$ poverty measures with different adult equivalence scales – S.E. and C.I. ....	146
Table A7: Regional $P_0$ poverty headcount index measures with different adult equivalence scales .	147
Table A8: Rural/Urban $P_{\alpha}$ poverty measures with different economies of scale adjustments .....	148
Table A9: Regional $P_0$ measures with different economies of scale adjustments .....	149
Table A10: OLS regression of household expenditure (Urban).....	151
Table A11: OLS regression of household expenditure (Rural) .....	152
Table A12: Marginal effects after logit of probability of being poor (Urban).....	153
Table A13: Marginal effects after logit of probability of being poor (Rural) .....	154
Table A14: Quantile regressions, 2003/04.....	155
Table A15: Quantile regressions, 1993/94.....	156
Table A16: Oaxaca-Blinder decomposition for leading and lagging regions.....	157

## 1. Introduction

In this thesis I examine poverty reduction and inequality changes in Namibia following its independence in 1990. Namibia presents an interesting case for this kind of applied research. Having emerged from decades of South African rule and Apartheid policies, the country is defined by one of the highest degrees of income inequality in the world (Central Bureau of Statistics, 2006; UNDP, 2006). Moreover, despite being classified as an upper middle income country by international financial institutions (World Bank, 2010), absolute poverty appears to be rife (see Van Rooy *et al*, 2006 and UNDP, 2007). This implies that basic welfare measures such as GDP per capita are poor indicators of the country's social development. While there is much speculation regarding the underlying drivers and trends of inequality and poverty in Namibia, little rigorous analysis has been done in this regard.

With independence in 1990, the period of Apartheid and economic discrimination against the black majority population in Namibia formally ended. The period and setting are particularly of interest as the newly-gained economic freedom for the majority of the population can be expected to have led to structural adjustments in the economic activities, in terms of both sectors and geographical location. These adjustments have been aided by almost consistently positive real economic growth over the period under review. It is therefore not surprising that both poverty and inequality have been found to have decreased between the only two nationally-representative, quantitative budget surveys since independence, the Namibia Household Income and Expenditure Surveys (NHIES) 1993/94 and 2003/04 (CBS, 2006).<sup>1</sup> The comparability of the NHIES data has been called into question, however, due to changes in the methodology (Levine and Roberts, 2008a). The official findings (CBS, 2006) are based on only one, very specific type of poverty measure (the food-share in consumption, which has been criticised in the literature, for example in Chaudhuri and Ravallion, 1995), an arguably arbitrary poverty line (>60 percent for poor and >80 percent for severely poor households) and one type of inequality measure, the Gini coefficient. Moreover, the measured positive trend is opposed by the worsening of other welfare measures since the mid-1990s, such as the Human Development and Human Poverty Indices (UNDP, 2007), as well as high and stagnant unemployment (Namibia

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<sup>1</sup> A third round of the NHIES was collected in 2009/10, but the report and data are yet to be released. Provisional demographic figures from this survey were put online in January 2012 (CBS, 2012).

Labour Force Surveys, 1997; 2000; 2004). The evidence of a worsening poverty situation is supported by qualitative research on poverty in the regions (Levine and Roberts, 2008a). A recent official report (CBS, 2008a) introduced a new poverty line for the NHIES 2003/04 data, based on a cost of basic needs (CBN) approach. This approach produced a significant upward revision in the measured incidence of severe poverty for that period. Given the apparent discrepancies, there is a need to re-evaluate what happened to poverty and inequality in post-independence Namibia based on a careful evaluation of the available data and a more rigorous methodology.

## **1.1 Objectives**

At the broadest level, this research aims to provide a better understanding of poverty and welfare distribution in post-independence Namibia. My study is of relevance both in a general context of inequality and poverty research and more specifically in relation to the Namibian literature. Inequality and poverty in developing countries have been widely studied, not least in cross-country analyses, establishing links of the two with growth and other determinants (Dollar and Kraay, 2002; Deininger and Squire, 1998; Alesina and Rodrik, 1994). With regards to changes over time, however, there appears to be a higher pay-off to in-depth country studies than to working on cross-national patterns (Fields, 2001; Ravallion, 2001). With the systematic investigation of the Namibian experience, I want to add to this body of literature. Not least, I also want to make a contribution to the analysis of social change in Namibia following independence. The recent literature on inequality and poverty in Namibia is sparse, reflecting the small population of the country and limited data availability, and is mainly descriptive and anecdotal in its nature (Bank of Namibia, 2003).

In order to explore the structure and changes in poverty and inequality, the following issues are addressed: Firstly, based on the NHIES data on household consumption, which is a more suitable welfare measure than income in a largely agrarian economy such as Namibia (Deaton, 1997), it establishes the levels and changes in poverty, inequality and mean consumption. Secondly, the nature of growth and the extent to which it is pro-poor are assessed. Thirdly, I explore the relative contribution of growth to poverty reduction. Fourthly, in trying to understand the drivers behind these observed changes, I analyse the role of sectoral shifts among households. Fifthly, with a view to getting a finer resolution on the picture of welfare distribution, I analyse how household characteristics are related to

household consumption, and how these relationships changed over time. Finally, I query the role of internal migration between rural and urban areas and between regions, and establish whether there has been convergence or divergence in the returns to movable household assets.

## 1.2 Namibia: Socioeconomic Background

### *Geography and Society*

Namibia is situated in the southwest of Africa, covering an area of 824,269 sq km (see Figure A1 in the appendix for a geographical map). It is bordering the Atlantic Ocean to the west, Angola and Zambia to the north, Botswana to the east and South Africa to the south. The climate is dominated by dry zones especially in the central and southern parts, as well as along the coastline which is largely composed of the Namib desert. To the east, the Kalahari desert stretches into Botswana. The north receives more rainfall than the rest of the country (about 700 mm of rain per year during good seasons, while the average rainfall along the coast and the southern part varies between 50 mm and 100 mm).<sup>2</sup> This means that crop cultivation is more favourable in the northern parts of the country than the southern parts. Cattle farming can be found in the north and central regions, while in the drier southern parts of the country, sheep and goat farming are more common.

With a population of around 2 million, Namibia has one of the lowest population densities in the world with 2.4 persons per square kilometre. This is mainly due to the fact that vast stretches of the area are too dry for human settlement, as a consequence of low and highly variable rainfall (Devereux and Naeraa, 1996). The population is distributed according to the climate and arability of the land, with two thirds of the population living in the northern regions, according to the latest census of 2001 (Central Bureau of Statistics<sup>3</sup> 2003). These regions are characterised by communal land ownership, high levels of poverty and food insecurity, and poor coverage of economic and social infrastructure (Levine *et al*, 2011). Countrywide, two thirds of households live in rural areas (CBS, 2003). The largest urban agglomeration is the capital Windhoek in the centre of Namibia with a population of approximately 233,000 (*ibid.*). Other larger towns, which in the country context means more

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<sup>2</sup> <http://www.sacmeq.org/education-namibia.htm#reports>

<sup>3</sup> From here on referred to as CBS.

than 10,000 inhabitants, are mainly found in the north (for example Rundu, Oshakati) and at the coast (Walvis Bay, Swakopmund). The southern parts of the country are occupied by less than 10 percent of the population, yielding a population density of only 0.5 persons per square kilometre.

Namibia is divided into 13 administrative regions, which vary significantly by population and size (see Figure A2 in the appendix for a political map of the regions). Khomas in the centre is the most populous region with around a quarter of a million inhabitants, followed by the northern regions of Ohangwena, Omusati and Kavango with populations above 200,000 each. Karas and Hardap in the south, as well as Kunene in the northwest, have the smallest populations of below 70,000 despite being the largest regions in terms of area (Central Bureau of Statistics, 2003). Given the small relative size of Namibia's population, its ethnic fragmentation is highlighted by the eleven ethnic groups officially recognized and even more languages being spoken (Maho, 1998). In terms of ethnic composition, the ethnic group of the Ovambo make up about 50 percent of the population, 9 percent belong to the Kavangos; other ethnic groups include Herero 7 percent; Damara 7 percent; Nama 5 percent; Caprivian 4 percent; San 3 percent; Baster 2 percent; and Tswana 0.5 percent. Whites and coloureds (mixed-race descendents) make up around 6 percent each (World Factbook, 2011).

### ***History and Politics***

In order to understand the Namibia of today, it is necessary to revisit this young country's recent history. As the last country in sub-Saharan Africa to do so, Namibia gained independence in 1990 following more than a century of outside rule. It had been colonized by the German Reich in the 1880s, who declared German South West Africa (Deutsch-Südwest-Afrika) as their protectorate in 1884. It comprised the centre and south of Namibia called the Police Zone, with its mineral wealth and vast grazing lands, which was primarily designated for settlement by white Europeans (Werner, 1993). Most of the arable land was distributed to European farmers, leading to largely skewed land ownership between the races that is still prevalent today. The North and Northeast of the country were largely left as native reserves to the indigenous black population (Moorsom, 1997). As the construction of infrastructure, extraction of minerals and expanding European farms required large amounts of unskilled labour, Ovambo men from the North were contracted to work in the Police Zone. This labour migration was aided by push factors of droughts and pauperisation

in northern Ovamboland, as well as a tightening of labour supply by the more Southern located Nama and Herero workers following the 1904 revolt and its bloody suppression by German colonial troops (*ibid.*). Restrictive legislation to control these migrant flows were introduced, including the use of “pass laws” that required all Africans to carry a pass. In addition, movement restrictions on the African population within the Police zone were imposed (Ekström, 1998).

In 1915 German colonial rule came to an end as South African troops conquered the territory. At the end of World War I, the League of Nations brought Namibia under British mandate, which passed on the administration of what was now called South West Africa to South Africa with full power of administration and legislation over the territory. A process of closer integration with the large neighbour to the south began, until it was “in many ways regarded as the fifth province of the union”.<sup>4</sup> From the late 1940s on, policies to promote the segregation of the races (Apartheid) were intensified. In 1959 townships were created outside the cities for blacks, most notably Katutura in Windhoek, and for coloureds. In 1963 a homeland system was created, in terms of which 40 percent of the country's land area (mainly in the North) was allocated to the indigenous population, 43 percent for white farmland, and the remainder, including diamond areas and game reserves, was considered to be unallocated Government land (Jauch *et al*, 2009). Around that time, the struggle for independence by native Namibians began, most notably among the participating groups being the South West African People's Organisation (SWAPO). In 1966, the UN called for South Africa's withdrawal from the territory, and officially renamed it Namibia in 1968 (Hopwood, 2007). The armed conflict in the North along the Angolan border that would last with varying intensity until independence in 1990 led to large displacements of people – predominantly Ovambo – internally and to third countries (Preston *et al*, 1993). Analogous to German colonial practice, movement of Africans from the townships or their communal areas to the towns and commercial farms continued to be limited and controlled under the system of contract labour (Frayne and Pendleton, 2001). Along with increasing pressure from the United Nations to hand over sovereignty and a protracted guerrilla war in southern Angola against SWAPO, South Africa relented in the late 1980s.

Following elections in 1989, in which SWAPO won 57 percent of the vote, Namibia gained its independence in March 1990 under President Sam Nujoma. The Namibian constitution,

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<sup>4</sup> <http://www.historyworld.net/wrldhis/PlainTextHistories.asp?historyid=ad32>

adopted on 9 February 1990, established the country as a “sovereign, secular, democratic and unitary state founded upon the principles of democracy, the rule of law and justice for all” (quoted in Hopwood, 2007). Namibia is a multiparty state, but since independence SWAPO has dominated Namibian politics, winning absolute majorities in all presidential and parliamentary elections. Following the era of Apartheid with its discriminatory policies, which arguably contributed to the large inequalities in the country, the Namibian government has pursued a number of redistributive policies in order to alleviate poverty and promote opportunities for the previously disadvantaged groups. The agenda for the country’s development has been guided by three consecutive five-year National Development Plans (NDP), which include widening the access to education, combating HIV/AIDS, land reform, social cash transfers – including a non-contributory, universal old-age pension – and affirmative action policies. One of the main challenges was to reform the educational system to give equal access to the previously disadvantaged. Until 1990, education had been organised along ethnic lines, with different administration, teacher training and curricula for whites, coloureds and blacks (Dahlstrom, 1995). The challenge after independence was thus a complete overhaul of the educational system with equal access for all races to all tiers (Gonzales, 2000). Namibia has since independence by regional standards very high public expenditures on education and health as a share of GDP (ACPF, 2010). However, while access to equal education was certainly improved, most notably at the primary level, concerns over the quality of education have persisted (Makuwa, 2005).

### ***The Namibian Economy***

Namibia is a small open economy which is characterised by being rich in mineral resources yet largely agrarian. With an average GDP per capita of USD 6,388<sup>5</sup> in 2009 (EIU, 2011), it is ranked as an upper middle income country by the World Bank.<sup>6</sup> This makes its average income one of the highest in Africa (IMF, 2010). As a member of the Southern African Customs Union (SACU) and the Rand Common Monetary Area (CMA), the Namibian economy is largely integrated with that of neighbouring South Africa, from where it sourced 68 percent of imports in 2009 (WTO, 2011). The economy’s openness is highlighted by high levels of international trade (exports plus imports), which have amounted to between

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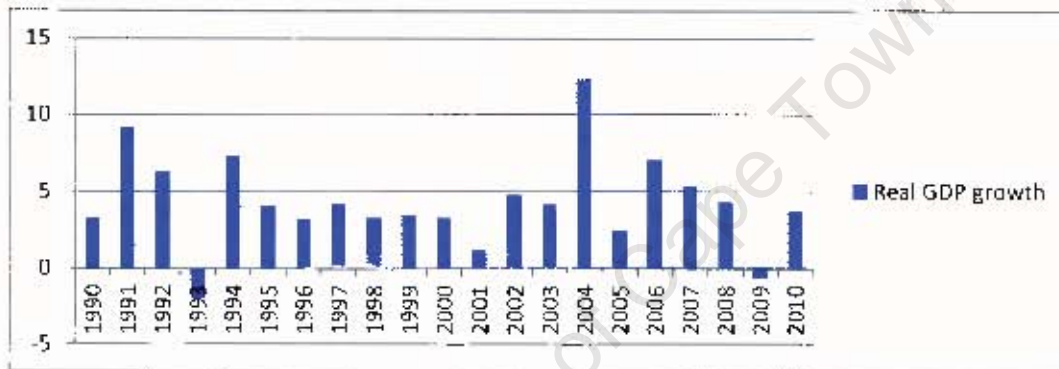
<sup>5</sup> In terms of purchasing power parity (PPP).

<sup>6</sup> [http://data.worldbank.org/about/country-classifications/country-and-lending-groups#Upper\\_middle\\_income](http://data.worldbank.org/about/country-classifications/country-and-lending-groups#Upper_middle_income) (accessed 18 March 2011).

95 percent and 120 percent of annual GDP since independence (Sherbourne, 2009). Main exports are minerals, notably diamonds and uranium, as well as beef and fish.

Namibia has experienced healthy economic growth since independence, with GDP increasing on average by 4.3 percent annually in real terms between 1990 and 2008 (World Development Indicators database, 2011). That is significantly above the average real GDP growth of developing Sub-Saharan Africa (3.4 percent p.a.) and South Africa (2.7 percent p.a.) for that period, but below the growth rate of Botswana at 5.3 percent p.a. (*ibid.*). Namibian economic growth has been export-led and largely driven by the mining sector (Jordaan and Eita, 2007; Sherbourne, 2009).

Figure 1: Real GDP Growth in Namibia per annum, 1990-2010

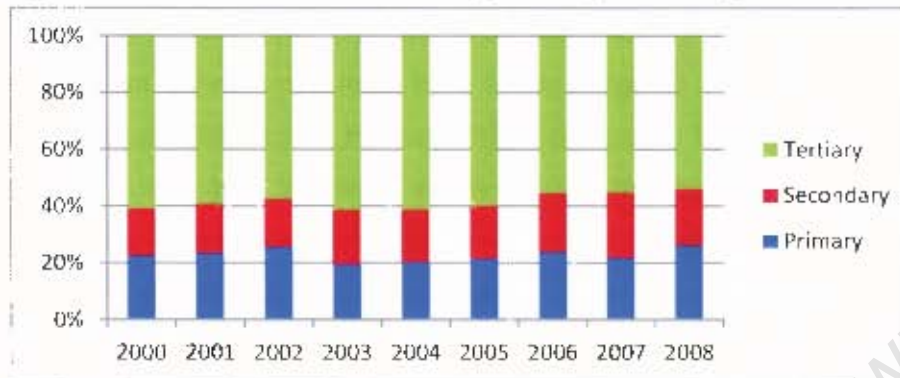


Source: National Accounts data, CBS; 2010: Estimate by Economist Intelligence Unit.

In terms of the overall sectoral composition of the Namibian economy, there have been no marked shifts since 1990. The tertiary sector comprises somewhat more than half of GDP, while primary and secondary industries make up the rest in approximately equal shares. Notable within the primary sector is the mining industry, which has been gaining in importance over the years, while agriculture experienced a declining, if volatile, trend. The contribution of mining to GDP has fluctuated between 9 and 15 percent, but the industry accounted for between one third and half of the country's export earnings (Sherbourne, 2009). On the other hand, the mining sector employs less than 3 percent of the national workforce (*ibid.*). Namibia is the fourth-largest exporter of nonfuel minerals in Africa, the world's fifth-largest producer of uranium, and a producer of large quantities of alluvial diamonds, lead, zinc, tin, silver, and tungsten (World Factbook, 2011). The reliance on mineral exports makes the economy vulnerable to external demand shocks. An important tertiary industry for Namibia that does not form part of the national accounts classification is tourism, which has experienced high growth in terms of international arrivals, more than

doubling from 461,000 in 1996 to 929,000 in 2007.<sup>7</sup> It has been described as holding much potential not only for foreign exchange earnings, but also employment creation in the country (Fita and Jordaan, 2007).

**Figure 2: Gross Domestic Product by Sector, Percentage contributions**



Note: Excluding "Taxes less subsidies" and indirectly measured financial intermediary services.

Source: National Accounts data, Central Bureau of Statistics.

The contribution of agriculture to GDP may be modest (5.5 percent in 2008), but this masks the fact that large numbers of households depend on it, not least among the two thirds of the population living in rural areas. The share of households relying on subsistence agriculture as their main source of income stood at 42 percent in 1993/94 (Central Statistical Office, 1996), falling slightly to 36 percent in 2003/04 (Central Bureau of Statistics, 2006). Around 41 percent of Namibia's land area consists of communal tenure farms operated by family units on land to which they have user rights but no title, while a further 44 percent of the land is made up of commercial farms with title deeds (Sherbourne, 2009). Since independence, the government has attempted a land reform with the objective of addressing the large imbalance in land ownership between the races and increasing the share of land owned by poor farmers. However, these policies, which comprised a willing-buyer, willing-seller scheme, affirmative action loans to new black farmers and expropriations with compensation, have yielded little result and only a small number of farms have been bought up and redistributed (see van Rheen, 2006, and Sherbourne, 2009, for a discussion of the reasons underlying this failure).

Largely due to the dry and erratic climate, both commercial and subsistence farming on communal land have experienced volatile growth since 1990, averaging only 1.7 percent (commercial) and 0.4 percent (subsistence) annually (*ibid.*). Livestock plays a significantly

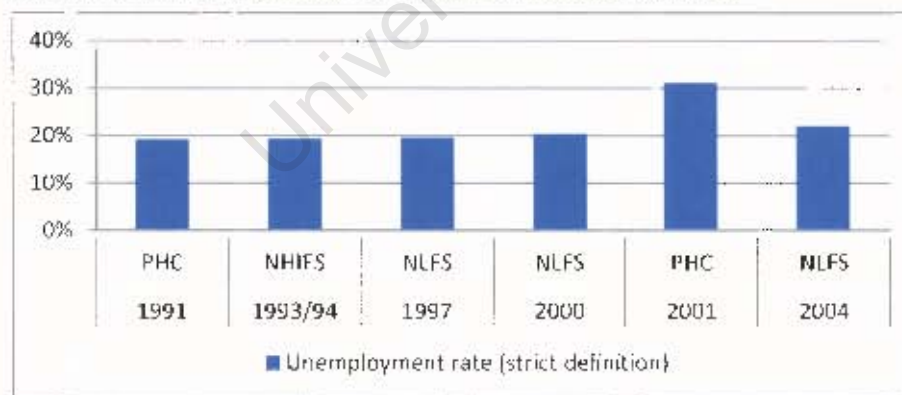
<sup>7</sup> UN Data, <http://data.un.org/CountryProfile.aspx?crName=Namibia> (accessed 18 March 2011).

larger role for overall sectoral production, accounting for almost all commercial farming output and almost half of communal farming output (Ministry of Agriculture, Water and Forestry, 2009). While beef is a significant Namibian export good, more than half of the country's cereal consumption has to be covered by imports from abroad (Sherbourne, 2009).

Another prominent feature of the Namibian economy is the large public sector. Total government expenditures have been in the range of 30 to 35 percent of GDP since independence (Ministry of Finance, budget documents 1991/92 – 2009/10), which is very high by international standards, especially compared to other African countries (Fan and Rao, 2003). Employment by the public sector (including state-owned enterprises) has risen from around 65,000 in 1991/92 to just under 100,000 by 2004/05 (Sherbourne, 2009).

Despite this increase and solid economic growth since independence, overall unemployment has not fallen in the country (*ibid.*). According to the available survey data and using the strict definition of unemployment (available and actively looking for work), the share of the unemployed in the economically active population of working age (Namibian definition: between the ages of 15 and 60 years) remained around 20 percent in the decade after independence. Using the broad definition, which includes those people who wish to work but are not actively looking for work, the share of unemployed in the workforce stood even well above 30 percent (see Eita and Ashipala, 2010).

**Figure 3: Unemployment in post-independence Namibia**



Source: Population and Housing Census (PHC) 1991 and 2001, Namibia Household Income and Expenditure Survey (NHIES) 1993/94 and Namibia Labour Force Survey (NLFS) 1997 and 2004.

Namibia's Human Development Index (HDI) score gives an indication that the country's mean wealth is only an imperfect indicator of the welfare of its people. The HDI is a composite index that comprises health, education and income as dimensions of welfare (UNDP, 2010). Namibia's HDI score has increased somewhat since 1990 and lies, as of

2010, with 0.606 just below the world average (0.624), and significantly above that for Sub-Saharan Africa (0.389). It is of note that Namibia's HDI rank of 105 out of 169 is 14 places lower than its rank by per-capita income (*ibid.*). It falls into the group of countries classified as having "medium human development", but differs from their average mostly by having a higher income per capita and significantly lower life expectancy at birth (*ibid.*).

### 1.3 Outline of Structure and Methodology

This thesis is structured with the aim of first establishing carefully what happened to poverty and inequality in Namibia after independence. Once the national levels and trends have been estimated, the emerging patterns are linked to the following potential drivers: economic growth; sectoral shifts; changing returns to household assets; and internal migration. The following paragraphs provide an overview of the chapters of the thesis and the approach taken in each of them. More detailed descriptions of the methodology are presented in the respective chapters.

The data underlying the analyses are the Namibia Household Income and Expenditure survey data from 1993/94 and 2003/04. These are the only two national household budget surveys available, allowing us to compare what happened between the two survey years. A new round of the NHIES was collected in 2009/10, but the summary report and the underlying data have not been published yet. In January 2012 provisional descriptive statistics from the survey were released, pointing towards a continuation in the main welfare trends (rise in mean income, decrease in poverty based on food-share measure, rural-urban migration and higher level of educational attainment in population) between the first two surveys. The fact that the latest data are not available is a drawback, but one that is mitigated by the fact that the main hypotheses in this paper are concerned with changes to have occurred in the decade after independence. The frame of reference for this study is thus the ten-year period between 1993/94 and 2003/04 over which changes can be observed, albeit only between these two points in time. As the first NHIES was conducted three years after independence it is not a perfect match, but it is deemed suitable to gauge any major shifts that may have occurred with regards to poverty and inequality. The second chapter revisits the underlying data and its limitations, as well as describing the adjustments made to improve the comparability of consumption aggregates between the two surveys.

In the third chapter I estimate the incidence of poverty in Namibia, nationally as well as for urban and rural areas. The chapter first provides an overview of poverty measurement in the country and outlines why the official food-share approach is not appropriate. Based on the recently derived CBN poverty lines for 2003/04, comparable CBN lines for 1993/94 are estimated. Poverty rates and changes, along with their statistical significance, are calculated based on these new poverty lines, the derived consumption aggregates and a set of common poverty measures. The poverty profile is tested for poverty dominance over time, as well as for its robustness to assumptions on rural-urban price differences, adult-equivalence scales and the introduction of economies of scale in the household.

Chapter 4 is concerned with inequality over the period under review. A range of inequality measures, including the Gini coefficient and generalised entropy indices, are calculated. I test the statistical significance of any index changes and probe inequality dominance between different distributions based on the Lorenz curve. I also attempt to provide an explanation for the diverging inequality trends based on my estimates and those in the official NHIES report (CBS, 2006). Separate inequality profiles are derived for urban and rural areas.

Chapter 5 deals with the impact of growth and inequality changes on poverty reduction. Following a review of the linkages between these variables, the incidence of growth and the elasticity of poverty to it are discussed. In addition, I assess if, and to what degree, growth may have favoured the poor. Finally a decomposition analysis is undertaken to estimate the relative impact of growth and distributional changes contributed to poverty reduction.

A sectoral breakdown of poverty, inequality and growth is presented in Chapter 6. Based on the main source of income by households, the chapter provides an overview of shifts in the size of sectors, as well as a profile of sectoral mean growth rates. Changes in the incidence of poverty by sector are decomposed into growth and population shift effects with a view to assessing the impact of households shifting their economic activities after independence. Sectoral inequality is also analysed along with the contributions of within-sector and between-sector components.

Chapter 7 takes a closer look at the determinants of household expenditure in order to get a better understanding of how changes in household assets and their returns may be related to the observed pattern of poverty reduction and inequality. The chapter draws on multivariate regression analysis of the two surveys, estimating the relationship between expenditure and

household characteristics such as human capital, access to land or ethnic group. Moreover, the probability of being poor is estimated dependent on a range of household characteristics, and changes over time herein observed.

In chapter 8 I gather evidence for rural-urban and interregional migration and trace their potential impact on poverty reduction and inequality. The hypothesis that the returns to movable household assets converged between regions over time as a consequence of migration is tested using an Oaxaca-Blinder decomposition analysis.

Finally, the conclusions of my research are presented in chapter 9. This is where the findings from the previous chapters are brought together to give an overall assessment of the observed dynamics.

University of Cape Town

## 2. Data description and issues

This thesis relies on household budget data from the two Namibia Household Income and Expenditure Surveys (NHIES) that were conducted in 1993/94 and 2003/04. Both NHIES are weighted, nationally-representative household budget surveys which follow a stratified, two-stage probability sample design. Based on the primary sampling units (PSU) from the preceding Population and Housing Census (1991 and 2001, respectively), the sampling covers the population of private households over a calendar year. The final sample of the 2003/04 survey consisted of 10,900 households, while only 4,752 households were sampled in 1993/94, which is still rather large for the given size of the population. The 12-month period for fieldwork is a major advantage over many budget surveys carried out in other African countries as it corrects for seasonal variation in consumption. The questionnaires included a diary for the recording of daily consumption and recall questions for larger, more irregular non-food expenditure items. Households only kept their journals for four weeks in order to mitigate response fatigue (the tendency of households to record less reliably with time, see Deaton, 1997), but their number was distributed evenly and representatively over the 12-month period. Detailed overviews of the questionnaires and applied methodologies can be found in the accompanying reports (CSO, 1996 and CBS, 2006). The NHIES provide rich sources of information on household expenditure in Namibia, and have consequently been the most important references for studies on welfare since independence (for example Levine *et al.*, 2011; Sherbourne, 2009). However, policy papers mostly refer to the survey reports rather than to new work with the data itself, which has been blamed partly on the restrictive data access policy by the Namibian Central Bureau of Statistics (Levine and Roberts, 2008b).

### 2.1 Limitations of the NHIES data

Despite the large scope of the surveys, there are a number of limitations that need to be considered when using the data for the analysis of wellbeing. To begin with, the number of sampled households in the surveys places restrictions on how detailed a poverty profile can be derived. While the sample size is not small in comparison to international standards, it

does not allow for statistically significant disaggregation below the regional level. This would hold even if the precise geographical location of each household was included in the data (in fact one can locate the households only by region and rural and urban setting).

A second issue affecting nationally representative welfare estimates stems from the sampling frame of the NHIES, which only includes private households and leaves out institutional populations, such as people living in military and police compounds, nursing homes or workers' dormitories. According to the last census of 2001, the size of this institutional population was 57,000 (CBS, 2003). Perhaps even more important in the context of poverty, homeless persons or those living illegally in the country, who thus do not appear on the population census roster, are excluded. These groups are arguably more at risk from deprivation than the average population. This is, however, an issue shared by all surveys sampled off census data.

Thirdly, as the expenditure data are collected at household level, intra-household inequality cannot be measured.<sup>8</sup> By default, researchers have been assuming a unitary-decision-maker model that allocates resources equitably among the members, in some cases adjusted by an adult-equivalence scale. This is a simplifying assumption necessitated by the data and analysis. In reality, however, some degree of intra-household inequality may push some members into poverty, especially for households just above the poverty line.

As a fourth limitation, individual households cannot be traced over time between the two surveys. Having multiple observations for the same household would allow insights into income mobility, namely what factors may be of importance for households to break out of or fall into poverty. By focusing on the relationship between the change in expenditure and changes of other household characteristics over time, one would be able to reduce the impact of fixed effects at the household level. Instead, the households in the NHIES are anonymous and changes over time can only be observed as an average for groups of households, for example at the regional level. Panel data surveys are more difficult to conduct than independent cross-sections like the NHIES, but they allow for more precise analyses of the determinants of poverty and inequality.

Fifthly, one of the main criticisms of the NHIES has been the lack of accompanying separate price surveys (Levine and Roberts, 2008a). The determination of consumption

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<sup>8</sup> While some sophisticated techniques of estimating intra-household inequality from household-level consumption data have been developed, they are far from incontrovertible; for examples see Deaton (1997).

values from quantities was rather done at the household level, partly with the assistance of the consumer price index (CPI). Here it is important to note that the Namibian CPI data is collected in urban areas only, thus not accounting for possible urban-rural price differences. As consumed quantities are not reported in the NHIES data, tracing spatial price variation that way is not possible. The cost of a basic basket of necessities, however, is generally deemed to be lower in rural than in urban areas, which is the reason why especially countries in south Asia have used separate poverty lines for urban and rural areas for decades (Fields, 2001). Assuming such a price differential exists, and given that the poverty line is derived from urban price data, poverty levels in rural areas may be overestimated. In chapter 4 the impact of some specifications of separate poverty lines on poverty incidence in rural and urban areas is tested. This cannot compensate for actual rural price data, and it is positive that CBS conducted regional price surveys along with the NHIES 2009/10, which is yet to be released as of February 2012.

The lack of distinction between own-production and in-kind traded consumption goods in the NHIES data poses some difficulties for the evaluation of public policies. Relative price changes will have different impacts on the poor depending on which items they produce and which they acquire through barter trade. A topical example is the VAT-zero rating of selected basic food items by the Namibian government in mid-2008 in response to rapidly increasing food-price inflation.<sup>9</sup> While the NHIES data show that the poor obtain the affected items (and food consumption in general) predominantly in-kind, it is unclear whether this arises from barter trade or own-production. Exempting certain goods from VAT reduces their cash price, which also affects their implicit price in barter trade. This means that net producers of the items are worse off in real terms, while net consumers are better off, all else being equal. Assuming that some of the poor are net producers of some of the affected items, it is therefore possible that they are worse off as a consequence of the policy intervention.

The fact that the NHIES questionnaire collects the main language spoken in the household as a proxy variable for ethnicity poses some problems given the importance the Namibian Government attaches to race in its policies, including affirmative action schemes. While language may be a good proxy for some ethnic/racial groups, such as German or San, it is arguably less appropriate for others, most notably Afrikaans, which is the main language of

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<sup>9</sup> See "VAT on food items to be scrapped", *Namibia Economist*, 20 June 2008.

white Afrikaners, Coloureds (Namibians of mixed-race ancestry) and some black households. This implies that the NHIES cannot trace relative well-being between races over time, a major drawback for the evaluation of the impact of affirmative action.

## 2.2 Issues of data comparability

A problem with the comparability between the two datasets is presented by methodological changes between the two surveys (CBS, 2006; CBS, 2008a): firstly, the sample frame was increased in 2003/04 to more than double the number of households interviewed in 1993/94. This was done to give more accurate estimates and allow for a more detailed level of disaggregation. I will deal with this change by presenting standard errors where possible. Secondly, based on experience from the first survey, a larger number of items for infrequent expenditures, notably capital goods and fees, were introduced. Thirdly, the time a person had to have spent in the household to qualify as a member thereof was increased from one week to two weeks out of a four-week period. Fourthly, modern technology, such as digital scanning, was introduced in the data capturing and cleaning process in 2003/04.

A fifth issue is that due to rezoning in some of the Northern regions that took place in 1998, the population of these regions in the sample frame for the NHIES 2003/04 has changed. More specifically, small parts of Kunene region were declared part of Omusati, while a constituency in Caprivi was relocated to Kavango (CBS, 2003). These changes affect the regional comparisons over time, but due to their limited scope and socio-economic homogeneity between the affected regions they should not distort the analysis fundamentally. Since those households in the rezoned areas cannot be identified in the data, they will be dealt with by looking at the affected regions jointly where appropriate to check for consistency with the findings from the individual regions.

Besides these issues, there have also been alterations in the way the consumption aggregates were calculated in the data. A notable difference is that an adult-equivalence scale<sup>10</sup> is applied to most of the estimates presented in the official 2003/04 report (CBS, 2006), whereas equal weights for all household members were applied in the 1993/94 report (CSO, 1996). This has implications for the estimation of poverty as well as inequality in the country, a fact that has generally been overlooked when the official estimates have been

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<sup>10</sup> Scaling weights: from age 0 to 5 = 0.5; age 6 to 15 = 0.75; age 16 and above = 1.

cited in the literature (see for example du Pisani, 2009; Kessy and Tostensen, 2008; European Commission, 2006). The introduction of adult-equivalence scales has a non-trivial impact on consumption and inequality estimates as will be explored further below and in chapter 4.

Most of the changes in the collection methodology were introduced to improve the precision of the results, but the authors of the survey admit that due to the changes in methodology, “observed changes over time between the two surveys [should be treated] as more indicative of direction than as precise estimates” (CBS, 2006, p12). Given that one of the main purposes of the surveys was to trace welfare changes in Namibia over time, this is a clear drawback. Levine and Roberts (2008a) try to solve the problem of comparability by re-estimating household consumption in 1993/94 with coefficients derived from the 2003/04 data. By means of semi-logarithmic regression, they model the determinants of per capita expenditure at the household level for the NHIES 2003/04. The estimated coefficients are then imposed on the respective household characteristics in the NHIES 1993/94 data to re-estimate per capita expenditure (in 2003/04 prices). Issues of comparability due to changes in the survey design and consumption definition are thus mitigated. This comes at the cost of losing any information provided by the NHIES 1993/94 consumption estimates, which may be different from the re-estimated figures not only because of methodological differences, but due to fundamental changes in the relationship between expenditure and its determinants. It is reasonable to assume, for example, that returns to education, or to household assets, have changed over the ten-year period between the two surveys. For these reasons, I believe that more precise estimates can be derived from using the actual 1993/94 consumption data, but matching the aggregates and weights to those applied in the NHIES 2003/04.

One starting point in assessing the consequences of methodological changes is to think about the direction of the biases induced by them: evidence from other countries shows that reported rates of consumption diminish with the length of the recall period; often even recall periods of two weeks may result in downward biased estimates of consumption (Deaton, 1997). For infrequent non-food expenditure items that are recalled for twelve months in the NHIES, the bias may thus be significant. If consumption that is further back in time is underreported, then, as a corollary, poverty may be overestimated. This holds for the CBN measure and also for the food-share measure as long as non-food consumption exhibits a higher underreporting bias than food consumption. It must be noted that the number of these

long-recall items was substantially higher in 2003/04 than in 1993/94, indicating that – all else being equal, which it was not as noted below – the 2003/04 estimates may be more exposed to underreporting bias.

A second bias in household consumption may stem from the more detailed consumption itemisation in 2003/04. Deaton (1997) points to international evidence that expanding the number of items in household budget surveys tends to increase reported expenditure significantly. This would have the effect of underreporting consumption estimates in the 1993/94 data relative to the 2003/04 survey. Some of the inability to recall spending that dates further back is thus compensated, or may be overcompensated, by the increase in reported expenditure due to a more detailed itemisation. While one cannot tell which of the two countervailing biases outweighs the other, an important point is that they work in opposite directions, mitigating their overall effect.

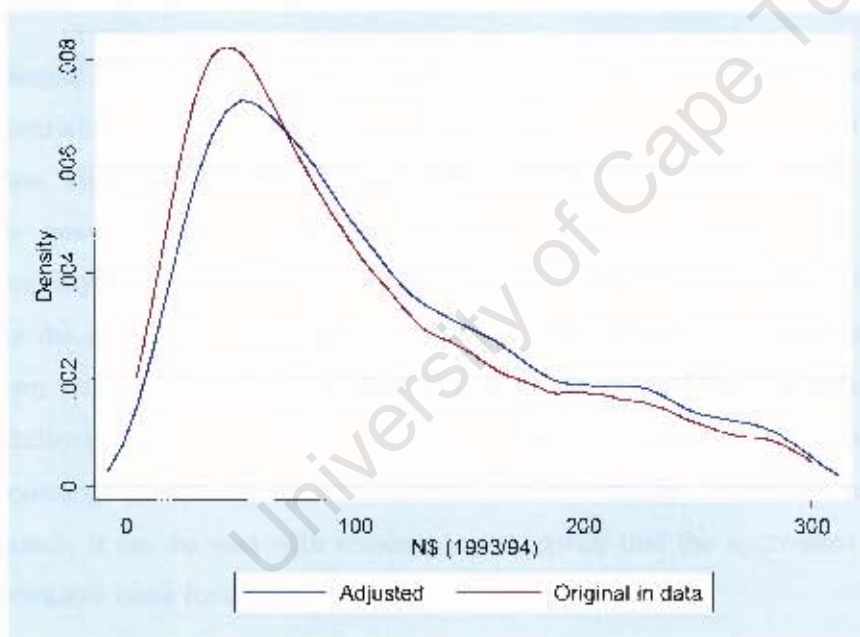
This is a vague basis for arguing the comparability of the two surveys, but there are number of other favourable observations: First of all, much of the expansion of the survey in 2003/04 took place on the side of non-consumption expenditure, household production and income, which do not have a direct bearing on the consumption-based utility measure employed in this study. Secondly, there are a number of new items that were categorised differently in the NHIES 1993/94 questionnaire. For example, in 2003/04, transport fares are disaggregated by mode of transport (bus, taxi, air, boat, etc), while in 1993/94 there was no such distinction, but such expenses were still captured as everyday and holiday travel cost. It is unclear whether such differences in classifications would induce a bias, i.e. a systematic difference in estimation. Finally, some of the items in the 2003/04 questionnaire were simply not available in 1993/94, such as cellular phones (which, even if available, should have been captured under “communication equipment”).

These examples should not imply that the changes in survey design have no bearing on the comparability of the consumption aggregates. For the purposes of this study, however, it was decided to keep the 1993/94 consumption data and to improve comparability with the 2003/04 data by aligning the items contained in the consumption aggregates as follows: Expenditure items that constitute investments or savings are excluded, with the exception of livestock, which could constitute consumption or production. As is convention in welfare analysis, costs associated with funerals, social occasions and lobola/dowry were excluded from the analysis as their utility does not go to the spender (World Bank Institute, 2005).

Building materials, house purchases and rent were replaced by an imputed rental and maintenance value of the type of dwelling. While not being a perfect like-for-like match, this approach is preferred over the methodology by Levine and Roberts (2008a) of imposing the 2003/04 coefficients on the 1993/94 data. The main benefit is that it allows the relationship between expenditure and its determinants to vary between the two survey years.

Having adjusted the 1993/94 consumption aggregates as described and applied the adult-equivalence scale from the 2003/04 data, the distribution of consumption expenditure is altered substantially compared to the original aggregate. The figure below depicts the kernel densities of the original variable from the 1993/94 dataset capturing monthly consumption expenditure per capita plotted alongside the transformed variable.

**Figure 4: Kernel density estimates of adjusted per capita consumption expenditure (1993/94)**



Source: NHIES 1993/94, own calculations.

Despite the improvements in comparability, there is still some evidence from comparisons with Namibian National Accounts data that the extended itemisation in the NHIES 2003/04 have possibly led to overestimation in consumption compared to the previous survey. Data on final private consumption expenditure from the National Accounts<sup>11</sup> exhibits nominal average growth of 12.2 percent per annum during the period between the two surveys, while

<sup>11</sup> Re-weighted from calendar year data to match the NHIES survey periods and expressed per capita.

average annual growth in mean household consumption expenditure per capita in the NHIES is estimated at 14.8 percent. This is a notable difference in growth rates, especially when compounded over the ten-year period, but it does not warrant an outright rejection of the NHIES' comparability. Moreover, interpreting the underlying reasons is far from clear. Besides the above-mentioned possibility of overestimating NHIES 2003/04 consumption relative to NHIES 1993/94, the discrepancy may be related to methodological inconsistencies between the consumption compilation in the National Accounts and the NHIES: measurement errors in the National Accounts are not uncommon (Ravallion, 2001; Deaton, 2005), for example due to the diversity of data sources or incorrect measurement of the informal sector. Other issues for comparisons with household data stem from the inclusion of spending by non-profit institutions into the private consumption aggregate in the National Accounts (CBS, 2002 and 2008b) or imperfect matching between NHIES and National Accounts periods.

Despite attempts to set the measurement of wellbeing on an objective, scientific footing, it is invariably subject to numerous assumptions and to the choice and quality of the underlying data. This chapter outlined some of the main issues in the case of the NHIES. Limitations for poverty analysis are posed, *inter alia*, by the sample size; lack of local price data; inability to trace observations over time and consumption inequality within households; and by the difficulty to distinguish policy-relevant characteristics, such as consumption from own production versus from barter trade or the race of the respondent. One of the main challenges addressed in this chapter was to evaluate and improve comparability between the consumption data for the 1993/94 and 2003/04 surveys. While the result is not a perfect match, it can be said with reasonable confidence that the aggregates arrived at provide a workable basis for analysis.

### 3. The measurement of poverty in Namibia

In the literature, the measurement of poverty is subject to a long and ongoing debate as to what to measure and how to do so (Watts, 1970; Sen, 1976; Atkinson, 1988; Hagenaars and de Vos, 1988; Ringen, 1988; Ravallion, 1998). It should be noted that this study focuses exclusively on the monetary dimension of poverty, which historically has been at the centre of research (Fields, 2001). This does not diminish the importance of other dimensions, such as access to non-market goods, including education, health and basic infrastructure, as for example considered in the Human Development Indicators by the United Nations (UNDP, 2010). The money-metric measurement of poverty supposes a linear relationship from a given level of income or expenditure to a basket of commodities, which yields a certain level of utility to the household or individual. Among a host of assumptions, it requires three basic choices to be made: firstly, the welfare measure; secondly, the poverty line; and thirdly, the poverty indicator.

The choice of welfare indicator generally comes down to whether to measure income or consumption expenditure. Consumption is often preferred as a better proxy for long-term standards of living (Fields, 2001), especially in developing countries. It has been the one used in Namibia. While the NHIES also surveyed individuals' incomes, these data could not be obtained for this research from the Central Bureau of Statistics, which cited human resource constraints as the reason why the data entry and cleaning had not been completed on the income side. While consumption expenditure is a preferable welfare measure, besides being the only one available, one challenge was to ensure that consumption aggregates are comparable. This was partly addressed by including only analogous consumption items in the aggregates, as outlined in the data chapter above, but the approach further requires adjustments for differences in the cost-of-living and in household needs. Such adjustments are often contentious in the literature (Ravallion, 1996). The lack of rural price data will be addressed by testing the sensitivity of the measured poverty incidence to a series of plausible rural-urban cost-of-living differentials as found in other developing countries. The adjustment for different household needs is dealt with by applying an adult-equivalence scale and by testing the sensitivity of poverty to introducing economies of scale in the household.

When selecting a type of poverty line, one must decide whether it should be absolute or relative to the distribution of welfare, or ‘objectively’ measured rather than subjective to the perception of the individual. Some argue that for the purposes of informing anti-poverty policies, a poverty line should always be “absolute in the space of welfare” (Ravallion, 1998), and only be adjusted by inflation. Relative poverty lines are deemed to be not as well suited for poverty comparisons over time or space, as they shift with changes in their anchor, such as mean or median expenditure. Similarly, ‘objective’, scientifically derived poverty lines have been preferred over subjective ones, which tend to be influenced by the individual’s relative position in the welfare distribution and varying perceptions of what poverty means (World Bank Institute, 2005). However, some authors have pointed out that any poverty line is arbitrary, and unlikely to be precisely measured (Deaton, 1997). They also have in common the unrealistic binary division into poor and non-poor, although the difference between these two states around the poverty line may be negligible. Nonetheless, poverty lines have been widely used in welfare analysis (Fields, 2001).

In developing countries, types of poverty lines that are absolute and objectively measured have been more popular (Ravallion, 1998). Examples include the cost of basic needs (CBN) method, which estimates the minimum cost of a bundle of basic goods; the food energy intake (FEI) method, which estimates the expenditure/income level at which the food energy intake is just sufficient to meet pre-determined food energy requirements; and, to a lesser degree, the food-share approach, which sets a maximum share of food in total consumption above which a household is considered to be poor. As a general rule, the poverty line should be appropriate for the intended purpose of the analysis. As will be shown further below, the use of the food-share poverty line is seriously flawed, in particular for public policy purposes. Given the available NHIES data and their properties, this analysis focuses on the CBN poverty line.

Following the selection of a welfare measure and poverty line, the final choice concerns the indicator with which to estimate poverty. This paper applies some of the frequently used Foster-Greer-Thorbecke ( $P_\alpha$ ) class of poverty measures that capture poverty incidence and severity (Foster, Greer and Thorbecke, 1984). Given the number of choices in the course of estimating poverty, it is important to be modest about the finality of one’s findings and to test how sensitive one’s results are to some of the assumptions made along the way.

### 3.1 Measuring the poor: Poverty lines in Namibia

The measurement of poverty in Namibia has mainly centred on the two NHIES surveys and the food-share poverty line (CSO, 1996; CBS, 2006), although more recently the CBN measure has become more prominent, first introduced by Van Rooy *et al* (2006) and officially adopted by CBS in November 2008. Before the NHIES, there were no nationally representative budget surveys in Namibia, and thus poverty profiles had to rely on a variety of sources and some degree of guess-work. A report on poverty alleviation shortly after Namibia's independence (World Bank, 1991) makes mention of some "rough estimates" by the National Building Investment Corporation (NBIC) of household incomes in black townships. In a number of surveys of townships throughout the 1980s, the NBIC found average incomes to be consistently (with the exception of Otjiwarongo in 1984) below the Primary Household Subsistence Level (PHSL), a poverty line based on a cost of 'very' basic needs approach developed by the University of Port Elizabeth in South Africa. The basket in the PHSL included food, clothing, fuel, light, washing and cleansing materials. A second poverty line, the Household Subsistence Level (HSL), included additional allowances for rent and transport. These lines were supposed to offer guidance to employers for setting wage levels. In 1990, the NBIC still estimated nearly 60 percent of urban black households to live below the PHSL.

For rural areas there were no quantitative poverty estimates, but at the time a qualitative food security profile and drought assessment study in 1989/90 by the UN was deemed the "most complete source of information for assessing the incidence of poverty in rural areas" (World Bank, 1991). According to these reports, rural poverty across the regions ranged from approximately 70 to 80 percent (*ibid.*). It is unclear, however, how the poverty line is defined in these studies. For selected rural communities, there were some poverty analyses done in the early 1990s based on a cost of basic needs method, for example Yaron *et al* (1992) in the Kavango region and Van Rooy *et al* (1994) for three different communities in Namibia. The limited scope of these studies makes it impossible to draw any nationally representative conclusions from their results.

### 3.2 Assessing the food-share approach

Starting with the compilation of the NHIES 1993/94, the Namibian government has until recently relied on a food-share measure of poverty, labelling every household as ‘poor’ that spends 60 percent or above of their total consumption expenditure on food items. Analogously, those households with a food-share of 80 percent or above are classified as ‘severely poor’. The food-share approach has been criticised extensively (Chaudhuri and Ravallion, 1995; Levine and Roberts, 2008b), but due to its apparent simplicity it is not uncommon internationally (World Bank Institute, 2005; Deaton, 1997). According to the measure, 32.6 percent of Namibians were classified as poor in 1993/94, while 6.5 percent were classified as severely poor.<sup>12</sup> As per the NHIES 2003/04 data, these prevalence rates decreased to 27.3 percent for ‘poor’ individuals and more sharply to 2.9 percent for those ‘severely poor’. This amounts to a reduction of 5.3 percentage points for poor individuals and 3.6 percentage points for severely poor individuals.

**Table 1: Poverty incidence based on food-share measure, 1993/94 and 2003/04**

Poverty Line	1993/94					2003/04				
	Est	Std Err	95% Conf Interval		DEFF	Est	Std Err	95% Conf Interval		DEFF
Namibia	0.326	0.018	0.290	0.362	6.654	0.273	0.010	0.254	0.292	4.636
Urban	0.158	0.025	0.109	0.207	5.864	0.042	0.004	0.034	0.051	1.602
Rural	0.394	0.021	0.352	0.436	5.965	0.395	0.014	0.368	0.423	5.271

Severe Poverty Line	1993/94					2003/04				
	Est	Std Err	95% Conf Interval		DEFF	Est	Std Err	95% Conf Interval		DEFF
Namibia	0.065	0.010	0.046	0.084	6.752	0.029	0.004	0.022	0.036	4.458
Urban	0.016	0.004	0.007	0.024	1.477	0.002	0.001	0.000	0.003	0.729
Rural	0.085	0.013	0.059	0.111	7.023	0.043	0.005	0.033	0.054	4.571

**Note:** Poverty Line = 60% food-share in consumption; Severe Poverty Line = 80% food-share in consumption; Poverty estimates for individuals; food-consumption excluding alcoholic beverages and tobacco. Est is the Po indicator; Std Err the robust standard error; 95% Conf Interval the 95% level confidence interval; and DEFF reports the DEFF design effect of the stratification.

Source: Own calculations, based on NHIES data.

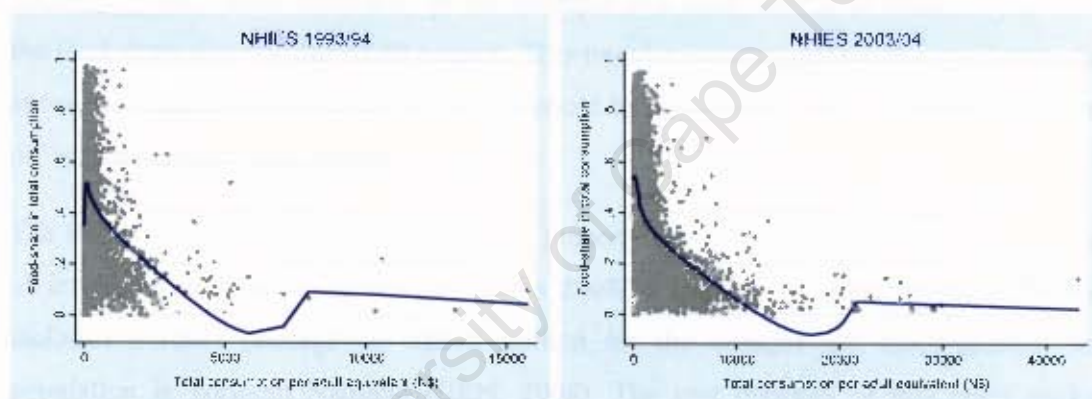
These reductions are markedly smaller than those reported in the NHIES report (CBS, 2006), which relies on a different consumption definition and uses households as units of

<sup>12</sup> Poverty rates for individuals, based on the consumption aggregates derived in the previous chapter. Alcoholic beverages and tobacco products are excluded from food consumption. The general poverty trend is robust to inclusion of these items, if at a slightly higher level.

analysis. Interestingly, this analysis shows that while urban poverty decreased from 15.8 to 4.2 percent, rural poverty remained almost constant around 39.5 percent.

The food-share in total expenditure approach relies on Engel's Law, which holds that the income elasticity of demand for food is less than unity, implying that the share of income dedicated to food steadily decreases as incomes rise. Engel's Law is supported widely by international evidence (Subramanian and Deaton, 1996; Houthakker, 1987; Holcomb *et al.*, 1995), but the relationship is subject to, among others, variations in preferences, relative prices and nutritional requirements. A scatter plot with locally weighted regression line (Lowess smoothing) based on the NHIES data appears to validate Engel's Law for both NHIES datasets, albeit not as a perfectly monotonic relationship, as illustrated by Figure 5 below.

Figure 5: Food-share by total consumption expenditure, 1993/94 and 2003/04



Note: N\$ current prices.

Source: NHIES, own calculations.

Given that the food-share approach, by Engel's Law and assuming comparable cost-of-living across households, recognises that total income/expenditure ( $y$ ) is the underlying welfare measure, this lack of monotonicity is a significant drawback. It violates a desirable property of poverty measures, which states that if  $y_A > y_B$ , then individual A cannot be considered poor if individual B is not (Fields, 2001). This violation is reflected in the finding that for both surveys, the mean and median consumption by adult equivalent is significantly higher for those households deemed 'severely poor' than for those deemed 'poor'. This result indicates that for those households with food consumption above 60 percent, Engel's Law breaks down, not allowing for a distinction between poor and severely poor. Further support comes from the finding that up to about N\$200 monthly expenditure

per adult equivalent (with parameters as introduced in Footnote 10) in the NHIES 2003/04, the food share appears to be rising with increasing income (CBS, 2008a).

Besides these drawbacks, the food-share poverty measure violates another important criterion, the so-called 'transfer principle' for poverty measurement as described by Sen (1976). According to this principle, if a transfer is made from a poor to a richer person, then poverty must increase. The principle can be restated as: if a transfer is made from a richer to a poor(er) person, then poverty must not increase. This is one of the main criticisms of the widely-used headcount index of poverty, which may increase if someone just above the poverty line gives to someone below the line. The benefactor may as a consequence fall into 'poverty' while the beneficiary may not be lifted above it, thus leading to an increase in the headcount index of poverty. The food-share measure of poverty violates the transfer principle in a less intuitive way, namely that the recipient of the transfer may be pushed into 'poverty'. This can be illustrated by the example of a food transfer to someone just below the food-share poverty line of 60 percent. This transfer may, *ceteris paribus*, push this share above 60 percent, thus leading to the household to be declared 'poor', despite being better off in terms of real consumption.

The following example illustrates how this property could obfuscate the measured outcome of interventions to alleviate poverty: In its 2008/09 Budget, the government of Namibia included a relief package of N\$280 million for the drought and flood-stricken rural population in northern Namibia (GRN, 2008). The vast majority of this relief package consisted of direct food aid to be delivered over the financial year. All else being equal, especially relative prices between food and non-food items, this would have raised both total (measured) consumption expenditure and the share of food expenditure in total expenditure. It may thus have raised the food-expenditure-share of some households above 60 percent, pushing them into 'poverty'. Even if poor households were perfectly targeted, which in reality is not possible, it would still have increased the food-share of some poor households to above 80 percent, as a result worsening their status from 'poor' to 'severely poor'. The irony is that the government's attempt to alleviate poverty has actually made it worse, if only according to the applied measure, and not in reality. With regards to policy evaluation, this is a powerful argument to discredit the usefulness of the food-share measure in comparing poverty levels.

### 3.3 The cost of basic needs approach

The cost of basic needs (CBN) approach to measuring poverty sets out to define a basic bundle of goods and attach a value to the minimum cost of attaining this bundle, which is the poverty line. Typically, the first step is to calculate the cost of a food basket that reflects the consumption pattern of the poor (Ravallion, 1998). Secondly, based on the nutritional value of the selected food items, the cost of meeting a person's (for example adult equivalent) daily caloric needs is computed. This cost estimate of meeting an individual's food requirements is the food poverty line. Usually a component of essential non-food needs is added to the food poverty line (*ibid.*). This can be done by estimating how much individuals around the food poverty line spend on average on non-food items. Such non-food expenditure is deemed to be essential, since individuals who can barely meet their nutritional needs forego additional food consumption to obtain it. The sum of the food poverty line and this observed non-food spending is the CBN poverty line (or, respectively, severe poverty line). Households with per adult-equivalent expenditure below this poverty line are considered 'poor'. It should be noted that a person who consumes less food than the stipulated basic needs will not be considered 'poor' as long as he or she could consume it by reallocating their consumption bundle (*ibid.*).

The CBN poverty line is appealing in that it provides a more objective, absolute measure of welfare, at least for food items. However, as with virtually all poverty lines, it rests on a number of assumptions that may appear arbitrary. Minimum nutritional requirements vary from individual to individual, not least at different levels of physical exertion. That is why some argue that rural caloric needs are generally higher than urban ones due to the more physical nature of agricultural labour (Deaton, 1997). Other differences relate to age and gender, with much debate over which equivalence scale to apply (Deaton and Zaidi, 1998). Variations in regional tastes and price levels further influence individual consumption bundles and the definition and affordability of what constitutes 'basic needs'.

Despite these shortcomings, it is clear the CBN method provides a more appropriate poverty measure than the food-share approach, partly because it is mapped directly on expenditure. It attempts to define a minimum amount of money that allows the members of a household to escape deprivation. The CBN method has proven popular around the world, in particular

in developing countries (World Bank Institute, 2005), and is now almost universally used by countries in the Southern African Development Community (SADC).

In Namibia, the CBN method is a recent addition. It was championed by Van Rooy *et al* (2006), who applied it to the NHIES 1993/94 data according to the two-step procedure as outlined above. It has since been taken up in an official publication (CBS, 2008a), which followed Van Rooy *et al*'s (2006) methodology and applied it to the NHIES 2003/04. However, ensuring that a poverty line is comparable between two surveys is not trivial and may require careful adjustments (Lanjouw and Lanjouw, 1997), which will be discussed further below.

The Namibian food poverty line is the cost of a set minimum daily caloric intake, based on the nutritional value of a typical basket of food items consumed by poorer households (*ibid.*). In Namibia, this basket comprises the top-30 cash and top-15 in-kind food items consumed by households in the 2<sup>nd</sup> to 5<sup>th</sup> deciles in terms of per capita expenditure. Since the NHIES do not contain community-level price data, the calculation relies on the urban-based CPI data. Van Rooy *et al* (2006) try to get around this drawback by including a rural price index, as discussed below. Once a value of the basic food cost is estimated, the cost of essential non-food consumption is derived by taking the average median non-food expenditure per adult equivalent for five successively larger intervals (from 1 to 5 percent) around the food poverty line (following Ravallion, 1998).

Van Rooy *et al* (2006) calculate this non-food component by applying the above methodology to those households whose per-capita *total* consumption is approximately equal to the food poverty line. While these households could satisfy their nutritional requirements, they forego some food purchases to obtain essential non-food items, such as clothing and shelter. The average value of these items for households at the food poverty line constitutes the non-food component which is added to the food poverty line to make up van Rooy *et al*'s (2006) CBN poverty line. CBS (2008a) follows the same method, but calls it the "Severe Poverty Line". The authors introduce a third, less restrictive definition of the Poverty Line: While the procedure is analogous to that above, the non-food component is calculated for those households whose per capita *food* expenditure is around the food poverty line. It thus measures how much those households spend on non-food items that just about satisfy their members' nutritional requirements. Using CBS' (2008a) nomenclature,

the following analysis distinguishes between Food Poverty Line, Severe Poverty Line and Poverty Line according to these definitions.

Despite the common methodological basis of the CBN for 1993/94 and 2003/04, one cannot simply adopt the poverty lines of the two cited studies (Van Rooy *et al*, 1996 and CBS, 2008a) for comparative purposes. First, important differences in the calculations need to be addressed. In the following section, these issues are discussed and attempts are made to mitigate the associated problems.

### 3.3.1 Improving comparability of the 1993/94 and 2003/04 CBN poverty lines

The differences in methodology between CBS (2008a) and Van Rooy *et al* (2006) fall mainly into three areas: the cut-off for the daily caloric intake, use of adult-equivalence scales (by CBS) and inclusion of rural price data (by Van Rooy *et al*). While the former two are relatively easily adjusted, the price data pose serious problems for comparability.

Van Rooy *et al* (2006) set the required daily nutritional intake at 2,200 kcal per adult, while CBS (2008a) applies 2,100 kcal. As the latter appears to be the more commonly used international standard (World Bank Institute, 2005), I recalculate the food-poverty line for the 1993/94 data at 2,100 kcal, and adjust it for the adult equivalence scale used by CBS (2008a).<sup>13</sup> The non-food component was then estimated in order to derive the Severe Poverty Line and the Poverty Line. In 1993/94 N\$, poverty line is N\$74 per month, while the re-estimated Severe Poverty Line and Poverty Line are N\$109 and N\$148 respectively. Despite the lower food poverty line (N\$74 compared to N\$77 by Van Rooy *et al*), the CBN line is actually higher (N\$109 compared to N\$107), due to a different consumption aggregate and the lack of adult equivalent scales used in their analysis.

Another difference is that Van Rooy *et al* (2006) made an attempt to include rural price data for the food consumption items in the basket. While the importance of reflecting different price levels in rural areas is beyond doubt, there are methodological issues with their approach. The price data are based on a 1993 Household Subsistence Level Survey by the Multi-Disciplinary Research and Consultancy Centre (MRCC) at the University of Namibia, which collected prices in three regions, one of which was deemed rural (Omusati) and two were deemed urban (Khomas and Hardap). The authors do not, however, provide more

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<sup>13</sup> Scaling weights: from age 0 to 5 = 0.5; age 6 to 15 = 0.75; age 16 and above = 1.

details on how large the sample was and how the distinction between rural and urban location was made. They conclude, rather curiously as is explained further below, that based on ten common food items, the average cost of living is 27 percent higher in rural than in urban areas. In order to calculate the required expenditure to cover the minimum daily caloric intake, a weighted average between rural and urban prices based on the spatial distribution of households was applied.<sup>14</sup>

Even if the estimated price differential was correct, the next step of calculating a weighted average of prices for the poverty line is bound to produce biased estimates. As the average price level lies below that estimated for rural areas and above that for urban areas, the common poverty line will underestimate rural poverty levels and overestimate those in urban areas. This could have been avoided by applying separate poverty lines for rural and urban households, or by deflating rural household consumption to the same effect.

Besides this issue, the rural price methodology is rejected for two fundamental reasons: Firstly, the sample on which the rural-urban price comparison is based is not representative. It is based on a simple price average of only ten common food items, and one region with an unspecified number of observations. Secondly, and following from the above point, the conclusion that the rural cost of living is almost a third more expensive than that in urban areas is unlikely. Not only is the difference very large, the direction is also not intuitive, as international evidence predominantly shows that rural price levels tend to be below urban ones (Fields, 2001; Deaton, 1997; Ravallion and Van de Walle, 1991).

In re-estimating the poverty line for 1993/94, one approach is to deflate the poverty line for 2003/04 from CBS (2008a) by CPI data to the price level of survey year. As the 2003/04 fieldwork started two months earlier than that of 1993/94<sup>15</sup>, annual CPI discounting by ten years would lead to a slight underestimation in the 1993/94 poverty line. This is corrected by taking the year-on-year CPI of each calendar month of the 2003/04 survey, discounting it to the respective calendar month in the 1993/94 survey, and taking the arithmetic mean of the estimates for the twelve months. The months November to August are thus discounted by ten years, while September and October are discounted by only nine years (from Sep/Oct 2003 to Sep/Oct 1994). The imputed values for 1993/94 are N\$118 for the Poverty Line,

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<sup>14</sup> The authors deflate the grams per monthly expenditure on each item for rural households, which amounts to the same result as inflating the cost per gram/calorie.

<sup>15</sup> The fieldwork for NHIES 2003/04 was conducted from September 2003 to August 2004; for NHIES 1993/94, the period was November 1993 to October 1994.

N\$83 for the Severe Poverty Line and N\$57 for the Food Poverty Line. Table 1 below provides an overview of the CBN poverty lines in this section.

**Table 2: Cost of Basic Needs Poverty Lines for NHIES**

Survey	Source	Poverty Line (N\$)	Severe Poverty Line (N\$)	Food Poverty Line (N\$)
NHIES 2003/04	CBS (2008a)	262.45	184.56	127.15
NHIES 1993/94	Own calculations, food poverty line CPI-deflated, based on CBS (2008a)	105.41	81.71	57.17
NHIES 1993/94	All poverty lines CPI-deflated, based on CBS (2008a)	118.00	82.98	57.17
NHIES 1993/94	Own calculations, based on Van Rooy <i>et al</i> (2006)	148.47	108.67	73.50
NHIES 1993/94	Van Rooy <i>et al</i> (2006)		107.00	77.00

Source: NHIES, own calculations.

The CPI-derived poverty lines for 1993/94 are markedly lower than those based on Van Rooy *et al*'s (2006) calculations. The most plausible explanation for this is the rural price inflator introduced by Van Rooy *et al* (2006), which contributed to the much higher food poverty line. This higher basis then feeds through to the Severe Poverty Line and Poverty Line. Indeed, if the poverty lines calculated on the basis of Van Rooy *et al*'s (2006) food price basket (N\$148.47, N\$108.67 and N\$73.50 in Table 2) are adjusted to approximately urban price levels<sup>16</sup>, the derived poverty lines (N\$120.25, N\$88.02 and N\$59.53) are not too far off the CPI-deflated poverty lines based on CBS' (2008a) food basket (N\$118.00, N\$82.98 and N\$57.17). This affirms the reasonable level of relative price stability – save for some short term fluctuations – between food and non-food items over time as exhibited in the sectoral CPI data (Levine and Roberts, 2008a). However, when reconstructing the Poverty Line and Severe Poverty Line from the NHIES 1993/94 data, based on the CPI-deflated Food Poverty Line (second row in Table 2), the relative price stability is called into question. While the Severe Poverty Line is close to the CPI-adjusted one (N\$81.71 vs. N\$82.98), the Poverty Line is markedly lower (N\$105.41 vs. N\$118.00).

The subsequent analysis in this dissertation relies on the re-calculated Poverty Line (N\$105.41) for 1993/94 to allow for such relative changes in food to non-food consumption for poor households, even if there is no indication of relative price changes in the overall, urban-collected CPI data. One should reiterate that the overall weights of the consumption

<sup>16</sup> The rural food-price inflator is 1.2722, times the share of rural households in the 2nd to 5th deciles (86.2%), as used by van Rooy *et al*, gives an adjustment factor of  $13.8\% + 86.2\% \times 1.2722 = 1.235$ .

categories in the CPI may not reflect the consumption pattern of the poor (Günther and Grimm, 2007). Nonetheless, the proximity of the CPI-deflated Food Poverty Line and that by Van Rooy *et al* (2006) based on the 1993/94 data supports the assumption that the CPI deflator is suitable at least for the food consumption in the NHIES. The poverty lines for the two surveys chosen for the following analysis are thus the first two in Table 2 above.

### 3.3.2 Identification of consumption poverty by the food-share method

In an attempt to gauge how well the food-consumption share approach captures poverty according to CBN poverty, matrices of the shares of households being identified by the two measures can be calculated. To that end it is estimated what percentage of food-share poor households are identified as poor, or below a certain threshold, by a number of welfare measures, and vice versa. These thresholds are the CBN poverty line derived in the previous section, as well as relative cut-off points in the distribution of consumption, such as mean, median, 50 percent of the median and the poorest quintile. As the general trend for the two NHIES surveys is similar, only the 2003/04 findings are discussed here. The identification rates for both surveys are presented in Table 3 and Table 4 below.

**Table 3: Identification of households by Food-share and CBN poverty measure**

1993/94							
Food-share				Food-share			
		Poor	Non-poor			Severely Poor	Non-sev. poor
Cost of Basic Needs	Poor	18.4%	30.1%	Cost of Basic Needs	Severely Poor	1.1%	32.1%
	Non-poor	11.8%	40.1%		Non-severely poor	4.6%	62.6%
2003/04							
Food-share				Food-share			
		Poor	Non-poor			Severely Poor	Non-sev. poor
Cost of Basic Needs	Poor	11.8%	15.7%	Cost of Basic Needs	Severely Poor	0.6%	13.2%
	Non-poor	14.9%	57.5%		Non-severely poor	2.7%	83.5%

**Note:** Food-share poverty line 60% and severe poverty line 80% food-share in total consumption; CBN poverty lines for 2003/04 from CBS (2008a), for 1993/94 as derived in section 5 of this paper. Read table as follows: for example, in 1993/94, 18.4% of households were identified as poor by both the food-share and the CBN method; 30.1% of households were identified as poor by CBN, but are non-poor by the food share method, etc.

Source: Own calculations based on NHIES data.

Overall, the food share approach appears to be wanting as a measure of consumption poverty. When compared to the CBN poverty line of N\$262.45 monthly adult equivalent consumption expenditure by CBS (2008a), the food-share poverty line only identifies 43 percent of those households as poor that are considered poor according to adult-equivalent consumption. For severely poor households (80 percent food-share and N\$184.56 monthly consumption expenditure for the two methods respectively), the identification rate is even lower at a mere 4 percent.

**Table 4: Population identified as food-share poor**

	1993/94	2003/04
> median	22.1%	13.5%
> mean	8.8%	4.3%

Note: Expressed as percentage of the population with per capita consumption expenditure above median and mean (food-share  $\geq 60\%$ ).

Source: Own calculations based on NHIES data.

On the other hand, 22 percent of households above the median consumption value are food-share poor, as are 9 percent of households above mean consumption. The food-share method appears to suffer both from excluding consumption-poor households and including some that are among the better-off in terms of consumption expenditure. Due to these findings as well as the drawbacks outlined in section 3.2, the food-share measure is not considered further in this dissertation, where poverty estimates are based entirely on the CBN approach.

### 3.4 $P_\alpha$ Class of Poverty Measures

A choice still has to be made regarding the unit of comparison: households or individuals. Given the tendency of poorer households to be larger than better-off ones (Lanjouw and Ravallion, 1995), measuring poverty by households may lead to an underestimation of poverty rates in the population.<sup>17</sup> This analysis therefore focuses on individuals, whereby members of the same household are assumed to have equal consumption, adjusted per adult equivalent (using the scale in CBS, 2006 and 2008a: From age 0 to 5 = 0.5; age 6 to 15 =

<sup>17</sup> Indeed, based on household weights, the poverty headcount is 10 to 11 percentage points lower for the two surveys.

0.75; age 16 and above = 1). The presentation below is limited to the Poverty Line and Severe Poverty Line.<sup>18</sup>

The poverty measures used are of the so-called  $P_\alpha$  class, also known as FGT measures (Foster, Greer and Thorbecke, 1984). The general formula for these measures is

$$P_\alpha = \frac{1}{n} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^\alpha \quad \alpha \geq 0$$

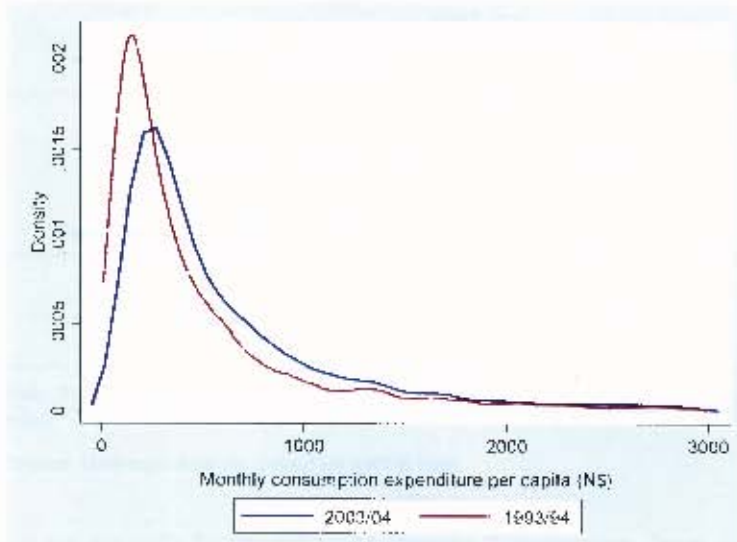
where  $n$  is the total population,  $q$  the number of poor individuals,  $y_i$  the income or consumption of individual  $i$ ,  $z$  the poverty line, and  $\alpha$  a parameter measuring poverty aversion. The three measures applied here are the headcount index of poverty,  $P_0$ , which measures the population share of individuals under the poverty line; the poverty gap index,  $P_1$ , which measures the aggregate consumption deficit of the poor as a proportion of the poverty line and normalised by the population size;<sup>19</sup> and a distribution-sensitive measure  $P_2$ , which is similar to the poverty gap index, but here the poverty deficits of the poor are weighted by the deficits themselves rather than equally.  $P_1$  thus measures the relative deprivation of the poor, but is neutral between different degrees of deprivation, while  $P_2$  places greater weights the greater the degree of deprivation.

### 3.5 Namibia: Changes in poverty over time

Based on the above consumption measure, poverty lines and poverty measures, one can compare how the level of poverty has changed between the two surveys. A first indication of welfare improvements is given when the kernel densities of per capita consumption expenditure for each survey year are plotted next to each other. There is a notable shift in the 2003/04 density function to the right and down, indicating rising consumption levels overall and in particular near the bottom of the distribution. The cumulative distribution functions, which are presented in the discussion of poverty dominance further below, also confirm this impression.

<sup>18</sup> The trend for the Food Poverty Line, which is not reported here, generally follows the Severe Poverty Line.

<sup>19</sup> Note that this is different from the average percentage difference of the poor from the poverty line as it also depends on the size of the non-poor population.

**Figure 6: Kernel density estimates of consumption expenditure, 1993/94 and 2003/04**

Note: Adult-equivalent monthly consumption expenditure expressed in 2003/04 prices.

Source: Own calculations, based on NHIES data.

As presented in Table 5, the incidence of poverty has considerably decreased in Namibia between 1993/94 and 2003/04. Based on the headcount index, poverty was reduced from an estimated 58 to 38 percent of individuals. Poverty is consistently more pronounced in rural than in urban areas. The absolute poverty reduction, however, was notably stronger in rural areas for all three measures. The rural headcount index decreased by 20 percentage points (from 69 to 49 percent), compared to 14 percentage points in urban areas (from 31 to 17 percent).

As a share of the respective populations, the picture is not as clear when comparing urban to rural poverty reductions. The difference between rural and urban areas in terms of relative poverty reduction was more pronounced for the poverty gap and poverty severity index scores than for the headcount index; this indicates that a higher proportion of poor households “managed to cross” the poverty line in urban areas, but among those households that remained in poverty, rural ones saw more improvement on average.

**Table 5:  $P_{\alpha}$  poverty measures for Namibia, 1993/94 and 2003/04**

Poverty Line	1993/94			2003/04		
	$P_0$	$P_1$	$P_2$	$P_0$	$P_1$	$P_2$
Namibia	0.58	0.28	0.17	0.38	0.13	0.06
Urban	0.31	0.12	0.07	0.17	0.06	0.03
Rural	0.69	0.34	0.21	0.49	0.16	0.08
<b>Severe Poverty Line</b>	<b><math>P_0</math></b>	<b><math>P_1</math></b>	<b><math>P_2</math></b>	<b><math>P_0</math></b>	<b><math>P_1</math></b>	<b><math>P_2</math></b>
Namibia	0.47	0.21	0.12	0.20	0.06	0.03
Urban	0.21	0.08	0.04	0.09	0.03	0.01
Rural	0.58	0.26	0.14	0.26	0.07	0.03

Note:  $P_0$  is the headcount index of poverty,  $P_1$  is the poverty gap index and  $P_2$  is the distribution-sensitive poverty gap index.

Source: Own calculations, based on NHIES data.

Severe poverty decreased more sharply than poverty, from 47 to 20 percent of individuals in Namibia. Again, the absolute reduction was more pronounced in rural areas. Both poverty gap and distribution-sensitive poverty gap indices fell as well, indicating that the situation of the average poor individual and the distribution of consumption among the poor improved. T-tests based on robust standard errors show that for all  $P_{\alpha}$  measures and for both poverty lines, the reductions are statistically significant at the 99 percent level. The differences in measured poverty between rural and urban areas are also significant at the 99 percent level (for standard errors see Table A1 in Appendix A).

The estimated poverty prevalence is significantly higher than that derived with the food-share poverty line. For severely poor households, they are even several-fold higher for both surveys. However, the CBN poverty line exhibits a much steeper reduction in the poverty headcount than the food-share measure. The difference is most pronounced for households in rural areas, where the incidence of poverty was estimated to have remained almost constant under the food-share approach.

The poverty shares in rural and urban areas have remained remarkably constant over time, with around 85 percent of the poor being found in rural areas and 15 percent in urban ones. The estimated absolute number of poor individuals in the country decreased from 684,000 to 583,000 in rural areas and from 123,000 and 108,000 in urban areas.

### Regional poverty rates

In terms of spatial poverty distribution, Table 6 provides an overview of poverty levels in the regions of Namibia. Due to space limitations, only results for the Poverty Line are discussed here. The same comparisons using the Severe Poverty Line yielded broadly similar results, as indicated by Table A3 in the appendix. For each of the surveys, the regions are ranked from the highest to the lowest poverty headcount. Two points of caution should be noted: firstly, due to fairly large estimated robust standard errors, regions with similar poverty levels cannot be distinguished at the 95 percent confidence level.<sup>20</sup> For 1993/94, for example, one cannot say with statistical significance whether Ohangwena had a higher poverty headcount index than Caprivi, or whether Khomas had less poverty than Erongo. It can be said with confidence at the 95 percent level, however, that Ohangwena had a higher headcount index than all regions except Caprivi, and that Khomas had a lower poverty incidence than all regions except Erongo. In the middle of the distribution, the distinction between regions by poverty levels becomes even more difficult. Secondly, the ranking rests on the assumption of equal price levels across regions. Differences in the relative cost of living may change the picture considerably. The following discussion should thus be regarded as indicative rather than precise in differences and changes.

**Table 6: Poverty levels by region in Namibia, 1993/94 and 2003/04**

Rank by P <sub>0</sub>	NHIES 1993/94			NHIES 2003/04				
	Region	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	Region	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>
1	Ohangwena	0.782	0.411	0.258	Kavango	0.641	0.276	0.150
2	Caprivi	0.745	0.375	0.236	Ohangwena	0.555	0.165	0.065
3	Kunene	0.725	0.364	0.231	Oshikoto	0.492	0.142	0.059
4	Oshikoto	0.698	0.344	0.210	Hardap	0.420	0.181	0.097
5	Oshana	0.696	0.309	0.172	Omaheke	0.414	0.162	0.085
6	Omusati	0.640	0.306	0.182	Otjozondjupa	0.390	0.153	0.079
7	Omaheke	0.608	0.268	0.152	Omusati	0.384	0.104	0.043
8	Kavango	0.581	0.257	0.144	Kunene	0.368	0.148	0.076
9	Otjozondjupa	0.472	0.243	0.152	Caprivi	0.365	0.119	0.054
10	Karas	0.437	0.210	0.122	Karas	0.327	0.134	0.072
11	Hardap	0.422	0.205	0.130	Oshana	0.257	0.070	0.027
12	Erongo	0.334	0.126	0.062	Erongo	0.143	0.050	0.024
13	Khomas	0.215	0.093	0.053	Khomas	0.081	0.021	0.009
	<b>Namibia</b>	<b>0.580</b>	<b>0.279</b>	<b>0.167</b>	<b>Namibia</b>	<b>0.377</b>	<b>0.128</b>	<b>0.061</b>

Source: Own calculations, based on NHIES data.

<sup>20</sup> Table A2 in Appendixure A presents standard errors and confidence intervals.

In 1993/94, the highest poverty headcount was found in Ohangwena, with 78 percent of the population considered poor. Ohangwena further exhibited the highest poverty gap index, with the average poor person spending 41 percent less than the poverty line. In terms of poverty severity, the region also led the table with an index of 26 percent. Khomas had the lowest prevalence of poverty for all three measures (22 percent, 9 percent and 5 percent respectively). The overall finding of poverty reduction also applies to virtually all regions, while the relative situation among the regions remained similar. There are, however, five notable exceptions: Kavango moved from the lower half of regions to the top of the table for all three measures. Indeed, it is the only region to note a worsening in its poverty levels.<sup>21</sup> However, it must be noted that this may be partly due to the rezoning with Caprivi that affected the region in 1998.<sup>22</sup> Hardap saw its poverty headcount of 42 percent barely change and consequently rose from rank 11 to 4. Caprivi, Kunene and Oshana registered the largest absolute drop in poverty, moving them from second, third and fifth position, respectively, into the bottom half of the table. The other regions maintained their approximate position in the poverty ranking. The large standard errors of the regional poverty indicators may be indicative of the limitations of the NHIES sample size, which does not allow for a more detailed mapping of poverty.

Contrary to the poverty shares in rural and urban areas overall, the regional poverty shares underwent some changes, as outlined in Table 7 below. Most of the poor live in the central northern regions, with Kavango, Ohangwena, Omusati and Oshikoto accounting for almost two thirds of all poor individuals in 2003/04. The notable changes in the shares of Caprivi and Kavango may have been affected by the rezoning of a constituency from the former to the latter region in 1998, however.

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<sup>21</sup> Not statistically significant at the 5% level.

<sup>22</sup> Jointly, the poverty incidence in Caprivi and Kunene declined from 65% to 56%; the other two regions affected by the rezoning, Omusati and Kunene, saw their overall incidence of poverty drop from 66% to 38%.

**Table 7: Poverty shares and number of poor individuals by region in Namibia**

	2003/04		1993/94	
	% of Poor	No. of Individuals	% of Poor	No. of Individuals
Caprivi	4.6%	31,556	8.5%	68,130
Erongo	2.1%	14,174	3.1%	24,836
Hardap	4.2%	28,613	2.8%	22,852
Karas	3.0%	20,396	2.9%	23,637
Kavango	19.4%	133,615	9.0%	72,591
Khomas	3.0%	20,989	4.3%	34,801
Kunene	3.3%	22,659	5.3%	42,814
Ohangwena	19.0%	131,423	18.5%	149,275
Omaheke	3.4%	23,178	3.6%	28,648
Omusati	12.5%	86,544	12.1%	97,873
Oshana	6.3%	43,736	13.9%	112,334
Oshikoto	12.3%	84,985	10.1%	81,033
Otjozondjupa	7.0%	48,416	5.9%	47,380

Source: Own calculations, based on NHIES data.

### 3.5.1 Poverty dominance testing

The measured poverty reduction between the two surveys is still subject to the specific CBN poverty line that was derived. Despite all attempts to set poverty lines on a scientific footing, they do remain open to the criticism of arbitrariness (Foster and Shorrocks, 1988). By testing for poverty dominance (Atkinson, 1987), this criticism can be addressed through a comparison of the extent of poverty in two populations across a range of poverty lines.

Poverty dominance testing is suitable for poverty measures of the general additive class, to which the  $P_\alpha$  measures belong (Fields, 2001). Following the notation by Fields (2001), one would like to establish whether distribution A yields higher levels of poverty than distribution B for all poverty lines  $z$  between a lower bound and upper bound. The lower bound typically takes the lowest income in the population  $y_{min}$ , while the upper bound can be the highest income in the population  $y_{max}$  or a maximum possible poverty line  $z_{max} < y_{max}$ .

The two distributions are then compared by means of their poverty incidence curves  $F_X(z)$ , which is the cumulative distribution function (CDF) for distribution  $X$  when the poverty line is  $z$ .

There are typically three levels of dominance considered in poverty measurement, of the first, second and third order. “First-order dominance [...] is defined as follows: if the CDF for distribution A ( $F_A$ ) is everywhere at least as high as that for distribution B ( $F_B$ ) between  $y_{min}$  and  $z_{max}$ , A *first-order-dominates* B” (*ibid.*, p79).

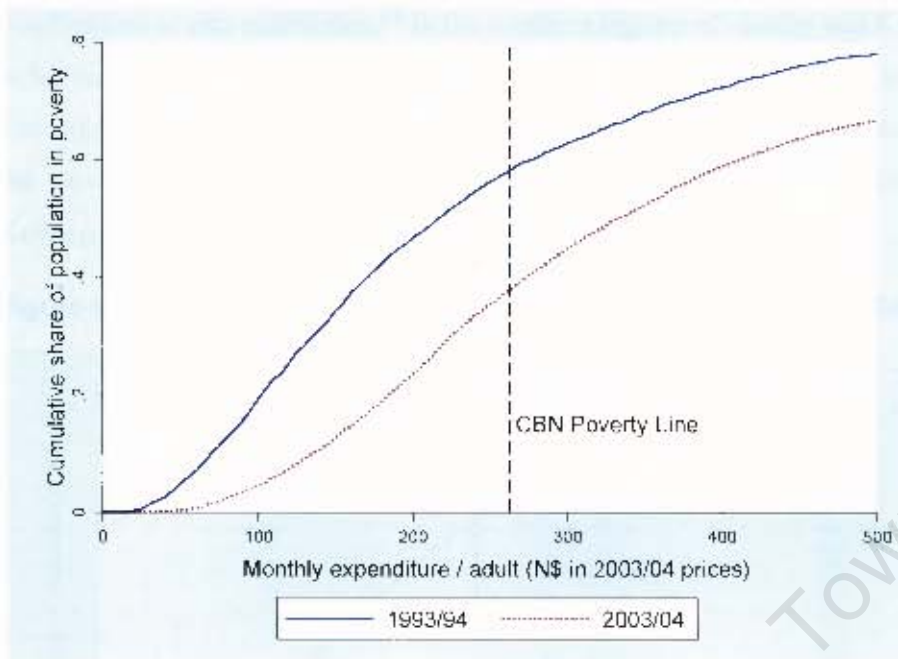
As applied to the  $P_\alpha$  class of poverty measures, this means that if A first-order-dominates B, then poverty under A is greater than under B for all  $P_\alpha$ ,  $\alpha \geq 0$  and for all poverty lines between  $y_{min}$  and  $z_{max}$ .

Such a first-order poverty ranking requires that the poverty incidence curves do not cross. In case they do, it may still be possible to rank the distributions by relying on second-order dominance, which compares the areas under the poverty incidence curves by plotting so-called poverty deficit curves. Analogously, third-order dominance may be relied on by plotting poverty severity curves, which compare the areas under the poverty deficit curves. For the purposes of this analysis, it is important to note that if first-order dominance holds, then by definition second- and third-order dominance also hold.

Applied to the NHIES 1993/94 and 2003/04 surveys, the following parameters are set for the poverty dominance analysis: instead of income, the chosen welfare indicator is adult-equivalent consumption expenditure per month as defined earlier, expressed in average 2003/04 prices. For convenience,  $z_{min}$  is set at 0, which is not far below  $y_{min}$  of N\$15.  $z_{max}$  is set at N\$500, which leaves a reasonable margin above the estimated CBN poverty line of N\$264. This value of  $z_{max}$  has the benefit of graphical clarity in the CDF, whereas the use of  $y_{max}$  (N\$43,087 in 2003/04) would yield very drawn-out curves.<sup>23</sup> Based on these specifications, the poverty incidence curves for 1993/94 and 2003/04 are depicted in Figure 7.

<sup>23</sup> However, the results of the analysis also hold for  $z_{max} \leq z \leq y_{max}$ .

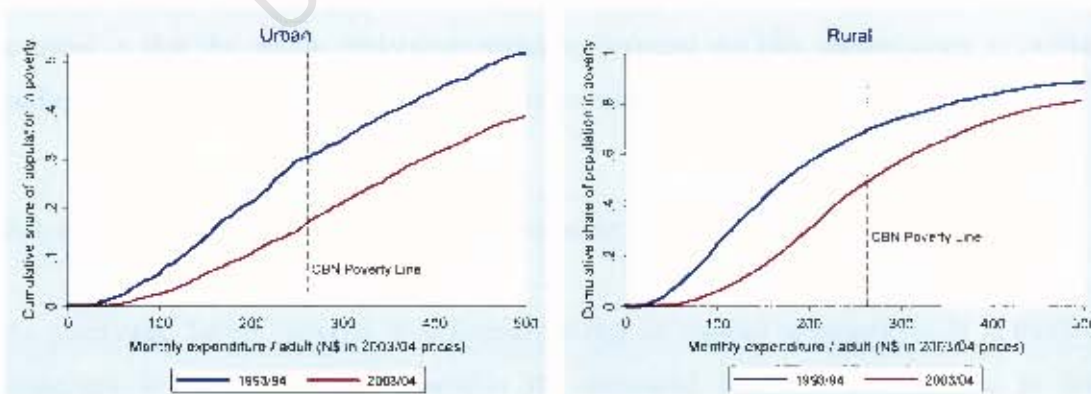
Figure 7: Poverty incidence curves for Namibia, 1993/94 and 2003/04



Source: Own calculations, based on NHIES data.

The graph shows that the poverty incidence curve for 1993/94 is at least as high as that for 2003/04 for all  $z$  between 0 and N\$500. This means first-order dominance of the 1993/94 distribution over the 2003/04 distribution for this range of poverty lines holds, supporting the finding that poverty decreased between the surveys. First-order dominance is confirmed when calculating the poverty incidence curves separately for urban and rural areas, as indicated in Figure 8 below.

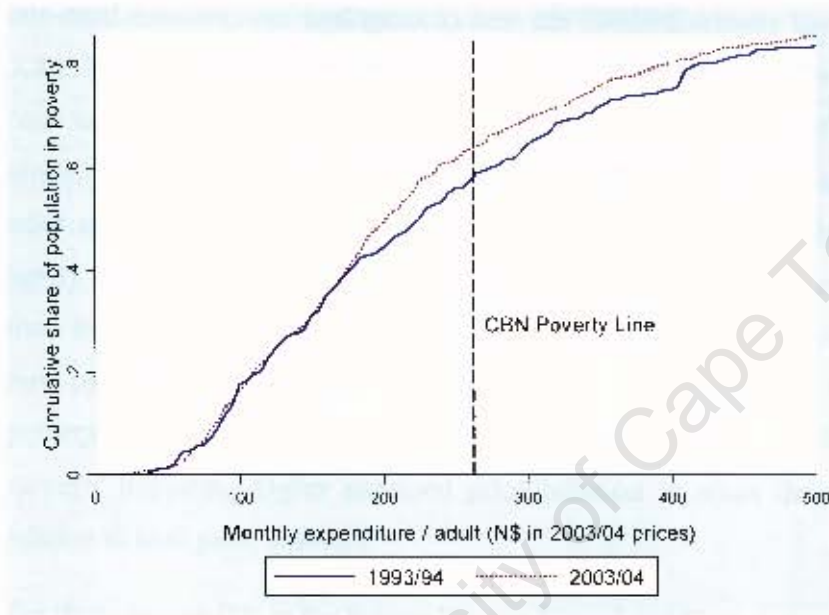
Figure 8: Urban and rural poverty incidence curves for Namibia, 1993/94 and 2003/04



Source: Own calculations, based on NHIES data.

For most of the intra-regional poverty estimates, first-order dominance of the 1993/94 distributions is also established.<sup>24</sup> In the southern regions of Hardap and Karas, only second-order dominance of the 1993/94 distributions is found in the range up to N\$500, while in Kavango no distributional dominance is established at all due to repeated intersections of the poverty incidence, deficit and severity curves. The poverty incidence curves for Kavango are plotted below.

Figure 9: Poverty incidence curves for Kavango, 1993/94 and 2003/04



Source: Own calculations, based on NHIES data.

The two regional distributions are intersecting repeatedly up to around N\$180, thus preventing the establishment of poverty dominance. The case of Kavango, however, is unusual in that the region underwent rezoning between the two survey years as outlined earlier, thus making any like-for-like comparisons over time impossible.

### 3.5.2 Testing the robustness of the poverty profile

As mentioned before, poverty measurement relies on various assumptions. It is therefore important to understand how sensitive the measured levels of poverty are to these assumptions. Two important dimensions are investigated here: Firstly, the assumption of

<sup>24</sup> Except some intersections of the distribution below N\$50, which are not considered due to the likelihood of outliers at this extremely low level of consumption expenditure.

equal price levels between urban and rural areas; and secondly, the use of equivalence scales for household size and composition.

### **3.5.2.1 Adjusting the CBN poverty line for rural-urban price differences**

The non-food component of the poverty line can be estimated separately for rural and urban areas following loosely Ravallion and Bidani (1994). Using this technique, it is estimated what rural and urban households around the (common) food poverty line each spend on non-food consumption, analogous to how the 1993/94 poverty line was derived in section 3.3.1. It can be seen that the non-food component of the poverty line varies largely between rural and urban areas. For those households in the NHIES 2003/04 with food consumption around the food poverty line, non-food consumption expenditure is estimated at N\$99 per adult in rural areas and N\$383 in urban areas.<sup>25</sup> The fact that urban households, that can barely afford the nutritional minimum intake, spend around four times more on basic non-food items points towards differences in relative prices or preferences between urban and rural households. In this context, it is also of interest that the ratio of the urban to the rural poverty line with separate non-food components increased from 1.5 to 2.3 between the two surveys, indicating higher non-food price inflation in urban than in rural areas, at least relative to food price inflation.

For those households at the Severe Poverty Line, the difference in non-food spending is not as stark: for 2003/04, the non-food component is N\$54 per adult for rural and N\$76 per adult for urban households, a difference of around 40 percent. For the 1993/94 data, the difference is not statistically significant, with both rural and urban households at the Severe Poverty Line spending around N\$35 on non-food items. This should not detract from the overall picture that urban households tend to spend relatively more on essential non-food items than rural households, which is in line with the casual observation of higher cost of urban accommodation and transport. Since there is no reliable price information available for rural areas, such conclusions can only be tentative.

In order to explore the effect of potential rural-urban price differences on poverty measures, some sensitivity analysis is undertaken. The baselines are the CBS (2008a) poverty lines for 2003/04, and those derived by CPI-deflating the Food Poverty Line for 1993/94. They will be the benchmark against which the following specifications are compared. The general

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<sup>25</sup> NHIES 1993/94: N\$38 (rural) and N\$155 (urban).

assumption of lower rural price levels will be tested in two ways: Firstly, as outlined above, equal cost of basic food requirements are assumed, but with a differentiation of the non-food components by location, i.e. rural and urban areas, leading to separate poverty lines. Secondly, the analysis relies on a simple yardstick measure of 10 percent lower price level in rural areas, which has been employed in other developing countries (Huppi and Ravallion, 1991; Ravallion and Van de Walle, 1991). In addition, to allow for the, albeit unlikely, possibility of higher rural price levels, the value of the rural poverty line is inflated by 10 percent. Given its weaknesses, a food poverty line for urban and rural areas based on the – previously rejected – rural price inflation factor by Van Rooy *et al* (2006) is not derived. It is interesting to note, though, that this would still lead to a lower Poverty Line in rural areas as the lower non-food component outweighs the higher food expenditure.

**Table 8:  $P_a$  measures for separate CBN poverty lines for urban and rural areas**

Poverty Line		1993/94			2003/04				
		Value (N\$)	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	Value (N\$)	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>
Standard	Overall		0.58	0.28	0.17		0.38	0.13	0.06
	Urban	105.41	0.31	0.12	0.07	262.45	0.17	0.06	0.03
	Rural	105.41	0.69	0.34	0.21	262.45	0.49	0.16	0.08
Common food-line, separate non-food component	Overall		0.58	0.27	0.16		0.39	0.14	0.07
	Urban	144.47	0.40	0.19	0.11	510.27	0.40	0.17	0.10
	Rural	96.50	0.65	0.31	0.18	225.71	0.39	0.12	0.05
10% rural price deflator	Overall		0.55	0.25	0.15		0.34	0.11	0.05
	Urban	105.41	0.31	0.12	0.07	262.45	0.17	0.06	0.03
	Rural	94.87	0.65	0.30	0.18	236.21	0.42	0.13	0.06
10% rural price inflator	Overall		0.61	0.30	0.19		0.42	0.15	0.07
	Urban	105.41	0.31	0.12	0.07	262.45	0.17	0.06	0.03
	Rural	115.95	0.73	0.37	0.23	288.70	0.55	0.20	0.10

Source: Own calculations, based on NHIES data.

All of the poverty lines in Table 8 confirm the overall trend of a sharp reduction in poverty. The poverty line with separate non-food components exhibits similar overall levels of poverty as the standard poverty lines derived in section 3.3.1. However, it exhibits higher levels of urban poverty and lower levels of rural poverty. In 2003/04, for example, the headcount index for the urban poor is 40 percent compared to only 17 percent under the standard definition. Under this specification, the urban headcount index remained constant

from the 1993/94 survey<sup>26</sup>, while the rural poverty headcount reduced from 65 to 39 percent. This difference may be linked to rural-urban migration, which will be explored at a later stage of this thesis.

The effect of introducing a rural price deflator of 10 percent into the poverty line leads to a drop in the poverty headcount of three percentage points in 1993/94 and four percentage points in 2003/04. The poverty gap index and poverty severity index also decrease by between one and three percentage points for both surveys.<sup>27</sup> Introducing a rural price inflator of 10 percent into the poverty line leads to broadly symmetrical changes compared to the deflator.

The regional poverty profile (Table A5 in the appendix) is more sensitive in 2003/04 than in 1993/94 to the above rural-urban specifications in the poverty line. One would expect some changes as regions have different relative sizes of rural and urban sectors, and thus should respond differently to changes in the sectoral poverty lines. Nonetheless, due to the large standard errors of the  $P_\alpha$  poverty measures at the regional level, many of the rank changes are not statistically significant. Indeed, for the 1993/94 data, none of the observed changes are significant.

For 2003/04, however, a number of significant changes are observed. Overall, the regional poverty measures responded to the three rural-urban poverty lines as would be expected for a given distribution of expenditure, depending on the relative size of each sector. Due to its large rural sector (98 percent), Omusati drops from rank 7 under the standard poverty line to rank 12 and 10 under the two specifications with relatively lower rural poverty lines and rises to fourth rank under the poverty line with the 10 percent rural price inflator. Khomas and Erongo, with relatively high urbanisation rates of 93 and 84 percent respectively, are most affected in relative terms by the higher urban poverty lines. Nonetheless, their ranks barely change from the bottom of the table. This is not to diminish the observation that prices are of importance to the poor and the measurement of poverty. The lack of regional price data in Namibia is a serious drawback in this regard, with simulation exercises such as those above serving only as a far inferior substitute.

<sup>26</sup> The Severe Poverty Line (N\$184) with separate non-food components, however, shows a statistically significant reduction of the urban severe poverty headcount index from 23% to 11%. See Table A3 in the appendix for robust standard errors and confidence intervals.

<sup>27</sup> None of these differences are significant at the 5% level.

### 3.5.2.2 Sensitivity to equivalence scales

An important assumption to be made when analysing household welfare is the use of equivalence scales. The two most important ones relate to the treatment of children, the so-called adult equivalence scale, and to the existence of economies of scale in the household. For the NHIES data, the standard case has been to use the adult-equivalent scale produced by CBS (2008a), as described above, and no adjustment for economies of scale. The above findings on poverty changes between 1993/94 and 2003/04 and differences between urban and rural areas are subject to these assumptions. In this section it is tested how robust the findings are to changes in the applied scales.

#### *Adult equivalence scales*

The theory behind using adult equivalence scales holds that members of the household have different needs depending on individual characteristics such as age or gender. This is perhaps most intuitive for caloric requirements, which tend to be lower for children, women and the elderly than for working-age males, all else being equal (see for example World Bank Institute, 2005). The default scale used by CBS (2008a) – and adopted for this study – only draws a distinction between children and adults, using weights of 0.5 for children aged 0 to 5 years, 0.75 for children aged 6 to 15 years and 1 for household members aged 16 and above. This specification is compared to two alternatives: firstly, no distinction between household members is made, i.e. each member is equally weighted as 1; secondly, the so-called “OECD-modified equivalence scale” (Haagenars *et al*, 1995) will be used, which assigns a value of 1 to the head of the household, 0.5 to each additional adult member and 0.3 to each child.<sup>28</sup> The choice of alternatives is somewhat arbitrary, but it provides one more and one less restrictive scale than the default for comparative purposes.

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<sup>28</sup> For this scale, household members from 0 to 15 years are classified as ‘children’.

**Table 9:  $P_\alpha$  poverty measures with different adult equivalence scales**

Adult equivalence scale		1993/94			2003/04		
		$P_0$	$P_1$	$P_2$	$P_0$	$P_1$	$P_2$
Standard (CBS, 2008a)	Overall	0.580	0.279	0.167	0.377	0.128	0.061
	Urban	0.305	0.125	0.068	0.170	0.060	0.029
	Rural	0.692	0.341	0.207	0.487	0.165	0.077
All members weighted equally	Overall	0.645	0.337	0.213	0.472	0.180	0.091
	Urban	0.349	0.153	0.087	0.217	0.079	0.040
	Rural	0.765	0.411	0.264	0.606	0.233	0.117
OECD-modified equivalence scale	Overall	0.409	0.163	0.087	0.127	0.035	0.014
	Urban	0.176	0.063	0.031	0.067	0.019	0.008
	Rural	0.503	0.205	0.109	0.160	0.044	0.018

Note: See Table A6 in the appendix for robust standard errors and confidence intervals.

Source: Own calculations, based on NHIES data.

Table 9 above shows that the  $P_\alpha$  poverty indicators are sensitive to the use of adult equivalence scales. When compared to the case where no scale is used and all members are weighted equally, the standard scale employed in Namibia leads to a lower poverty headcount of 7 percentage points in 1993/94 and 10 percentage points in 2003/04. Had the OECD-modified scale been used, the drop in measured poverty would have been even starker (25 percentage points in 1993/94 and 35 percentage points in 2003/04). The responsiveness to the scales is higher for rural than for urban poverty, at least in absolute terms. This is due to the larger average family size in rural areas, as households with relatively larger shares of children among their members “benefit” more from the introduction of equivalence scales that assign lower values to children. The overall trend of reduced levels of poverty over time is robust, however, for all indicators. The relative poverty profile at the regional level is also robust to changes in the scale, except for very few, statistically insignificant rank swaps.<sup>29</sup>

### 3.5.2.3 Economies of scale in the household

In household budget surveys, per capita consumption tends to decrease with household size (Lanjouw and Ravallion, 1995). This is sometimes seen as evidence that, for a number of intrinsic reasons, large households have lower standards of living, with much debate concerning the direction of causality (*ibid.*). However, the observation may, at least partly, also be due to economies of scale in expenditure. One can think of public goods in the

<sup>29</sup> See Table A7 in the appendix for regional breakdown.

household, for example, that “can be shared by several people without affecting the enjoyment of each” (Deaton, 1997). This is to some degree true for many durable household goods. Another reason for economies of scale is cheaper unit prices for foodstuffs that are bought in bulk.

While there is general agreement that some economies of scale exist in the household, there is much less on how to model them. There are a variety of methods to estimate such an adjustment factor, but they are all somewhat arbitrary (Lanjouw *et al*, 1998). This may be the reason why CBS did not apply any adjustment for economies of scale to the NHIES consumption data. Nonetheless, some economies of scale in the household are intuitively appealing, and the sensitivity of the poverty profile to a number of specifications could inform its robustness. In the absence of an agreed, satisfactory method of deriving economies of scale (World Bank Institute, 2005), a simple, commonly used class of scales is employed (Lanjouw and Ravallion, 1995; Burniaux *et al*, 1998). Equivalent expenditure per household member adjusted for economies of scale can be defined as

$$W_{ij} = \frac{Y_i}{S_i^\varepsilon}$$

where  $W_{ij}$  is the adjusted expenditure of member  $j$  in household  $i$ ,  $Y_i$  is total household expenditure and  $S_i$  is the number of members in household.  $\varepsilon$  is the equivalence elasticity households are assumed to achieve, and ranges from 0 (an additional member is assumed to use no extra resources) to 1 (no economies of scale). It follows that the smaller the value of  $\varepsilon$ , the larger are the economies of scale. While Burniaux *et al* (1998) use  $\varepsilon = 0.5$  as the standard case in their study, I regard this as a strong assumption and introduce two additional intermediary elasticity values of  $\varepsilon = 0.9$  and  $\varepsilon = 0.75$ .

**Table 10:  $P_{\alpha}$  poverty measures with different adjustments for economies of scale**

Economies of Scale		1993/94			2003/04		
		$P_0$	$P_1$	$P_2$	$P_0$	$P_1$	$P_2$
No Economies of Scale, $\epsilon = 1$	Overall	0.580	0.279	0.167	0.377	0.128	0.061
	Urban	0.305	0.125	0.068	0.170	0.060	0.029
	Rural	0.692	0.341	0.207	0.487	0.165	0.077
Economies of Scale Factor $\epsilon = 0.9$	Overall	0.504	0.225	0.128	0.283	0.087	0.039
	Urban	0.243	0.093	0.049	0.130	0.043	0.020
	Rural	0.611	0.278	0.160	0.365	0.111	0.049
Economies of Scale Factor $\epsilon = 0.75$	Overall	0.391	0.152	0.080	0.161	0.046	0.019
	Urban	0.166	0.057	0.028	0.080	0.024	0.010
	Rural	0.482	0.191	0.101	0.204	0.057	0.024
Economies of Scale Factor $\epsilon = 0.5$	Overall	0.211	0.067	0.030	0.058	0.014	0.005
	Urban	0.072	0.022	0.010	0.033	0.008	0.003
	Rural	0.268	0.085	0.039	0.071	0.017	0.006

**Note:** CBS (2008a) adult equivalent scale applied. See Table A8 in the appendix for robust standard errors and confidence intervals.

**Source:** Own calculations from NHIES data.

Introducing economies of scale in the household leads to a decline in measured poverty levels.<sup>30</sup> As would be expected, the smaller the equivalence elasticity  $\epsilon$ , the larger is the decrease in poverty. For the extreme case of  $\epsilon = 0.5$ , the poverty headcount index drops from 58 percent without economies of scale to 21.1 percent for 1993/94 and from 37.7 to 5.8 percent for 2003/04. For the more moderate assumption of  $\epsilon = 0.9$ , the reduced headcount indices are 50.4 and 28.3 percent for the two surveys respectively. A notable observation is that with increasing economies of scale, rural poverty decreases more rapidly in absolute terms than urban poverty. This is due to the larger average household sizes in rural areas (in 2003/04: 5.4 households members in rural areas compared to 4.2 members in urban households), which make them more sensitive to the assumptions. There are no level or trend reversals between urban and rural areas for any of the indicators.

The impact of economies of scale on the relative regional poverty profile turns out to be very limited, as presented in Table A9 in the appendix. Regions with smaller average household sizes tend to have more robust indicators than those with larger ones. While this leads to some rank changes between adjacent regions in the profile, the poverty rates in these regions can invariably not be distinguished at the 95 percent level of statistical

<sup>30</sup> Although for  $\epsilon = 0.9$ , the reduction in the  $P_{\alpha}$  indicators for urban locations and overall are not or barely significant at the 95% level.

significance. It is therefore concluded that the (relative) regional poverty profile is relatively robust to the introduction of economies of scale in the household.

### 3.6 Chapter summary

In this chapter, two types of poverty lines, the food-share method and the cost of basic needs method, were examined more closely. The food-share approach was until recently favoured in Namibia due to its simplicity, but as was shown, it is fraught with problems. Engel's Law seems not to apply at the lower end of the expenditure distribution in the NHIES data, where households with a food-share in consumption of 80 percent and above ("severely poor") have in fact higher mean and median consumption than households with a food-share of 60 percent and above ("poor"). Indeed, the food-share was shown to be a poor predictor of total consumption. From a policy perspective, the food-share approach violates the transfer principle in that the recipient of, say, food aid may become 'poor' as a consequence of the transfer.

Given the flaws of the food-share methodology, the recent adoption of the CBN poverty line by the Namibian government is seen as an important step forward. While the CBN methodology has been applied to both NHIES datasets, the poverty line derived by Van Rooy *et al* (2006) for 1993/94 is rejected due to flaws in the methodology of including rural price data. Instead, the food poverty line derived by CBS (2008a) for 2003/04 is deflated by the (urban) consumer price index to the 1993/94 price level, from where the non-food component of the poverty line is re-calculated.

Based on the chosen CBN poverty lines for adult-equivalent consumption,  $P_{\alpha}$  poverty indicators weighted for individuals were estimated. The incidence of poverty (58 percent of individuals in 1993/94; 38 percent in 2003/04) is significantly higher than that exhibited by the food-share measure (1993/94: 33 percent; 2003/04: 27 percent). This observation is confirmed for the incidence of severe poverty, with 47 percent in 1993/94 and 20 percent in 2003/04 under the CBN approach, compared to 7 percent in 1993/94 and 3 percent in 2003/04 under the food-share method. However, as these percentages make clear, the declining trend of both poverty and severe poverty over time is even more pronounced under the CBN approach. Contrary to the food-share approach, the CBN-derived measures show a larger absolute decrease of poverty in rural than in urban areas.

The regional ranking by poverty headcount suffers from relatively high standard errors, rendering most changes over time statistically insignificant. What could be shown, however, is that Kavango, and to a lesser degree Hardap, appear to have fared worse in terms of poverty reduction than the other regions. Caprivi, Kunene and Oshana, on the other hand, appear to have improved significantly in comparison to the average. In 2003/04, Kavango, Ohangwena and Oshikoto had the highest headcount of poverty, while Khomas and Erongo exhibited the lowest. More research should be undertaken to examine the reasons behind this observed regional variation. It may, for example, not hold up to the introduction of regional price level variation, on which there are currently no data available.

In sum, the lack of rural price data is a drawback for the analysis. Significantly higher expenditure in urban areas for non-food items at a given level of food spending indicates differences in relative, and probably absolute, price levels between the two sectors. Sensitivity testing with separate poverty lines for urban and rural households confirms the overall trend of reducing poverty; an exception here is a CBN specification with separate estimation of the non-food component for urban and rural areas, which exhibits a constant level of urban poverty.

The poverty measures are sensitive to the choice of adult equivalence scale and to the introduction of economies of scale in the household, especially in rural areas. The overall decreasing trend, however, is robust to adjustments in either scale.

## 4. Inequality in Namibia

It is already well-documented that Namibia is characterised by a very high level of income inequality (Central Bureau of Statistics, 2006; UNDP, 2006, 2009, 2010). The NHIES reports provide an estimate for inequality based on the Gini coefficient, a brief description of which follows further below. These official estimates show a notable reduction in inequality from 0.70 in 1993/94 to 0.60 in 2003/04 (CSO, 1996; CBS, 2006). However, to this author's knowledge the methodology underlying these calculations is not documented and verification has not been attempted by other researchers. As will be shown below, there are indeed notable differences to the official findings when this is done.

In this chapter, inequality estimates will be derived based on the re-estimated consumption estimates in chapter 2. The hypothesis postulated is that in response to the newly-found economic freedoms by the relatively poor majority and redistributive policies undertaken by government, one would indeed expect overall inequality to have decreased, as suggested by the official Gini coefficients. This should hold at least with respect to the formerly privileged group at the top of the distribution, while there could be a divergence at the lower quantiles as some of the formerly disadvantaged were able to make use of the new opportunities while others were not. The fact remains that this is a descriptive analysis in an attempt to derive a picture to what happened to inequality since independence. It is meant to lay a foundation for trying to understand why the observed patterns have emerged.

### 4.1 Description of inequality measures

Measuring inequality is far from an exact science, and the choice of measure has a bearing on the outcome (Fields, 2001). Since each measure has different properties and varies in its sensitivity to changes in different parts of the distribution, there is merit to using several of them in order to capture different aspects of inequality and its trend. In the following analysis, inequality is estimated by means of a number of salient measures with different properties: the expenditure ratios of different percentiles in the distribution, such as the 10<sup>th</sup> to the 90<sup>th</sup> percentile; the Gini coefficient; and the class of Generalised Entropy measures. In addition, Lorenz curves are graphed with the data.

The Lorenz curve (Lorenz, 1905) is not just another way of measuring inequality, but it is an important tool for index-free inequality comparisons. It depicts the cumulative share in consumption expenditure (or income) plotted against population percentiles. The population is ordered from the poorest to the richest percentiles. A 45 degree line represents perfect equality where every individual has the same expenditure. The further away the Lorenz curve is from the 45-degree line, the more unequal the underlying distribution is said to be. Lorenz curves are important aides to establish the robustness of inequality measures. If the Lorenz curves of two distributions do not cross, the upper one represents an unambiguously more equal distribution, in as far as the lower curve can always be transformed into the upper curve by making equalising transfers from richer to poorer individuals (Atkinson, 1970). In this case of non-crossing curves, there is said to be Lorenz dominance of the upper over the lower distribution. If Lorenz dominance can be established, then any inequality measure that respects the above-described transfer principle will exhibit a lower level of inequality for the distribution with the upper Lorenz curve (Deaton, 1997).

The Gini coefficient, which is directly related to the Lorenz curve, has been the most commonly used inequality measure in Namibia (CBS, 2008a) and is often used in applied work internationally (Fields, 2001). It can take on a value between 0, representing total equality, and 1, representing total inequality. Following the notation by Fields (2001), the Gini coefficient can be expressed as

$$G = \frac{-(n+1)}{n} + \frac{2}{n^2 \mu_x} \sum_{i=1}^n ix_i$$

where  $n$  is the total number of individuals,  $x_i$  is the expenditure by individual  $i$  and  $\mu_x$  is mean expenditure. The Gini coefficient also has a more intuitive interpretation based on the Lorenz curve. As described above, the Lorenz curve plots the cumulative percentage of individuals (or households), ordered from poor to rich, on the horizontal axis and the cumulative percentage of expenditure (or income) on the vertical axis. The Gini coefficient measures the area between the 45-degree line and the Lorenz curve, relative to the area between the 45-degree line and the horizontal and right vertical axis.

The third type of inequality measures employed belongs to the group of Generalised Entropy, or  $GE(\alpha)$ , measures. The Generalised Entropy measures contain a parameter  $\alpha$  that can be adjusted in order to place weight on different parts of the welfare distribution. The

lower  $\alpha$ , the more sensitive the measure is to changes in the bottom of the distribution. The most common measures are the Theil-L index – also referred to as Mean Logarithmic Deviation – GE(0), Theil-T index GE(1) and GE(2), which will also be applied in this study along with a measure GE(-1). Generalised they can be expressed as follows

$$GE(\alpha) = \begin{cases} \frac{\alpha}{\alpha(1-\alpha)} \frac{1}{n} \sum_{i=1}^n \left[ 1 - \left( \frac{x_i}{\mu_x} \right)^\alpha \right] \text{ for } \alpha \neq 0,1 \\ \frac{1}{n} \sum_{i=1}^n \frac{x_i}{\mu_x} \ln \left( \frac{x_i}{\mu_x} \right) \text{ for } \alpha = 1 \\ \frac{1}{n} \sum_{i=1}^n \ln \left( \frac{\mu_x}{x_i} \right) \text{ for } \alpha = 0 \end{cases}$$

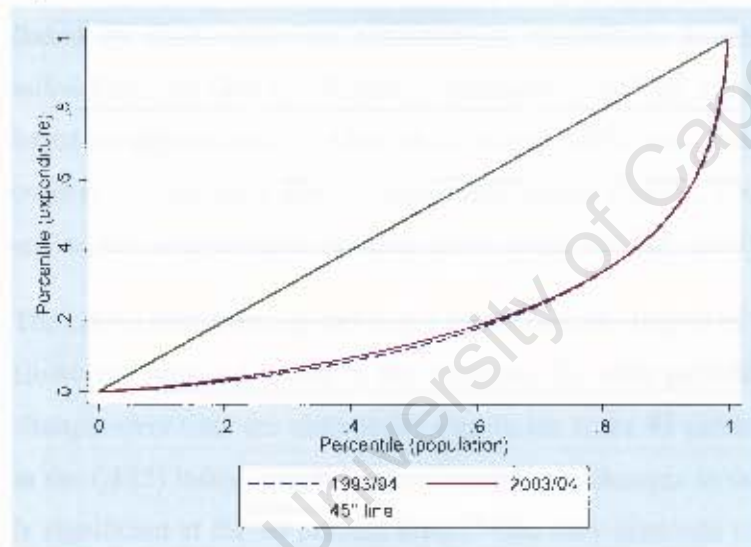
where  $n$  is the total number of individuals,  $x_i$  is the expenditure by individual  $i$ ,  $\mu_x$  is mean expenditure and parameter  $\alpha$  represents the weight given to distances between expenditures at different parts of the distribution. For lower values of  $\alpha$ , GE( $\alpha$ ) is more sensitive to changes in the lower tail of the distribution, and vice versa. The values of the GE( $\alpha$ ) measures can take any positive number and do not have an intuitive interpretation (World Bank Institute, 2005). The most common measures are GE(0), GE(1) and GE(2).

Finally, a simple measure of inequality is the expenditure ratio of two percentiles in the sample population, i.e. the relation of a certain “low expenditure” percentile to one with “high expenditure”. This ratio can be expressed as  $q_{a/b} = x_{n^a}/x_{n^b}$ , where  $x_{n^a}$  is the per capita expenditure at the  $a$ th percentile and  $x_{n^b}$  that at the  $b$ th percentile. In this analysis I will consider the ratio of the 10<sup>th</sup> to the 90<sup>th</sup> percentile ( $q_{10/90}$ ) and the ratio between the 25<sup>th</sup> and the 75<sup>th</sup> percentile ( $q_{25/75}$ ).

## 4.2 National inequality estimates

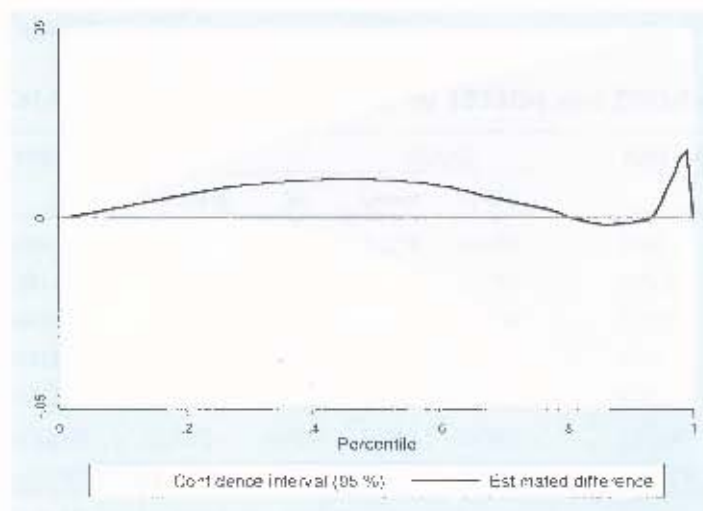
The Lorenz curves for Namibia are depicted in Figure 10 below. Based on adult-equivalent consumption expenditure as derived above and weighted for individuals, the Lorenz curves display the cumulative percentile of expenditure on the vertical axis and the cumulative percentile of the population on the horizontal axis. The two curves are based on the NHIES 1993/94 and 2003/04 and differ only marginally, with the 1993/94 curve appearing to lie slightly lower around the middle of the distribution. Both curves highlight the stark overall inequality in Namibia: the bottom half of the population accounts for only just over 10 percent of total expenditure, while the richest quintile accounts for around two thirds of the total.

Figure 10: Lorenz curves for Namibia, 1993/94 and 2003/94



Source: NHIES, own calculations.

One way of comparing inequalities is to test for Lorenz dominance. Following the methodology by Araar and Duclos (2009), the difference between the Lorenz curves for 1993/94 and 2003/04 is shown in the figure below. For most of the distribution, the 1993/94 curve lies above the 2003/04 curve, but only at the very bottom is there any statistical significance of that difference at the 95 percent level of confidence. The two curves cross at five points, three times within the first percentile, and then again in the 85<sup>th</sup> and 94<sup>th</sup> percentiles. On this basis alone, it can therefore not be concluded that one of the distributions exhibits less inequality than the other.

**Figure 11: Difference between Lorenz curves for Namibia, 1993/94 and 2003/94**

Source: NHIES, own calculations.

Based on adult-equivalent consumption expenditure as derived above and weighted for individuals, the Gini coefficient is estimated at 0.61 for 1993/94 and 0.60 in 2003/04, again based on applications by Araar and Duclos (2009). Irrespective of the problems with cross-country comparisons due to survey differences (Fields, 2001), these levels rank Namibia among the most unequal societies in the world (UNDP, 2009).

The  $GE(\alpha)$  measures register larger reductions, the largest of which being found with  $GE(2)$ . However, applying t-tests to the estimates for both periods show that none of the  $GE(\alpha)$  changes over time are statistically significant at the 95 percent level, and only the reduction in the  $GE(2)$  index, which is more sensitive to changes in the upper end of the distribution, is significant at the 90 percent level.<sup>31</sup> One may conclude that while there is no significant reduction in overall inequality, some changes appear to have occurred with regards to richer households. Notwithstanding, the expenditure shares of the richest decile and quintile remained virtually unchanged at 51 percent and 66 percent respectively.

The expenditure ratio  $q_{10/90}$  rose from 7.5 percent in 1993/94 to 9.1 percent in 2003/04 (significant at the 90 percent level), while  $q_{25/75}$  increased from 27.4 to 31.4 percent (significant at the 95 percent level), indicating that there has been moderate catching up in relative terms by poorer households. Indeed, the expenditure share of the bottom quintile increased somewhat from 2.9 percent in 1993/94 to 3.5 percent in 2003/04. This confirms

<sup>31</sup> The absolute differences and their statistical significance can be found in Table 13 further below.

the shift to the right in the density curve of consumption expenditure that was observed in Figure 6.

**Table 11: Inequality measures for 1993/94 and 2003/04, Namibia**

1993/94		95% CI		2003/04		95% CI			
	Estimate	SE	Lower	Upper		Estimate	SE	Upper	Lower
Gini	0.612	0.017	0.578	0.646	Gini	0.600	0.012	0.577	0.623
GE(-1)	1.072	0.102	0.870	1.274	GE(-1)	0.891	0.055	0.783	0.999
GE(0)	0.681	0.045	0.593	0.768	GE(0)	0.635	0.028	0.579	0.691
GE(1)	0.826	0.054	0.721	0.932	GE(1)	0.777	0.034	0.709	0.844
GE(2)	2.448	0.316	1.826	3.069	GE(2)	1.852	0.109	1.638	2.066
q10/90	0.075	0.007	0.061	0.089	q10/90	0.091	0.006	0.080	0.102
q25/75	0.274	0.015	0.245	0.302	q25/75	0.314	0.009	0.297	0.331

**Note:** SE denotes standard errors; CI is the confidence interval. Sampling variance generated by bootstrapping; standard errors corrected for sampling design.

**Source:** Own calculations based on NHIES data using DASP Stata application.

Nonetheless, given the lack of statistical significance in the change of most of the indicators, it is difficult to reject the hypothesis that inequality has remained largely unchanged over time at a very high level. This is contrary to the official finding that inequality decreased significantly in Namibia over the period. The often-cited trend can be found in Central Bureau of Statistics (2006), which summarises the results of the NHIES 2003/04, pointing out that there was a reduction in the Gini coefficient from 0.70 in 1993/94 to 0.60 in 2003/04. What was apparently not checked, however, is the basis on which the high coefficient for 1993/94 was calculated, for which no written record appears to exist.<sup>32</sup> The 2003/04 calculation, on the other hand, is easy to replicate and analogous to that in this paper, based on consumption expenditure (excluding household investments), adjusted by adult equivalent and weighted by individuals, as opposed to households.

An attempt to re-estimate the high Gini of 0.70 from the NHIES 1993/94 data with a number of configurations was not successful. These estimates included variations of the original consumption aggregate, adult-equivalence scales and sample weights. The highest value obtained was 0.69, by relying on a wider expenditure definition<sup>33</sup>, adjustments per capita without adult-equivalence scale and weighting by households, not individuals. Each of these changes has a positive impact on measured inequality. This strongly suggests that

<sup>32</sup> According to CBS's verbal response to my request (February 2009).

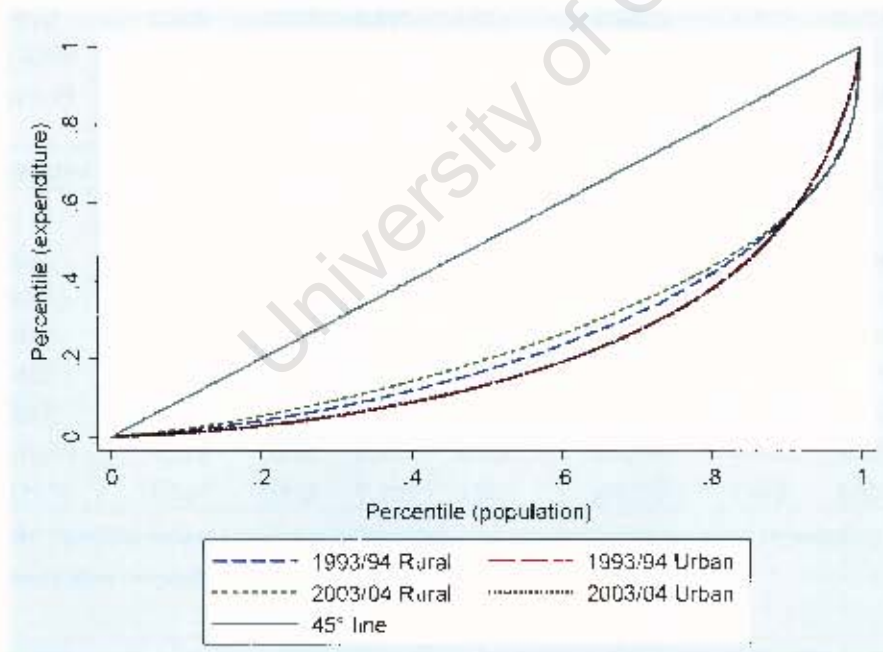
<sup>33</sup> For example including funeral fees, fees for life/pension insurance, building materials, which were excluded for 2003/04; also included rent cost and maintenance of house, which are replaced by imputed rent cost in 2003/04 calculation.

the authors of the NHIES 2003/04 Main Report were comparing two Gini estimates based on different data and calculation methods. Using comparable consumption aggregates, the same adult-equivalence scales and the same type of sample weight, however, the reduction the Gini coefficient is not statistically significant.

### 4.3 Urban and rural inequalities

The levels of inequality have also changed within rural and urban areas, which are presented separately in the tables below. Comparisons of inequality can thus be made between urban and rural areas within each period, as well as in each of the locations over time. The Lorenz curves for both areas are depicted in Figure 12 below. While the urban Lorenz curve is virtually indistinguishable between the two periods, the rural Lorenz curve appears to have shifted up somewhat by 2003/04. In both areas, however, the curves cross, therefore not fulfilling the criteria of Lorenz dominance.

Figure 12: Lorenz curves 1993/94 and 2003/04, for urban and rural areas



Source: Own calculations, based on NHIES data.

The impression from the graphs that urban inequality is higher is supported by most of the selected inequality measures, which tend to exhibit higher levels in urban than in rural areas, a finding that holds for both periods. For example the Gini coefficient for 2003/04 was 0.574 in urban Namibia, compared to 0.502 in rural areas (difference significant at the 99 percent level). The difference is particularly notable among the quantile ratios, where  $q_{10/90}$  in rural areas is more than twice as large as that in urban ones. Once again, however, the assessment is not clear-cut as the GE(1) and GE(2) measures give significantly higher estimates for inequality in rural than in urban areas. This suggests that inequality at the top of the distribution may be more pronounced in rural areas, while overall inequality and that among the lower quantiles is higher in urban areas.

**Table 12: Inequality measures for 1993/94 and 2003/04, urban and rural areas**

1993/94 (Urban)		95% CI		2003/04 (Urban)		95% CI			
	Estimate	SE	Lower	Upper		Estimate	SE	Upper	Lower
Gini	0.577	0.021	0.536	0.618	Gini	0.574	0.014	0.546	0.601
GE(-1)	1.140	0.175	0.794	1.485	GE(-1)	1.039	0.088	0.867	1.211
GE(0)	0.626	0.055	0.518	0.734	GE(0)	0.606	0.034	0.539	0.674
GE(1)	0.632	0.049	0.535	0.728	GE(1)	0.613	0.033	0.547	0.678
GE(2)	1.148	0.133	0.885	1.411	GE(2)	1.022	0.072	0.880	1.164
q10/90	0.058	0.011	0.037	0.079	q10/90	0.061	0.005	0.051	0.072
q25/75	0.233	0.024	0.186	0.281	q25/75	0.245	0.013	0.220	0.271

1993/94 (Rural)		95% CI		2003/04 (Rural)		95% CI			
	Estimate	SE	Lower	Upper		Estimate	SE	Upper	Lower
Gini	0.536	0.022	0.492	0.579	Gini	0.502	0.014	0.476	0.529
GE(-1)	0.681	0.067	0.548	0.813	GE(-1)	0.499	0.033	0.433	0.565
GE(0)	0.509	0.044	0.421	0.596	GE(0)	0.438	0.025	0.389	0.488
GE(1)	0.738	0.091	0.558	0.919	GE(1)	0.673	0.049	0.576	0.769
GE(2)	3.796	0.955	1.915	5.677	GE(2)	2.605	0.304	2.009	3.202
q10/90	0.118	0.008	0.103	0.134	q10/90	0.173	0.007	0.159	0.188
q25/75	0.334	0.013	0.309	0.360	q25/75	0.442	0.010	0.422	0.463

Note: Sampling variance generated by bootstrapping; standard errors corrected for sampling design.

Source: Own calculations based on NHIES data using DASP Stata application.

Findings are also not conclusive when looking at the inequality trends within each region. For both rural and urban areas, most of the differences in inequality between 1993/94 and 2003/04 are not statistically significant. One exception is the GE(-1) for rural areas, for which the rural estimate significantly decreased between the two periods. An emphasis on the bottom of the rural distribution therefore yields a significant reduction in rural

inequality, implying that poorer rural households have caught up somewhat compared to the rural mean. This is in line with the other significant finding among the measures, which is that both quantile ratios in rural areas increased over time.

**Table 13: Absolute differences in inequality measures between periods and locations**

		Gini	GE(-1)	GE(0)	GE(1)	GE(2)	q10/90	q25/75
<b>Between periods:</b>	Namibia	0.012	0.182	0.045	0.050	0.595*	0.016*	0.041**
	Urban	0.004	0.101	0.019	0.019	0.126	0.004	0.012
	Rural	0.033	0.182**	0.070	0.066	1.191	0.055***	0.108***
<b>Between Urban and Rural:</b>	1993/94	-0.042	-0.459**	-0.117*	0.107	2.648***	0.061***	0.101***
	2003/04	-0.071***	-0.540***	-0.168***	0.060***	1.583***	0.112***	0.197***

Note: Periods refer to 1993/94 and 2003/04; locations refer to urban and rural areas. Significance levels: \* 90%, \*\* 95%, \*\*\* 99%.

Source: Own calculations based on NHIES.

#### 4.4 Chapter summary

Over the period 1993/94 to 2003/04, the applied inequality measures indicate that overall inequality in Namibia remained largely unchanged at one of the highest levels in the world. This is contrary to the official estimates of the Gini coefficient that claim that inequality decreased significantly over the period. I do, however, find some evidence for the relative catching up of poorer households compared to richer ones with an increase in expenditure ratios  $q_{10/90}$  and  $q_{25/75}$  and a rising expenditure share by the poorest quintile.

While overall inequality appears to be higher in urban than in rural areas, a comparison of the respective GE(2) measures points towards inequality at the top of the distribution being more pronounced in rural areas. The national finding of largely unchanged levels of overall inequality also holds for the urban distributions, while inequality in rural areas appears to have decreased at least according to those measures that emphasise changes at the bottom of the distribution.

## 5. The impact of growth and inequality on poverty reduction

Having derived estimates of poverty and inequality, this chapter turns to the question of growth and inequality and their relationship with poverty reduction. As was already described in section 1.2, Namibia has experienced solid, if somewhat volatile, real economic growth since independence. This growth should also be reflected in mean consumption growth among households. The following analysis is aimed at shedding some light on how the poor have benefited from this growth relative to the rest of the population. It provides an overview of mean consumption growth and assesses its impact on poverty relative to distributional changes. The previous chapters established significant poverty reduction to have occurred over the period under review, along with relatively stable, high levels of inequality. Nonetheless, the findings also suggest some catching up by poorer households. Ex ante one cannot deduce from the stagnant overall inequality that there have not been shifts within different segments of the distribution that are relevant for poverty reduction.

The following sections first provide an overview of the linkages between growth, inequality and poverty, along with some evidence from other countries. Thereafter the analysis focuses on consumption growth and the elasticity of poverty to it, followed by an attempt to determine whether growth has been “pro-poor”. Finally, I assess the relative impact of growth and redistribution on poverty reduction.

### 5.1 A brief description of the linkages between growth, inequality and poverty

A relatively broad consensus has emerged among development economists in recent years that sustained growth plays a positive role in reducing poverty (Dollar and Kraay, 2002; Ravallion, 2001; Klasen, 2004; Bourguignon, 2004). What is still being debated, however, is the magnitude of this impact and which other conditions influence it. One factor of importance that has been identified is the level of inequality prevalent in society (Bourguignon, 2004). Based on an absolute poverty line and mean expenditure as the chosen welfare measure, changes in poverty can be attributed to the impact of expenditure growth and changes in inequality (*ibid.*). More specifically, poverty reduction can thus be due to overall growth in which poor households share proportionally, therefore lifting some

of them out of poverty, or due to a decrease in inequality at a given expenditure mean. Methodologies have been developed to make a distinction between the so-called growth effect and redistribution effect on poverty tractable (Huppi and Ravallion, 1992; Kakwani, 1997). One should note that shifts in the distribution are not necessarily due to redistribution in the sense of taking from high-expenditure households and giving to poorer ones. Rather they can follow from a variation in growth rates between expenditure quantiles.

While the determination of poverty changes from growth and redistribution components is tractable in a descriptive sense, the causal relationships between poverty, growth and inequality are complex and interdependent (Fields, 2001). If growth is heterogeneous across households, it will lead to changes in inequality. Changes in inequality, on the other hand, may have an impact on future growth. For example, worsening inequality could lead to poorer households becoming more risk-averse (or worsen their access to credit), thus rendering them unwilling (or unable) to exploit growth-promoting opportunities. Increases in poverty may have similar effects, for example due to the inability to accumulate physical and human capital, leading to lower growth among poor households, which also changes the relative welfare distribution by increasing inequality. There may, however, also be adverse effects on growth from redistribution; if agents do not reap the full gain of growth-inducing activities, for example because part of it is taxed away, they will have less incentive to engage in such activities. One must therefore be cautious with counterfactual claims such as “had government only reduced inequality by  $x$  percent, then growth would have led to  $y$  percent less poverty”. For this to hold, the assumption is required that growth would have been no lower with more redistributive policies (Ravallion, 2002). Aside from these behavioural links, higher initial inequality reduces the poverty impact of growth, *ceteris paribus*, simply because the absolute increments in the welfare of the poor are smaller than under a more equal distribution (Klasen, 2004).

The empirical literature generally confirms that the poor benefit from growth. In their cross-country study, Dollar and Kraay (2002) find that the poor tend to benefit as much from growth as the average household and that poverty reduction is fastest where mean income growth is highest. It had also been found that poverty reduction is slower in countries with higher income inequality (Deininger and Squire, 1998; Alesina and Rodrik, 1994). Klasen (2004) reconciles these results by pointing out that Dollar and Kraay (2002) only find a close correlation between average income growth and the proportionate income growth rate of the poor; poverty reduction is nonetheless easier in countries with lower inequality,

because at a given growth rate, the proportionate income gains of the poor are larger in absolute terms. While a review of the cross-sectional literature points towards the absence of a systematic relationship between inequality and growth (Fields, 2001), there are indications that high initial levels of inequality have an adverse effect on subsequent growth (Alesina and Rodrik, 1994; Ravallion, 2001). Contrary to these findings, the high level of initial inequality in Namibia at independence did not prevent the country from registering solid growth rates by international standards (and in the absence of a counterfactual). The subject of the following sections is whether it hindered the poor from taking part in that growth.

## 5.2 Growth incidence and its pro-poorness

Before turning to the relationship between growth and poverty, let us examine mean consumption growth over the period. According to the NHIES, monthly consumption per capita, adjusted by an adult-equivalence scale and expressed in 2003/04 Namibia dollars<sup>34</sup>, is estimated at N\$474 in 1993/94 and N\$742 in 2003/04. This implies consumption growth by 56.5 percent over the period under review, or an annualised growth rate of 4.6 percent, which is marginally higher than the average real GDP growth of 4.3 percent annually derived from National Accounts data for that period (CBS, 2008b). Average real growth of final private consumption expenditure from the National Accounts is estimated at 3.5 percent per annum. This discrepancy may be due to comparability problems between the NHIES and National Accounts data, for example due to imperfect matching of survey periods. In addition, it has been noted that measurement errors in the National Accounts are not uncommon due to the diversity of data sources or incorrect measurement of the informal sector (Deaton, 1997). Secondly, the National Accounts' definition of private consumption aggregate includes spending by non-profit institutions, which do not feature in the NHIES data. For the purposes of this study, the NHIES consumption growth rates are deemed more appropriate as they are based on the same data from which the poverty and inequality estimates are derived.

One descriptive measure that traces that relationship between growth and poverty is the so-called poverty elasticity (Kakwani and Pernia, 2004). It is defined as  $\eta = \theta_{ij}/g_{ij}$  where  $\theta_{ij}$

<sup>34</sup> 1993/94 consumption data was adjusted by Consumer Price Index (CPI) inflation to average prices of the 2003/04 survey (September 2003 to August 2004).

is the change in poverty between the years  $i$  and  $j$  and  $g_{ij}$  is mean expenditure growth over the same period.  $\eta$  is the proportional change in total poverty when there is a positive growth rate of 1 percent. The proportion of poor individuals in Namibia, as measured by the headcount ratio, declined by 35 percent from 1993/94 to 2003/04, meaning that on average each percentage point of growth (57 percent over the 10-year period) is associated with a reduction in the poverty rate of 0.62 percent. At -0.95 and -1.13 respectively, the poverty elasticity was significantly higher for the poverty gap and poverty severity indices. This also holds for separate elasticities calculated for urban and rural areas.

**Table 14: Growth elasticity of poverty in Namibia, 1993/94 to 2003/04**

Poverty index	Namibia	Urban	Rural
Headcount poverty P0	-0.62	-1.00	-0.62
Poverty Gap Ratio P1	-0.95	-1.17	-1.07
Severity of Poverty P2	-1.13	-1.28	-1.30

Source: Own calculations based on NHIES data

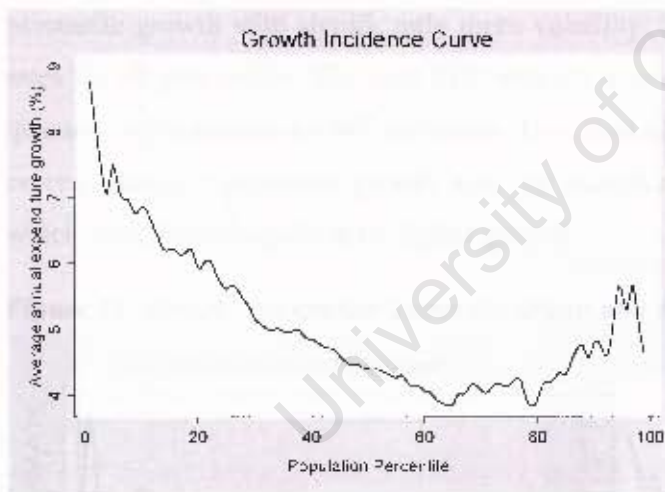
The Namibian growth elasticities to poverty are low by international comparison, a finding that corroborates with cross-country research pointing towards lower growth-poverty elasticities in countries with high poverty levels and high initial inequality (Klasen and Misselhorn, 2008). Using survey data from 50 developing countries over 120 growth spells, Ravallion (2001) estimates the average elasticity of headcount poverty to growth to be -2.5, more than four times the elasticity estimated for Namibia. The Namibian estimates are also low by comparison to findings from growth spells in the 1990s in seven countries in Sub-Saharan Africa, although they were higher than those found in Zambia (-0.58 from 1991 to 1996 and -0.44 from 1996 to 1998) and Ethiopia (-0.56 from 1994 to 1997) (Christiaensen *et al*, 2003).

Relatively low growth elasticities of poverty do not as such mean that growth has not favoured the poor. Pro-poor growth has been interpreted in various ways in the literature, which makes it important to clarify what one means by it. Firstly, there is an absolute definition of pro-poor growth, which requires that poor people must benefit from growth in absolute terms, i.e. that the chosen poverty measure declines over time (Ravallion, 2004). This definition lacks some intuitive appeal, as even growth that is strongly skewed towards rich households would be deemed pro-poor as long as there is a marginal absolute gain to the poor. Secondly, there is a relative definition, under which growth is pro-poor if it favours the poor in relative terms, such that they exhibit higher mean growth than the non-

poor. This implies that poverty falls more under pro-poor growth than it would have done had growth been proportional along the entire income distribution. This relative definition of pro-poor growth has proved more popular in the literature (McCulloch and Baulch, 1999; Kakwani and Pernia, 2000; Klasen, 2004) and shall also be employed in this study. The questions this section seeks to answer are twofold: firstly, whether there has been pro-poor growth in Namibia between the two NHIES surveys; and secondly, if there was pro-poor growth, how large was it? Two methodologies are relied on: firstly, the Growth Incidence Curve following Ravallion and Chen (2003); and secondly, the index of pro-poorness as developed by Kakwani and Pernia (2000).

The Growth Incidence Curve (GIC) plots the growth rate for a given expenditure percentile, where the percentiles are ranked in ascending order. The GIC for Namibia is illustrated below, based on percentile growth in adult-equivalent consumption expenditure from the NHIES surveys. The growth rates are expressed in real terms per annum.

**Figure 13: Growth Incidence Curve for Namibia, 1993/94 – 2003/04**



Source: NHIES data; own calculations

Two observations stand out from the GIC: firstly, all expenditure percentiles experienced positive growth.<sup>35</sup> This implies that all percentiles experienced an improvement in their real consumption from 1993/94 to 2003/04, which in turn means that irrespective of where one draws the poverty line, the poverty headcount index has fallen over time. Secondly, the shape of the GIC is convex, such that the highest growth rates are registered by the poorest

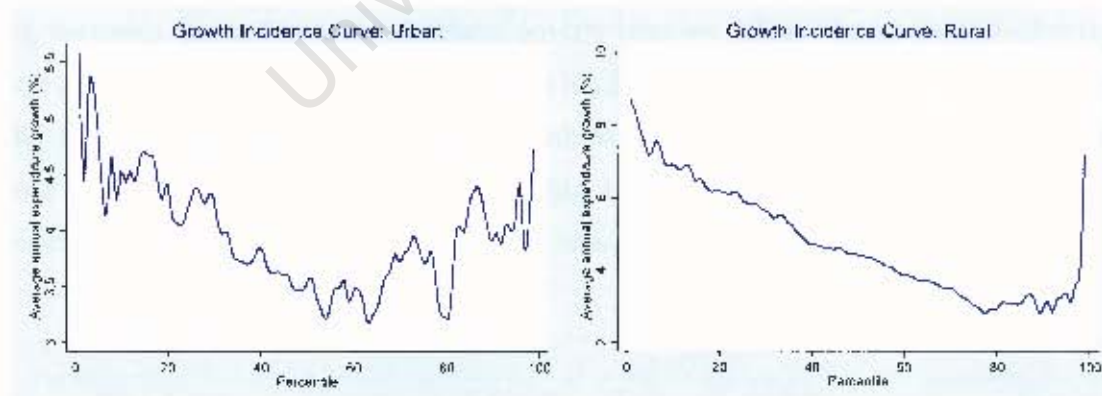
<sup>35</sup> Note that this does not mean all households experienced positive growth. Since the NHIES are independent budget surveys, individual households cannot be traced over time. Therefore, one can only compare average growth rates by percentile.

percentiles. Growth rates decline until around the 65<sup>th</sup> percentile; from the 80<sup>th</sup> percentile onwards, growth rates increase with expenditure. Poorer households and the richest quintile thus gained more from growth than those in-between.

The highest growth rates are registered right at the bottom of the distribution. This catching-up of the poor should have led to lower inequality, but since the richest households also gained disproportionately, overall inequality was not significantly reduced. The shape of the GIC also implies that although the poorest percentiles gained the most, many of them may have been too far from the poverty line to surmount it in the ten-year period between the two NHIES. In that case their improvement impacts on the measured poverty gap ratio and poverty severity index, but it has no bearing on the poverty headcount index of poverty.<sup>36</sup> This is confirmed by my finding that these former indices decreased much faster (in relative terms) than the headcount index.

Separate GICs for urban and rural areas are presented in Figure 14 below. They broadly follow the convex shape of the national GIC, while the urban curve exhibits overall lower percentile growth with significantly more volatility. Both GIC also show positive growth rates for all percentiles. The rural GIC exhibits a smooth declining trend from the poorer quantiles up to around the 80<sup>th</sup> percentile. The curve of the richest quintile is flat at around 3 percent annual expenditure growth with the exception of the very top of the distribution, which experienced significantly higher growth.

Figure 14: Growth Incidence Curve for urban and rural areas, 1993/94 – 2003/04



Source: NHIES data; own calculations

<sup>36</sup> This is one of the most frequent criticisms of the headcount ratio as a measure of poverty trends (Fields, 2001).

Ravallion and Chen (2003) propose a measure of pro-poor growth that integrates the growth rates of the poorest quantiles until the poverty line in the initial period. The pro-poor growth rate is thus the mean growth rate of the poor (by percentile), as opposed to the growth rate at mean expenditure of the poor (*ibid.*). Based on the CBN poverty line of N\$262.45<sup>37</sup>, a pro-poor growth rate of 5.6 percent p.a. is derived, compared to 4.6 percent p.a. mean growth and 4.4 percent p.a. median growth. According to this measure, it can thus be concluded that growth was pro-poor at a rate of 1 percentage point. The finding of pro-poorness is confirmed for both rural and urban growth: rural areas registered a difference between growth among the poor and the mean of 1.4 percentage points, while urban growth was less pro-poor at a difference of only 0.7 percentage points.

McCulloch and Baulch (1999) propose a different measure of pro-poor growth which they term the “poverty bias of growth”. It is derived by subtracting actual changes in the poverty headcount index between two periods, from the counterfactual change in poverty that would have occurred if all households had gained equally at the mean growth rate. Applied to the NHIES data and all three  $P_\alpha$  poverty measures in this study, and increasing base period household consumption by the mean growth rate, growth appears to have been biased towards the poor over the 10-year period under review: Had growth been equally distributed in Namibia, then the poverty headcount index would have been 1.5 percentage points higher in 2003/04, the poverty gap index would have been 2.8 percentage points higher and the poverty severity index would have been 2.3 percentage points higher.<sup>38</sup> For urban areas, there is virtually no difference (<0.3 percentage points) between the measured and simulated  $P_\alpha$  measures. In rural areas the simulated poverty rates are 0.5 percentage points higher than the actual ones for  $P_0$ , 2.3 percentage points higher for  $P_1$  and 3.2 percentage points higher for  $P_2$ .<sup>39</sup> So according to this measure, growth can be said to have been pro-poor nationally and in rural areas, at least for the poverty gap and poverty severity indices. These are, of course, only descriptive results as individual households cannot be observed over time.

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<sup>37</sup> In 2003/04 N\$.

<sup>38</sup> Only the poverty gap and poverty severity differences are statistically significant at the 95% (99%) level.

<sup>39</sup> As with the national comparison, only the poverty gap and poverty severity differences are statistically significant at the 95% level.

### 5.3 The relative impact of growth and redistribution on poverty reduction

While growth appears to have been higher among the poor than the overall population, it remains to be seen how changes in the welfare distribution impacted on them, and how large the relative impacts of these two factors were. Kakwani (1997) proposes a methodology of decomposing poverty reduction into growth and inequality effects. The author stipulates three axioms for the decomposition of poverty changes into growth and inequality effects. The first two axioms are intuitive: Axiom 1 holds that when the growth effect (inequality effect) is zero, then the change in poverty is entirely due to changes in inequality (mean income). Axiom 2 holds that if both growth and inequality effects are greater (less) than zero, then the total poverty effect must also be greater (less) than zero. Of particular note is Axiom 3, which holds that the growth and inequality effects should be symmetric with respect to the base and terminal years. In other words, the two absolute effects must not change if the initial and final poverty rates are reversed.

This decomposition is similar to that by Datt and Ravallion (1992), but Kakwani's method has the advantage that it does not leave a residual term that is difficult to interpret. This is achieved by averaging results across the initial and final distributions and means. Changes in poverty are thus fully 'explained' by the two effects. The growth and inequality effects are defined as

$$G_{ij} = \frac{1}{2} \left[ \theta(z, \mu_j, L_i(p)) - \theta(z, \mu_i, L_i(p)) + \theta(z, \mu_j, L_j(p)) - \theta(z, \mu_i, L_j(p)) \right]$$

and

$$I_{ij} = \frac{1}{2} \left[ \theta(z, \mu_i, L_j(p)) - \theta(z, \mu_i, L_i(p)) + \theta(z, \mu_j, L_j(p)) - \theta(z, \mu_j, L_i(p)) \right]$$

where  $G_{ij}$  is the growth effect and  $I_{ij}$  is the inequality effect between the two years  $i$  and  $j$ ;  $z$  is the poverty line, which is fixed across the two years;  $\mu$  is the mean of the distribution in each of the years, adjusted to the same price level; and  $L(p)$  is the distribution of income/expenditure as measured by the Lorenz curve.  $\theta(z, \mu_j, L_i(p))$  is the rate of poverty at the initial distribution but with the mean of the final year. It is therefore the poverty rate that would have been achieved in the terminal period had all incomes grown at the same

rate. According to his methodology, the change in poverty between two periods  $\theta_{ij}$  can be fully explained by the growth effect and an inequality effect such that  $\theta_{ij} = G_{ij} + I_{ij}$ . The above definitions satisfy all three axioms.

Qualifying poverty measures for the decomposition are those that are fully defined by the poverty line, mean income and the distribution of income (Lorenz curve), such as the  $P_\alpha$  class of measures used in this study. Table 15 presents the growth and inequality effects on poverty reduction in Namibia. The miniscule, statistically insignificant (positive) inequality effect implies that changes in the distribution of expenditure played a negligible (poverty-increasing) role in changing the poverty headcount ratio.

**Table 15: Decomposition of poverty reduction in Namibia**

Indicator	93/94	03/04	Change <sup>1</sup> $\theta_{ij}$	Change explained by <sup>2</sup>	
				Growth component $G_{ij}$	Inequality component $I_{ij}$
Headcount poverty P0	0.58	0.38	-0.203	-0.205	0.001
Poverty Gap Ratio P1	0.28	0.13	-0.150	-0.128	-0.022
Severity of Poverty P2	0.17	0.06	-0.106	-0.083	-0.023

Note: 1) Expressed as percentage points over period 1993/94 to 2003/04. 2) Growth components statistically significant at 1% level, Inequality components not statistically significant (at 10% level).

Source: NHIES, own calculations.

In the case of the poverty gap ratio and the poverty severity index, the growth effect also dominates, but the inequality effect is considerably larger than for the headcount ratio, and it is also negative. Barring the lack of statistical significance of the inequality components, this still suggests that the degree of poverty among the poor, and especially that of the poorest percentiles, may have improved somewhat due to inequality changes.

**Table 16: Decomposition of poverty reduction in rural and urban areas**

Indicator	Urban					Rural				
	93/94	03/04	$\theta_{ij}$ <sup>1)</sup>	$G_{ij}$ <sup>2)</sup>	$I_{ij}$ <sup>2)</sup>	93/94	03/04	$\theta_{ij}$ <sup>1)</sup>	$G_{ij}$ <sup>2)</sup>	$I_{ij}$ <sup>2)</sup>
P0	0.31	0.17	-0.135	-0.120	-0.015	0.69	0.49	-0.205	-0.207	0.002
P1	0.12	0.06	-0.065	-0.054	-0.011	0.34	0.16	-0.176	-0.138	-0.038
P2	0.07	0.03	-0.039	-0.031	-0.007	0.21	0.08	-0.130	-0.091	-0.039

Note: 1) Expressed as percentage points. 2) Growth components statistically significant at 1% level, Inequality components not statistically significant (at 10% level).

Source: NHIES, own calculations.

The growth component is also dominant when decomposing poverty reduction separately for rural and urban areas. The inequality component is generally smaller for urban than for rural poverty reduction. Among the  $P_1$  and  $P_2$  measures for rural Namibia, it amounts to 4 out of 18 percentage points and 4 out of 13 percentage points respectively, but the lack of statistical significance still applies. What can be concluded is that in all cases (Namibia, urban, rural), the poor benefited from growth and the growth effect was far more dominant than the inequality effect.

#### 5.4 Chapter summary

Namibia experienced significant growth in household consumption expenditure during the period under review. The growth elasticity of poverty was relatively low compared to growth spells in other developing countries, a finding that is in line with international evidence that high initial inequality and high poverty levels are associated with lower poverty elasticities. Nonetheless, growth in household consumption expenditure appears to have been pro-poor according to two simple measures. The incidence of growth favoured the poorest percentiles, while the richest percentiles also experienced higher growth than the middle of the distribution, which explains why overall inequality does not appear to have significantly decreased. In terms of the relative impact on poverty reduction, mean growth appears to have been much more important than changes in the welfare distribution. With regard to evidence from other developing countries, the Namibian example confounds a common finding since very high initial inequality does not appear to have hampered economic growth in Namibia. It also does not seem to have hindered the poor from benefiting from growth, although the relatively low growth elasticity of poverty, especially for the poverty headcount index, suggests that with less initial inequality, poverty could have declined more rapidly at the given incidence of growth.

## 6. Sectoral breakdown of poverty, growth and inequality

Following the liberalisation that came along with independence, the constraints on Namibians' choice of economic activities were significantly loosened. One would therefore expect households to reallocate their factors of production, mainly labour, where they yield a higher utility. This reallocation should have unambiguously positive effects on poverty reduction, assuming that poor households are able to participate in these shifts, while the impact on inequality is ambiguous, depending on the relative shifts of different percentiles of the distribution as well as their respective gains. Such reallocation of household factors could take place geographically or across sectors, or both. This chapter focuses on the sectoral distribution of growth, poverty reduction and inequality changes with the aim of profiling the contribution by the different sectors to each of these dimensions.

The first part of the analysis traces the growth of each of the sectors over time, both in terms of their population shares and mean income, which as before will be proxied by adult-equivalent household expenditure. The second part focuses on sectoral poverty rates and their changes, including a decomposition exercise to determine the relative importance of intra-sectoral effects and population shift effects between the sectors. It further describes the correlation between sectoral growth and poverty changes. The third part of the chapter compares inequality within and between sectors, as well as changes in their relative importance over time.

The sectoral disaggregation is constrained by the limitations of the NHIES data. For the purposes of the analysis, each household is classified by its main source of income. This is an imperfect approximation, but the only one tractable given the available data and has been used in the literature for similar purposes (for example by Huppi and Ravallion, 1991). It is imperfect in two ways: firstly, members of a household may be employed in multiple sectors, but secondary or other sources of income are not recorded in the NHIES. This also means that any analysis of the contribution of different income sources per household to the welfare distribution cannot be undertaken. However, for the purposes of classifying economic activities of the household, the main income source appears to be a descent proxy: the latest labour force survey 2008 indicates that 72 percent of households (86 percent urban, 63 percent rural) did not have any secondary income source (MLSW, 2010),

suggesting that this may not be a major drawback. A second point of note is that some of the income sources in the data do not constitute economic sectors, but social transfers such as remittances and pensions. These transfers as the main source of income signal mainly that a household lacks any significant income from economic activities. Despite these qualifying notes, some interesting observations can be made based on the assumption that the main source of income represents the economic sector on which a household depends. The above notes should be kept in mind when, for ease of reading, the term “sector” is used in this chapter.

The following main sources of income can be identified from the data: “Salaries/wages”, “Subsistence farming”, “Commercial farming”, “Non-farming business activities”, “Remittances” and “Pensions”. In order to do justice to the separate developments in urban and rural areas, “Salaries/wages” and “Non-farming business activities” are subdivided by rural and urban location of the household (following the example of Huppi and Ravallion, 1991). In both periods, more than three-quarters of the population was dependent on either wage labour or subsistence farming, with the rest mainly depending on entrepreneurial income or transfers.

There were some changes in the list of possible income sources between the two surveys which required modifications to the categories. While the 1993/94 survey only had “Remittances” and “Pensions” as social transfer sources, the 2003/04 survey included a broader range of options such as “Cash Remittances”, “Pensions”, “Maintenance Grants”, “Drought relief assistance” and “In-kind receipts”. In order to allow for comparisons, “Remittances” was aggregated in the 2003/04 data from “Cash Remittances” and “In-kind receipts”, while “Pensions” was aggregated from “Pensions” and “Maintenance grants”. The latter were not separately listed in the 1993/94 questionnaire, but are often interchangeably used with pensions or welfare grants. The residual category “Other” in the 2003/04 data includes investment/savings income, rental income, drought relief aid and other/not stated. In the 1993/94 data, no such distinction can be made, but nonetheless the unspecified category “Other” comprised only 0.1 percent of the population.

Before moving on to the descriptive statistics, a brief background to Namibia’s social pension shall be given. Since its independence, Namibia has been providing a universal, non-contributory old-age pension for anyone above the age of 60 and for the disabled. This “social pension” already existed before independence, but the monthly amount varied by

race: N\$382 for whites, N\$192 for coloureds and between N\$55 and N\$150 for blacks (Sherbourne, 2009). This system was abolished in 1992 for an equal amount of N\$135 per month, but this only took effect in May 1994. The social pension's nominal value has been periodically increased since then, while in real terms it has risen more modestly, with the latest 2008/09 increase to N\$450 still leaving it well behind the value of the "white pension" at independence (Levine *et al*, 2011). The number of recipients of the social pension increased from around 75,000 in 1991 (data for 1993/94 not available) to around 130,000 in 2003/04, with the vast majority of recipients being old-age pensioners rather than disabled (*ibid.*)

Since 1995, the government also pays out child support grants for orphans and vulnerable children (OVC) and, since 1999, grants to veterans of the liberation struggle. The OVC grants have seen a rapid expansion in their coverage since 2004, from less than 10,000 registered children to more than 100,000 in 2008. The veterans' pension has also been expanded since its introduction, but by 2007 there were still less than 2,000 recipients (*ibid.*).

Simulation analyses of the incidence of pension and other social transfers based on NHIES 2003/04 data indicate that they have a positive impact on poverty reduction, but that targeting remains inefficient (*ibid.*), a finding that reverberates the conclusions of an earlier analysis of social transfers using the NHIES 1993/94 (Subbarao, 1998). During the period under review between the two NHIES surveys, the old-age pension was far more important than the other transfers in terms of the number of recipients as well as overall expenditure (Levine *et al*, 2011; Sherbourne, 2009). For this reason, and because eligibility can be easily modelled based on the individuals' age, the role of the old-age pension is also taken up again in the multivariate analyses in chapter 7.

## 6.1 Population shares and mean expenditure by main income source

Table 17 below shows the population shares and mean monthly adult-equivalent consumption expenditure by main income source for the two survey years, as well as the average annual growth rates for the 10-year period in-between. Subsistence farming is the most important source of income with 42 percent of individuals depending on it in 1993/94. This share declined to 36 percent of the population in 2003/04. Urban wage labour, the

second most important sector, saw its share increase from 23 percent to 27 percent. Rural wage labour saw its share decrease somewhat from 15 percent to 13 percent. The developments in these three major categories point towards a trend of urbanisation, which is confirmed by the 6 percentage point increase in the share of the urban population (this will be discussed in more detail later on). Commercial farming, which unsurprisingly only a small fraction of the population cites as their main source of income, saw its share drop from 1 percent to 0.5 percent. Non-farming business activities experienced the highest relative growth rates<sup>40</sup>, albeit from a low base. The share of people relying mainly on social transfers decreased slightly over time.

**Table 17: Population shares and mean expenditure by sector, 1993/94 – 2003/04**

	Population share			Mean expenditure <sup>2</sup> (N\$ <sup>3</sup> )		
	1993/94	2003/04	Change <sup>1</sup>	1993/94	2003/04	Change <sup>1</sup>
Wages and salaries (Urban)	0.23	0.27	1.70%	940.7	1324.13	3.5%***
Wages and salaries (Rural)	0.15	0.13	-1.20%	461.72	673.9	3.9%***
Subsistence farming	0.42	0.36	-1.50%	237.69	337.3	3.6%***
Commercial farming	0.01	0.00	-8.60%	1372.68	5326.81	14.5%***
Non-farming business (Urban)	0.02	0.04	4.70%	1124.6	1503.88	2.90%
Non-farming business (Rural)	0.02	0.03	4.60%	231.07	729.07	12.2%***
Remittances	0.04	0.03	-0.90%	385.22	387.92	0.10%
Pensions	0.11	0.10	-1.00%	281.41	420.49	4.1%**
Other	0.00	0.03	44.30%	252.98	603.99	9.1%**

Note: 1) Changes expressed in average annual terms. 2) Monthly adult-equivalent consumption expenditure. 3) N\$ in 2003/04 prices; All shares and means adjusted for household size. Statistical significance of expenditure change: \* 90%, \*\* 95%, \*\*\* 99%.

Source: NHIES, own calculations.

Mean consumption expenditure increased in all sectors over the period under review, with households in rural areas gaining slightly more than their urban counterparts. All of these sectoral increases are statistically significant with the exception of urban non-farming business and remittances. The biggest growth rates were registered in commercial farming and rural non-farming activities. Notably, real expenditure growth among households mainly relying on pensions amounted to 4.1 percent annually, which is higher than what wage earners and subsistence farmers experienced. Mean expenditure of households mainly relying on remittances remained virtually unchanged in real terms over the 10-year period. Some of these changes are due to households having changed their main source of income between the two surveys, something that is not observed in the data. One must therefore be

<sup>40</sup> The strong growth in "Other" is excluded from the analysis as it is unclear which households are included in this category in 1993/94 and how much of the growth is due to methodological changes.

cautious with the interpretation of these “growth rates”, as they are affected by such changes of main income sources.

## 6.2 Poverty incidence by main income source

The incidence of poverty is unsurprisingly highest for those households mainly relying on pensions and remittances, with headcount poverty rates standing at 65 percent and 52 percent respectively in 2003/04. The absence of economic activities that could yield a significant return thus appears to be closely correlated with high poverty rates. The two social transfer categories also registered a slower reduction in poverty than the economic categories.

All sectors experienced statistically significant declines in all three poverty measures. Commercial farming saw the largest drop in the poverty headcount index from 53 percent in 1993/94 to only 4 percent in 2003/04. This is not surprising given the high growth rates in the sector, but both of these observations should be interpreted with caution. Firstly, the sector itself and the respective sample are very small. Secondly, there may be definitional issues: in 2003/04, the questionnaire’s list of main income sources included “Subsistence Farming” and “Commercial farming” for agricultural activities, whereas that for 1993/94 had included “Subsistence Farming (crop & animal)”, “Cash cropping” and “Animal rearing”. The latter two categories were summed to constitute “Commercial Farming” for the purposes of this analysis. It may well be, however, that households that have small-scale farming operations that include the selling of some produce or animals in the market would have put themselves in the “Cash cropping” or “Animal rearing” category in 1993/94, but equivalent households may not have identified with the “Commercial farming” label in 2003/04, as it may evoke associations with large-scale farming. There could thus be a bias in the sample of commercial farming households that leads to an overestimation of expenditure growth and poverty reduction. This is supported by the fact that the population share of the sector shrunk by more than half. In any event, the small size of the sector limits its relevance for overall poverty and growth. The most important sectors in this respect are wage earners and subsistence farmers.

**Table 18: Poverty incidence by main source of income, 1993/94 – 2003/04**

Sector	P <sub>0</sub>			P <sub>1</sub>			P <sub>2</sub>		
	1993 /94	2003 /04	Change	1993 /94	2003 /04	Change	1993 /94	2003 /04	Change
Wages and salaries (Urban)	0.25	0.14	-6.0%***	0.10	0.04	-7.9%***	0.05	0.02	-9.1%***
Wages and salaries (Rural)	0.51	0.31	-4.7%***	0.23	0.11	-6.9%***	0.13	0.05	-8.4%***
Subsistence farming	0.72	0.48	-3.9%***	0.35	0.15	-8.4%***	0.21	0.06	-11.5%***
Commercial farming	0.53	0.04	-23.0%***	0.29	0.01	-29.3%***	0.19	0.00	-36.3%***
Non-farm. business (Urban)	0.41	0.18	-7.8%***	0.18	0.06	-10.3%***	0.10	0.03	-12.3%***
Non-farm. business (Rural)	0.75	0.50	-3.9%***	0.35	0.19	-6.0%***	0.20	0.09	-7.5%***
Remittances	0.70	0.52	-2.8%***	0.34	0.23	-3.7%***	0.20	0.13	-4.0%**
Pensions	0.78	0.65	-1.8%***	0.41	0.25	-4.9%***	0.26	0.12	-7.3%***
Other	0.62	0.56	-1.0%	0.40	0.25	-4.6%	0.29	0.14	-7.2%

Note: Changes expressed as annual averages. Statistical significance at: \* 90%, \*\* 95%, \*\*\* 99%.

Source: NHIES, own calculations.

Urban wage earners had the lowest incidence of poverty<sup>41</sup> in both survey years, followed by urban non-farming business owners. These two groups also registered the highest rate of poverty reduction in relative terms. Subsistence farmers saw their poverty headcount drop at a slower rate, but they realised the largest absolute decrease from 72 percent in 1993/94 to 48 percent in 2003/04. Regarding the poverty gap index (P<sub>1</sub>) and poverty severity index (P<sub>2</sub>), subsistence farmers registered faster relative reductions than both urban and rural wage earners. These two indices place more weight on the bottom of the distribution than the headcount index, implying that the poorest subsistence farmers gained more than those just below the poverty line, in relation to their wage-earning peers.

### 6.2.1 Intra-sectoral and inter-sectoral effects on poverty reduction

While poverty reduction is found to have occurred in all sectors, there is still a need to explore how important these intra-sectoral developments were compared to population shifts between sectors. Huppi and Ravallion (1991) present a sectoral decomposition formula for poverty changes based on the  $P_\alpha$  class of poverty measures. Let  $P_{it}$  denote the

<sup>41</sup> Excluding commercial farming for the above-stated reasons.

poverty measure for sector  $i$  with population share  $n_i$  at date  $t$ , where there are  $m$  such sectors (9 in this case) and  $t = 1993/94, 2003/04$ .<sup>42</sup> The authors derive the following formula which can easily be shown to hold algebraically:

$$P_{04} - P_{94} = \sum (P_{i04} - P_{i94})n_{i94} + \sum (n_{i04} - n_{i94})P_{i94} + \sum (P_{i04} - P_{i94})(n_{i04} - n_{i94})$$

(Intra-sectoral effects)    (Population shift effects)                      (Interaction effects)

where all summations are over  $i = 1, \dots, m$ . The intra-sectoral effects describe the contribution of poverty changes within sectors, controlling for the base period (1993/94) population shares; the population shift effects signify how much poverty was reduced between the two periods due to the various changes over time in population shares of sectors, controlling for poverty rates in the base period. The interaction effects stem from possible correlations between sectoral gains and population shifts (*ibid.*). For a sector with decreasing poverty that also saw its population share drop, this would mean a positive interaction effect, i.e. one that contributes to overall poverty compared to a scenario where its poverty rate or population share had remained constant. Table 19 shows that the total intra-sectoral effects were responsible for between 94 percent and 100 percent of the overall poverty reduction, depending on the poverty measure. Population shift effects also contributed to poverty reduction (between 4 and 11 percent), indicating that the population shifted towards those sectors with below-average initial poverty. Interaction effects were poverty increasing of a magnitude of around 5 percent for all  $P_\alpha$  measures. Given that all sectors experienced decreasing poverty, this means that those sectors registering increasing population shares had, based on a population-weighted average, lower reductions in their poverty rates than those registering decreasing population shares.

<sup>42</sup> For simplicity in the equation, let 94 denote the period 1993/94 and 04 the period 2003/04.

**Table 19: Decomposition of poverty reduction by sector, 1993/94 – 2003/04**

Sector	% of pop. 1993/94	P <sub>0</sub>		P <sub>1</sub>		P <sub>2</sub>	
		Absol. change	% of change	Absol. change	% of change	Absol. change	% of change
Wages and salaries (Urban)	22.6	-2.66	13.1	-1.26	8.4	-0.74	6.9
Wages and salaries (Rural)	14.75	-2.88	14.2	-1.70	11.3	-1.12	10.6
Subsistence farming	42.25	-9.99	49.2	-8.74	58.3	-6.33	59.6
Commercial farming	1.22	-0.60	2.9	-0.35	2.3	-0.23	2.2
Non-farming business (Urban)	2.28	-0.53	2.6	-0.27	1.8	-0.17	1.6
Non-farming business (Rural)	1.76	-0.43	2.1	-0.28	1.9	-0.19	1.8
Remittances	3.61	-0.62	3.1	-0.38	2.6	-0.23	2.2
Pensions	11.45	-1.45	7.1	-1.86	12.4	-1.60	15.1
Other	0.08	0.00	0.0	-0.01	0.1	-0.01	0.1
Total intra-sectoral effects		-19.16	94.3	-14.86	99.0	-10.64	100.1
Population-shift effects		-2.18	10.7	-0.94	6.2	-0.46	4.4
Interaction effects		1.01	-5.0	0.79	-5.3	0.48	-4.5
Total change in poverty		-20.32	100.0	-15.00	100.0	-10.62	100.0

Note: Absolute changes expressed as percentage points.

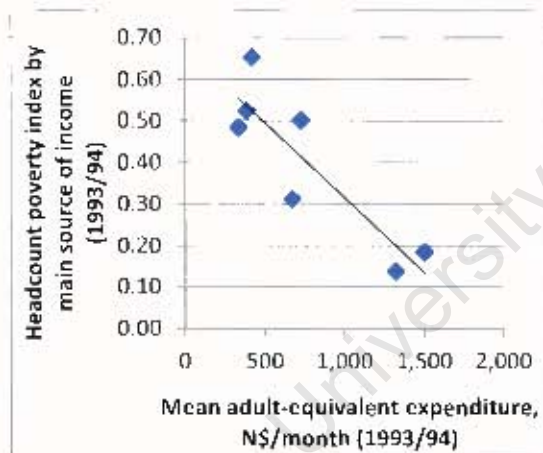
Source: NHIES, own calculations.

Intra-sectoral effects thus appear to have been much more important with regards to poverty reduction in post-independence Namibia. Among the intra-sectoral effects, subsistence farming registered the largest absolute poverty reduction, contributing about half to the overall reduction registered between the surveys. As seen in Table 17, subsistence farming also registered the largest absolute decrease in its population share (by 6 percentage points), thus largely driving the observed positive interaction effect. The sector of rural wage earners contributed 14 percent to the reduction in headcount poverty, with urban wage earners adding 13 percent. A notable pattern emerges when moving from the headcount poverty index  $P_0$  to the poverty gap index  $P_1$  and poverty severity index  $P_2$ : with the increase in  $\alpha$ , pensions, and to a lesser degree subsistence farming, gain in importance for poverty reduction. For example, the sector of households mainly depending on pensions contributed only 7 percent to the reduction based on the headcount index, but 15 percent when the decomposition is based on the poverty severity index. Pensions therefore appear to have been of particular consequence to those households right at the bottom of the welfare distribution.

### Correlation between sectoral growth and poverty reduction

The above paragraphs showed that intra-sectoral effects were predominantly responsible for poverty reduction. As was further shown in the Chapter 5, growth played a dominant role in overall poverty reduction, but these findings do not provide any information regarding the sources of growth that were responsible for this reduction. A logical extension of these two observations is to look at the relationship between growth and poverty reduction within the different sectors of the economy. Given the limited breakdown and the small size of some sectors one should be cautious when interpreting the findings, but an interesting observation can be made. Figure 15 below plots mean household consumption expenditure against sectoral headcount poverty index scores for the initial period 1993/94. Albeit based on only seven sectors<sup>43</sup>, there appears to be a significant negative correlation between the two variables.<sup>44</sup> This is to be expected given that the poverty measures are based on consumption expenditure.

Figure 15: Poverty and mean expenditure by main source of income, 1993/94



Source: NHIES, own calculations.

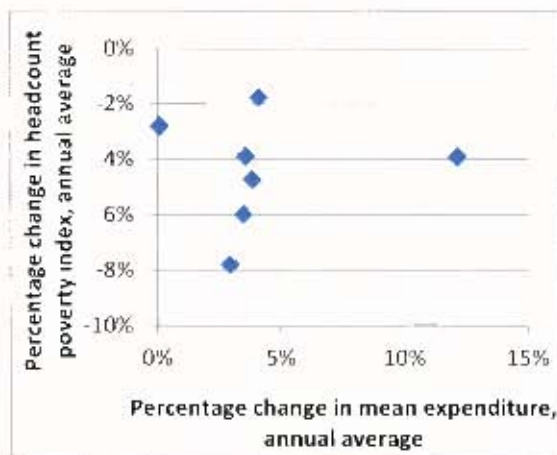
A different picture, however, emerges from Figure 16, which plots sectoral expenditure growth against the rate of poverty reduction between 1993/94 and 2003/04. It appears that those sectors that experienced the more rapid rates of poverty reduction were, as a rule, not those which had the highest rates of expenditure growth; indeed, one may conclude that the rate of poverty reduction is uncorrelated with the rate of growth in each sector. This is supported by a high variance among the sectoral growth elasticities of poverty, which are

<sup>43</sup> "Commercial farming" was omitted due to the comparability issue outlined above; "Other" was omitted due to lack of clarity which types of households constitute this category.

<sup>44</sup> The same graph for 2003/04 yields an almost identical distribution.

just another way of presenting the same data. Among the three large sectors, Urban Wages and Salaries had a significantly higher headcount poverty elasticity (-1.13) than Rural Wages and Salaries (-0.84) and Subsistence Farming (-0.78). On the other hand, the elasticity with respect to the severity index was highest for Subsistence Farming (-1.68). One must bear in mind, however, that these findings are based on the crude sectoral breakdown derived from the NHIES, whereas a more detailed disaggregation by industries, which the data do not allow, may have produced a different picture.

**Figure 16: Changes in poverty against changes in mean expenditure by mean source of income**



Note: Changes expressed per annum for period 1993/94 to 2003/04.

Source: NHIES, own calculations.

What can be taken away from this section, however, is that there is strong variation in the incidence of poverty by main source of household income. Among the large economic sectors, urban wage earners registered the lowest poverty rates, while subsistence farmers registered the highest. A significant reduction of poverty was noted in all sectors. Intra-sectoral effects appear to be the dominant driver of these welfare improvements, while population shifts played only a minor, albeit poverty-reducing role.

### 6.3 Inequality by sector

Given the variation in poverty reduction and growth rates between the sectors, it is not surprising that there are also notable differences in intra-sectoral inequality and its change between the periods, as presented in Table 20 below. The sector with the highest Gini coefficient of 0.73 in 1993/94 was commercial farming. The sector's Gini decreased to 0.53 by 2003/04, apparently transforming it to one of the more equal sectors. What could have caused such a significant change? The most likely explanation is not any real development, but rather the data issue outlined above: semi-commercial farming households that were included in "Commercial farming" in 1993/94 would have led to strong inequality between these presumably poorer households and large commercial farms. If many of these households declared themselves subsistence farmers in the 2003/04 questionnaire, as is suggested in this thesis, this also would have led to decreasing inequality within the sector.

Rural non-farming business emerged as the most unequal sector in 2003/04 for all three inequality measures. That is surprising as it was estimated to be the most equal sector in 1993/94. While the underlying reasons are not known, the strong increase may be related to the rapid growth in consumption expenditure in the sector.

Subsistence farming exhibits the lowest levels of inequality among the larger sectors. It is also the only one of them that registered a significant reduction in inequality, with the Gini falling from 0.44 to 0.35. Wages and salaries showed ambiguous trends: while the Gini coefficient remained constant (urban) or decreased somewhat (rural), both Theil indices point towards increasing inequality. The reason behind this ambiguity is that the different measures are sensitive to different parts of the expenditure distribution. For example, the Theil-L measure, which is more sensitive towards changes at the lower end of the distribution, records only a marginal increase in inequality among wage earners, while the Theil-T measure, which is more sensitive towards changes in the upper end of the distribution, records a strong increase for both urban and rural areas.

**Table 20: Inequality by sector, 1993/94 – 2003/04**

Sector	Gini			Theil-T			Theil-L		
	1993 /94	2003 /04	Change (%) <sup>1</sup>	1993 /94	2003 /04	Change (%) <sup>1</sup>	1993 /94	2003 /04	Change (%) <sup>1</sup>
Wages and salaries (Urban)	0.55	0.55	0.1	0.56	0.57	0.1	0.56	0.55	-0.2
Wages and salaries (Rural)	0.56	0.53	-0.6	0.75	0.60	-2.3	0.57	0.49	-1.5
Subsistence farming	0.44	0.35	-2.3***	0.40	0.25	-4.6**	0.33	0.21	-4.7***
Commercial farming	0.73	0.53	-3.1	1.21	0.51	-8.3**	1.37	0.68	-6.8***
Non-farm. business (Urban)	0.66	0.62	-0.6	0.84	0.70	-1.9	0.90	0.72	-2.1
Non-farm. business (Rural)	0.42	0.67	4.9	0.39	1.22	12.1***	0.31	0.84	10.3***
Remittances	0.62	0.49	-2.3***	1.26	0.47	-9.3	0.71	0.43	-4.9
Pensions	0.59	0.57	-0.3	0.89	0.86	-0.3	0.62	0.57	-0.8
Other	0.47	0.66	3.4**	0.40	1.03	9.8***	0.48	0.79	5.1*

Note: 1) Expressed as average annual changes. Statistical significance of change: \* 90%, \*\* 95%, \*\*\* 99%.

Source: NHIES, own calculations.

### *The relative importance of intra-sectoral and inter-sectoral inequality*

It is also of interest to examine to what degree inequality is due to the distribution within sectors and between sectors. While the Gini index is the most commonly used measure of inequality, it has the drawback that it cannot be fully additively decomposed by contributions of within-subgroup and between-subgroup inequality (Bourguignon, 1979). In order to assess these contributions, generalised entropy indices  $GE(\alpha)$  such as the Theil-L and Theil-T are preferred due to their full additive decomposability. This decomposition by population sub-group is

$$GE(\alpha) = GE_W(\alpha) + GE_B(\alpha)$$

where  $GE_W$  is within-group inequality and  $GE_B$  is between-group inequality. In the case of the Theil-T measure the decomposition can be expressed (following World Bank, 2005) as

$$GE(1) = \sum_j \left(\frac{x_j}{x}\right) GE(1)_j + \sum_j \left(\frac{x_j}{x}\right) \ln \left(\frac{x_j/x}{n_j/n}\right)$$

where  $x_j$  is the expenditure by subgroup  $j$  and  $x$  is total expenditure;  $GE(1)_j$  is the Theil-T index for subgroup  $j$ ; and  $n$  and  $n_j$  are the total population and that of subgroup  $j$

respectively. The first term is the within-group component (WG), i.e. the sum of  $GE(1)$  for each subgroup  $j$ , weighted by that subgroup's share in total expenditure. The second term is the between-group component measuring inequality between different sub-groups at their expenditure means. The weighting by expenditure share means that at a given sub-group population size, richer sectors are weighted more than poorer ones. Similarly, the decomposition of the Theil-L is expressed as

$$GE(0) = \sum_j \left(\frac{n_j}{n}\right) GE(0)_j + \sum_j \left(\frac{n_j}{n}\right) \ln\left(\frac{n_j/n}{x_j/x}\right)$$

where the within-group component is the sum of  $GE(0)$  for each subgroup weighted by their respective population share. The  $GE(0)$  does thus not place different weights on the subgroups based on their expenditure share, but instead uses population shares as weights. It is in this sense that it is said to give relatively more attention to the bottom of the distribution than the Theil-T measure. Applying the decomposition to the NHIES data shows that within-group inequality among the sectors contributes most to overall inequality, as outlined in Table 21.

**Table 21: Within-group and between-group components of inequality, 93/94 – 03/04**

	Theil-T				Theil-L			
	1993/94		2003/04		1993/94		2003/04	
Overall $GE(\alpha)$	0.83		0.78		0.68		0.64	
Between-Group	0.19	23%	0.21	27%	0.19	28%	0.20	31%
Within-Group	0.63	77%	0.57	73%	0.49	72%	0.44	69%
Contribution by Subsector to WG:		% of WG		% of WG		% of WG		% of WG
Wages and salaries (Urban)	0.25	39.7%	0.27	47.5%	0.13	25.8%	0.15	33.7%
Wages and salaries (Rural)	0.11	17.1%	0.07	12.4%	0.08	17.2%	0.06	14.7%
Subsistence farming	0.08	13.3%	0.04	7.2%	0.14	28.7%	0.07	17.1%
Commercial farming	0.04	6.7%	0.02	3.2%	0.02	3.4%	0.00	0.8%
Non-farm. business (Urban)	0.05	7.2%	0.05	8.9%	0.02	4.2%	0.03	5.9%
Non-farm. business (Rural)	0.00	0.5%	0.03	5.8%	0.01	1.1%	0.02	5.3%
Remittances	0.04	5.8%	0.01	1.4%	0.03	5.2%	0.01	3.2%
Pensions	0.06	9.6%	0.05	8.8%	0.07	14.4%	0.06	13.5%
Other	0.00	0.0%	0.03	4.7%	0.00	0.1%	0.03	5.8%

**Note:** WG stands for "within-group" component of inequality.

**Source:** NHIES, own calculations.

Based on the Theil-L measure in 2003/04, inequalities within the different economic sectors made up 69 percent of total inequality, while inequality between the sectors was responsible for the remaining 31 percent. The trend over time points to a small reduction in within-sector inequality, whereas between-sector inequality remained almost unchanged. The sector that contributed the most to within-group inequality was urban wage earners. Based on the Theil-T, inequality in the sector contributed 40 percent to all within-sector inequality in 1993/94 and gained in importance to 48 percent in 2003/04. The sector is somewhat less dominant for Theil-L, indicating that at the lower end of the distribution urban wages and salaries play a lesser role. Indeed, here the contribution by subsistence farming is more than twice as large as for the Theil-T.

Subsistence farming noted a significant decrease in its contribution between the periods for both inequality indices, which is mostly due to the rapid decline in inequality among subsistence farmers, and to a lesser degree to their declining population share in the economy. Indeed, the absolute decline of the contribution of intra-sectoral inequality among subsistence farmers was larger than (Theil-L) or almost as large (Theil-T) as the absolute overall reduction in the respective inequality indices. So while one has to take a closer look at urban wage earners to understand the high level of inequality in Namibia, changes in the distribution among subsistence farmers appear to be essential to explaining the reduction in the Theil scores.

### ***Correlation of initial inequality with growth and poverty reduction***

As pointed out in Chapter 5, there is some international evidence indicating a negative correlation between the initial level of inequality and subsequent growth and poverty reduction. Based on the sectoral breakdown in the NHIES data, there is little evidence to support either of these relationships in Namibia. While the selection of sectors is too small to allow any robust conclusions, the notion of any strong correlation between initial inequality and subsequent growth can be rejected. Neither is there any notable relationship between the initial sectoral Gini coefficient and the reduction in the poverty headcount index (see Figure A3 and Figure A4 in the appendix).

## 6.4 Chapter summary

Based on the main source of household income, subsistence farming remained the largest individual sector over the period under review, even with a significant reduction in its population share. Among the three largest sectors, namely subsistence farming, urban and rural wage earners, it also remained the one with the lowest mean consumption expenditure per capita. All sectors experienced positive real expenditure growth, with commercial farming (possibly due to comparability problems in the data) and rural non-farming business activities seeing the fastest growth rates, while the group of households mainly relying on remittances registered the slowest expenditure growth. The three large sectors, which comprised more than three-quarters of the population, saw their expenditure grow on average between 3.5 and 3.9 percent annually.

Unsurprisingly, the incidence of poverty is highest for those households mainly relying on pensions and remittances. These two social transfer categories also registered a slower reduction in poverty than the economic sectors. Commercial farming saw the largest drop in poverty, but as with growth that may be partly due to data problems. Of the large sectors, urban wage earners had the lowest incidence of poverty in both survey years, as well as one of the highest rates of poverty reduction. Subsistence farmers saw their poverty headcount drop at a slower rate, but due to the high initial level of poverty they realised the largest absolute decrease.

Intra-sectoral effects were far more important for overall poverty reduction than population shifts between sectors. Most important was the reduction in poverty among households relying on subsistence farming, which constituted around half of the total poverty reduction. This may be related to the significant rural-urban migration observed during the period under review, which is examined in more detail in chapter 8. One must note, however, that in 2003/04 subsistence farming still accounted for 47 percent of the poor in Namibia (down from 52 percent ten years earlier). The level of sectoral poverty appears to be related to the level of mean consumption expenditure, but no such correlation could be found between expenditure growth and the rate of poverty reduction.

Concerning inequality, subsistence farming exhibits the lowest levels of inequality among the larger sectors. It is also the only one of them that registered a significant reduction in its Gini coefficient, from 0.44 to 0.35. Rural non-farming business emerged as the most

unequal sector in 2003/04, which is interesting as it was estimated to be the most equal sector in 1993/94. This radical change is linked to the observed rapid growth in consumption expenditure in the sector, which may have been skewed towards those businesses and households able to take advantage of new opportunities in the wake of liberalisation and land reform in rural areas.

When decomposing overall inequality by economic sector into within and between group components, it is found that within-group inequality is much more significant than between-group inequality. Urban wage earners made the largest contribution to overall inequality (except Theil-L for 1993/94, where it came second to subsistence farming) and also had the largest increase in within-group inequality among the large sectors. Subsistence farming noticed a significant decline in its contribution. According to the sectoral breakdown, there is little evidence of a negative correlation between the initial level of inequality and subsequent growth and poverty reduction.

In sum households appear to have undertaken some reallocation of factors of production between sectors that contributed somewhat to poverty reduction, but the major changes in poverty seem more likely to have been caused by developments within sectors. Assuming that the choice of economic activity is not fully endogenous, this indicates that there are other important differences between households than the main source of income that contribute to inequality and poverty changes. The next chapter turns to this heterogeneity of household characteristics and their relationship with expenditure.

## 7. Determinants of household expenditure and poverty

What are the characteristics of a household that are associated with having a higher or lower level of economic welfare and has the relationship between these characteristics and welfare changed over time? These are the two underlying questions to be explored in this chapter. There are a number of hypotheses about how the relationship between certain characteristics could have changed over time after the end of Apartheid. Indeed, given that poverty has unambiguously decreased over the period under review, one may well expect changes in these relationships to have taken place. One particular hypothesis that is to be explored is that with the end of discrimination in the labour market and better education opportunities, ethnicity should play a decreasing role in determining a household's welfare, while human capital and thus education should play an increasing role.

The conditional correlates of household expenditure based on a model of household characteristics are first analysed, with estimations for both survey years to allow for comparisons over time. In a similar fashion, the determinants of household poverty are explored. Both household expenditure and poverty status, which in this case is derived from the expenditure-based CBN poverty line introduced earlier, are assumed to be related to certain characteristics of the household. In the first part of this section, these relationships are estimated by means of multivariate ordinary least squares (OLS) regression analysis of the two surveys. More specifically, a linear regression setup is employed that accounts for the complex survey design and sampling weights for individuals. The basic linear setup of OLS estimates is to provide a basic understanding of the conditional magnitude and significance of the regressors at the mean. In order to explore whether these relationships also hold at different points in the welfare distribution, the regression analysis is extended by two models: first, a logit model of the probability of being poor dependent on household characteristics; and secondly, a (semi-parametric) quantile regression model to explore the relationship along the conditional distribution of household welfare.

## 7.1 The basic model of household welfare

In the regression analysis, household welfare is as before proxied by per capita consumption expenditure. The linear (OLS) regression model applied here follows the general form:

$$\ln y = \beta X + \epsilon$$

where  $\ln y$  is the natural logarithm of monthly adult-equivalent household consumption expenditure in 2003/04 prices,  $X$  is a vector of household characteristics,  $\beta$  the vector of their respective coefficients and  $\epsilon$  a random error term. The coefficients  $\beta$  thus summarise the influence (in a descriptive sense) of a variety of household attributes on the standard of living of the household.

The characteristics included among the regressors are chosen to reflect factors impacting productivity, such as human capital, experience and main source of income, as well as those affecting consumption such as household composition. Such specifications have been used for household welfare analyses in African settings, for example by Glewwe (1991) or Appleton (2001). In a post-Apartheid context race would be a relevant variable, but official Namibian statistics refrain from asking about respondents' race. Using language spoken in the household as a proxy for race suffers from a poor correlation between the two. A quick check of correlations with data from the only – unofficial – national survey to include both language and race, the Afrobarometer, shows that in 2005, Afrikaans speakers were 50 percent coloured, 36 percent black and only 12 percent white; English speakers were 64 percent white, 18 percent black and 18 percent coloured. It is thus difficult to identify white households, with the exception of German-speaking households, but they constitute too small a comparison group. Nonetheless, due to the importance of ethnicity in Namibian society, the main language spoken in the household is included in the analysis.

Serving as proxies for human capital in the household, two types of variables were generated. Firstly, dummy variables were generated for the educational attainment of the head of the household. These dummies identify whether the household head has at least some education at a certain level (primary, secondary, tertiary). Their effect is then compared to the omitted default category of having no formal education at all. Secondly, to allow for the human capital of other household members more generally than at the threshold levels of attainment, the mean years of schooling, also counting tertiary education,

of adult household members are included in the model.<sup>45</sup> While the years of schooling variable models the acquisition of education as continuous process, the threshold dummies for the head try to capture the fact that these qualifications enable access to certain types of jobs. In addition, other specifications were tested, such as the maximum years of schooling in the household and dummies for educational attainment by the spouse. Since they capture the same concept and yielded similar findings as the above variables, they are not presented here.

It was also tested if having unemployed members in the household is correlated with consumption expenditure and the probability of being poor. The definition of unemployment here applies, as is common in Namibian statistics (CBS, 2001), to the population between 15 and 60 years of age. Given the available variables in the NHIES data on individuals, the following criteria are applied: in the given age group; not still in school; did not do any work for pay; profit or family gain for at least one hour in the past week; and does not have any economic or farming activity to return to. Both a broad and a narrow definition of unemployment are used, the latter including whether the individual was actively looking for work in the past week. For each definition, a dummy variable is generated if at least one working-age member is unemployed. In the following, the broad definition is reported, but applying the strict definition yields similar results of slightly smaller magnitude.

Categorical variables were also generated regarding the household's main source of income and language spoken. Other regressors refer to household size and age of the head, both of which include squared terms to allow for non-linear relationships with expenditure. In addition, the gender of the head is controlled for, as well as rural/urban location and the presence of a spouse in the household. Based on the omitted categories, the default household is headed by a man without formal education, with a spouse present, who resides in an urban area, is Oshiwambo-speaking, has no access to agricultural land and draws its main source of income from wages or salaries. In urban areas, this represents a fairly commonly found household.

In the regression analysis, observations with missing values among the independent variables are dropped, following a procedure called "complete cases only" or "list-wise

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<sup>45</sup> Only those household members between the ages of 15 and 60 are included, the assumed range of potential work force participation.

deletion". This requires the assumption that item non-response is distributed randomly. The approach is supported by the fact that the non-response rate generally amounts to less than 1 percent of households.

The calculation of standard errors takes into account the two-stage sample design.<sup>46</sup> For the 1993/94 NHIES, the data include variables for sampling weights and clusters (primary sampling units, or PSU), whereas the 2003/04 data also include the strata. The missing strata information for 1993/94 is expected to lead to slightly larger standard errors, but it does not interfere with the estimates themselves. Thus, it should not fundamentally impair the analysis.

For both survey years, regression residuals of log expenditure appear to be fairly normally distributed, relying on kernel density estimates and comparing them to the normal distribution. I find in both cases a slight deviation from normality at the upper tail and to a lesser degree at the lower tail.<sup>47</sup> More formal testing for skewness and kurtosis (Stata command *sktest*) lets me reject normality for the residuals in the model, but the above visual inspection lends support to my assumption that this is not a significant problem.

A Breusch-Pagan test and plotting the residuals versus the fitted values (*rvfplot*) indicates that there is some evidence of heteroskedasticity in both datasets. This is not unusual as it has been found to be the rule rather than the exception in household survey data (Deaton, 1997). Heteroskedasticity does not bias the coefficients, but it leads to OLS estimates no longer being the best linear unbiased estimates (BLUE), rendering them inefficient. In addition, standard errors are biased when heteroskedasticity is present. This in turn leads to a bias in test statistics and confidence intervals, but this applies mostly if heteroskedasticity is severe. In mild cases, significance tests are hardly affected.

I use robust standard errors in the regression accounting for the complex survey design based on the Huber/White/sandwich correction method, as proposed in MacKinnon and White (1985). Robust standard errors are calculated using the linearized variance estimator – so called because it is based on a first-order Taylor series linear approximation (StataCorp, 2009). This is equivalent to the Huber/White/sandwich estimator mentioned above, which in a nonsurvey context is referred to as the robust variance estimator (*ibid.*).

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<sup>46</sup> Stata provides for with its *svyset* command.

<sup>47</sup> Stata command *qnorm*.

Multicollinearity does not appear to be a major problem among the regressors in either of the NHIES surveys, according to the variance of inflation test<sup>48</sup> and the covariance matrix of the regressors. Only age of the head and age squared show, for obvious reasons, a high degree of collinearity, but allow for a concave shape of the relationship between income/expenditure and age of the head of the household.

A much bigger issue with this type of household regression is endogeneity of the regressors. There are general limitations to inferring causality from regressions based on non-experimental data (Freedman, 2010). While there are technical fixes available to try to infer causality from non-experimental data, such fixes often rely on strong assumptions (Deaton, 1997). In the absence of appropriate instruments for the regressors of interest, I proceed with the caveat that correlation is not causality. In this way, the applied models and techniques can still deliver valuable insights in the relationship between household characteristics and economic welfare (Deaton, 1997; Glewwe, 1991).

## 7.2 OLS regression findings

Not least since the NHIES are independent cross-sectional surveys and not panel data, I will rely on careful description of conditional correlates and make only modest claims regarding potential causality, as has been recommended in similar settings, for example Uganda by Appleton (2001). The OLS regressions are run separately for both survey years. Changes in the coefficients of the independent variables over time are tested for their significance by conducting pair-wise Wald tests on the parameters estimated for each of the survey years (StataCorp, 2009). Most of these changes are not found to be significant at the 10 percent level, with the exceptions being discussed below.

The semi-logarithmic OLS regression allows for a straight-forward derivation of the marginal effects: while its exact value is  $\exp(\beta) - 1$ , this can be approximated by the coefficient  $\beta$  as long as the latter is not very large in absolute terms. In the case of dummy variables, into which most of the regressors were transformed, the marginal effect represents the discrete change in  $y$  as the dummy variable changes from 0 to 1. Since expenditure is in a logarithmic form, the unit of this change is percent.

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<sup>48</sup> Stata post-regression command *vif*.

**Table 22: OLS regression of household expenditure on characteristics, Namibia**

Y = log of adult equivalent monthly consumption expenditure (2003/04 prices)	2003/04		1993/94	
	Coeff.	S.E.	Coeff.	S.E.
Age of head of household	0.012	0.00 ***	-0.007	0.00
Age of head (squared)	0.000	0.00 ***	0.000	0.00
Female head	-0.209	0.03 ***	-0.125	0.05 ***
Rural location dummy	-0.303	0.04 ***	-0.263	0.07 ***
Household size	-0.061	0.00 ***	-0.064	0.01 ***
Spouse absent (dummy)	0.061	0.03 **	0.001	0.04
Old-aged present (dummy)	-0.140	0.03 ***	0.002	0.04
Unemployed members (dummy)	-0.160	0.02 ***	-0.131	0.04 ***
Mean years of education	0.077	0.00 ***	0.083	0.01 ***
<b>Education attainment by head (Omitted: No formal education):</b>				
Primary	-0.006	0.02	-0.029	0.05
Secondary	0.195	0.03 ***	0.164	0.06 **
Tertiary	0.906	0.05 ***	0.560	0.13 ***
Access/ownership of fields (dummy)	-0.012	0.03	0.023	0.06
Access/ownership of grazing land (dummy)	0.191	0.02 ***	-0.056	0.04
<b>Language dummies (Omitted: Oshiwambo):</b>				
San	-0.021	0.08	-0.052	0.12
Caprivian	-0.142	0.04 ***	-0.461	0.07 ***
Otjiherero	0.164	0.05 ***	0.107	0.10
Rukavango	-0.316	0.05 ***	0.054	0.11
Nama/damara	-0.176	0.04 ***	-0.150	0.07 **
Setswana	0.223	0.12 *	0.304	0.15 **
Afrikaans	0.427	0.05 ***	0.434	0.08 ***
German	1.136	0.10 ***	1.210	0.16 ***
English	0.768	0.10 ***	0.776	0.15 ***
Other	0.357	0.15 **	-0.247	0.22
<b>Main income source dummies (Omitted: Salaries/wages):</b>				
Subsistence farming	-0.162	0.04 ***	-0.174	0.07 **
Commercial farming	0.907	0.18 ***	-0.037	0.25
Non-farming business	0.022	0.05	-0.187	0.08 **
Remittances	-0.339	0.04 ***	-0.406	0.07 ***
Pensions	-0.297	0.04 ***	-0.356	0.08 ***
Other	-0.255	0.07 ***	-0.264	0.48
Constant	5.716	0.08 ***	6.134	0.18 ***
Observations	9409		4109	
R-squared	0.62		0.49	

Notes: S.E. are standard errors (linearized); \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%

Source: NHIES, own calculations.

What stands out in the regression is that most regressors are highly significant (>99 percent level), while the overall predictive power of the model with an R-squared of 0.61 in 2003/04 and 0.48 in 1993/94 is acceptable. Compared to the OLS regression results on the 2003/04 dataset reported in CBS (2008), the coefficients generally point in the same direction, while the overall fit of this specifications is also comparable (R-squared of 0.61 versus 0.63). Changes over time in the regression coefficients are indicative only as almost none of the differences between 1993/94 and 2003/04 are significant at the 95 percent level (the exceptions being Rukavango and Caprivan language speakers and commercial farming and non-farming business as main income sources). This finding points to an overall story of stability in returns to household characteristics over time. In the following not all regressors are discussed, but the analysis is limited to the more interesting cases.

The relationship between the age of the head of the household and expenditure is only significant in 2003/04. The squared term has a minute coefficient indicating that the relationship is almost linear rather than concave, indicating that the positive association between age and consumption expenditure is also found among households with older heads. Households with a female head tend to have lower predicted expenditure at the mean by 21 percent in 2003/04, almost twice the effect registered for 1993/94.

As would be expected from the literature (Lanjouw and Ravallion, 1995; Deaton and Paxton, 1998), household size is negatively related to adjusted per capita consumption. These results should be interpreted with caution as they may partly reflect economies of scale in the household which are not accounted for in the regressand. Residing in a rural area is associated with adjusted per capita consumption being almost one third lower, *ceteris paribus*.

Interestingly, an absent spouse is associated with significantly higher per capita consumption in 2003/04, while it had no effect in 1993/94. Given the history of individuals being more likely to move in search for work following the labour market liberalisation after independence, this finding may indicate absent spouses sending remittances to the household. This is backed up by surveys among rural migrant workers in Windhoek which show that more than half of them send cash remittances back to their families in rural areas, with more than 90 percent of the money going to the northern regions of Namibia (Ashton *et al*, 2009). Introducing interaction terms for absent spouse and the sex of the head of the

household do not yield significant coefficients, rejecting a potential hypothesis that the effect depends on the gender of the absent spouse.

Having at least one unemployed member in the household is associated with lower per capita expenditure between 13 and 16 percent. Unsurprisingly, the more adult members are unemployed, the larger the effect (different dummy specifications for one and more than one unemployed person were also used).

The presence of household members above the age of 60 is significant and negatively related to per capita consumption only in the 2003/04 survey. This is to be expected due to the reduced productivity and engagement in economic activities among the elderly. On the other hand, all Namibians from the age of 60 are entitled to an old-age pension. Actual receipt of a pension is not recorded in the NHIES data available to this author. What can be deducted from the data, however, is that the share of the elderly who reported to be retired or too old to work remained constant over time at around 35 percent of all above 60 year-olds. Yet the share of above 60-year old respondents who were found to be economically inactive decreased from two thirds in 1993/94 to just below half in 2003/04. This may suggest that the perceived necessity to continue work beyond retirement age increased over time, but it may also reflect an increased ability of the elderly to engage in economic activities. In any case, one can conclude that the extension of the universal old-age benefit scheme does not appear to have led to an increase in older people becoming economically inactive. On balance, the presence of such a person appears to constitute more of a liability than a benefit to the household.

Language is a strong predictor of household consumption, which is indicative of the significant income inequalities between different ethnicities in the country, not least following the Apartheid era up to 1990. Compared to Oshiwambo-speakers who make up more than half of Namibian households, speaking German, English or Afrikaans is associated with significantly higher consumption expenditure. These latter groups arguably include most of the formerly advantaged white minority, although as noted earlier official Namibian surveys, including the census, do not ask for race of the respondent. The coefficients on German and English, the two best-off language groups, decreased only insignificantly from 1993/94 to 2003/04, indicating that the previous advantage of these groups did not decrease even when controlling for other characteristics.

Unsurprisingly, relying on subsistence farming or income transfers such as pensions and remittances as a main source of income is associated with significantly lower per capita consumption than households which stated salaries/wages. While the small group of commercial farmers is not statistically distinguishable from the mean wage-earner in 1993/94, the 2003/04 data show such households to be massively better off with almost twice the expected consumption expenditure. However, causal interpretations in this case are particularly difficult due to the potential issues of data comparability described in chapter 6. In relative terms, the relationship between the two large groups of wage-earners and subsistence farmers has broadly stayed the same, with the latter having about 16-17 percent lower consumption expenditure, all else being equal.

### ***The relationship between household expenditure and education***

While primary education of the household head does not appear to yield significantly higher welfare vis-à-vis uneducated heads, the benefits of secondary and tertiary education are found to be large. Household heads with at least some tertiary education are expected to have per capita expenditures of almost double those with no education, controlling for other factors. The benefit of tertiary compared to secondary education is also significant and appears to have increased strongly over time (statistically significant at the 99 percent level). More broadly speaking, there is a strong association between the mean years of schooling of working-age household members and welfare. One additional mean year of education in the household is estimated to yield 8 percent higher per capita expenditure, although the usual caveats regarding causality apply. These “returns to education” remained constant over time, but they went along with a large expansion in education among the population.

The population share of over 15-year olds who have no formal education at all declined from 30 percent in 1993/94 to 17 percent in 2003/04. Strong increases are found across all regions, but they are especially strong in the poor northern regions (CBS, 2006). This expansion in education is not picked up in the data for household heads, which experienced only an insignificant increase in the average level of educational attainment, arguably because many were already too old in the 1990s to benefit from it. The expansion is, however, notable when considering the average years of education among working age household members. Here an increase from 5.9 years in 1993/94 to 7.3 years in 2003/04 is observed, which is significant at the 99 percent level. This significant increase also holds for

urban areas (from 7.9 to 9.0 years) and for rural areas (from 5.1 to 6.4 years). This expansion of education across the country, coupled with the evidence for fairly large returns, may be one of the drivers behind the observed welfare improvements over the period under review.

The hypothesis that formerly disadvantaged households may have benefitted differently from access to education cannot be confirmed based on the available data. When introducing interaction terms for the level of education of the head and a proxy for a disadvantaged status (in this case the tribal languages Oshiwambo, Otjiherero, Rukavango, San, Caprivi languages, Nama-Damara and Setswana), no significant effect can be found for either survey year.

When running separate regressions for urban and rural areas (see Table A10 and Table A11 in the appendix), the signs and significance levels of the joint analysis are broadly confirmed for both locations. What is observed, however, is that in rural areas, there are significantly (at the 99 percent level) lower coefficients on the mean years of school than in urban areas for both survey years. This may suggest that the returns to education in rural areas are smaller due to a lack of economic opportunities that pay a premium on human capital. Support for this hypothesis is found when interacting mean years of schooling with subsistence farming for the national sample: there is a significant negative coefficient on the interaction term of almost half the magnitude of the coefficient on mean school years for other households. For 2003/04 it is further found, that having unemployed household members is associated with a significantly larger reduction in expenditure than in rural areas, possibly indicating that being unemployed in urban areas means more to household income than in rural areas, again related to fewer economic opportunities there.

### **7.3 The probability of being poor**

Analogous to the OLS regression, the probability of being poor can be estimated as a function of the observed characteristics as described above. This is of interest as they may have a different relationship to the welfare of the poor than to that that at the mean of the welfare distribution (Appleton, 2001). The poverty status of the household (i.e. monthly per capita consumption expenditure of less than N\$262.45 in 2003/04 prices per adult-equivalent household member) is thus a binary dependent variable to be estimated by means

of a latent variable model (Woolridge, 2002). The latent variable is the probability of being poor, while only the two stages of poor / non-poor are observed. In the following, I rely on a maximum-likelihood estimator based on the logit regression model (*ibid.*). With the dependent variable being the probability of being poor, the independent variables are chosen analogously to the OLS regression presented above. Table 23 presents the marginal effects of the independent variables, which are derived at the mean value in the case of continuous variable, while for binary variables they represent the effect of a change from 0 to 1.

The findings from the logit regressions are broadly in line with the OLS estimates for the log of household expenditure. This also applies to separate regressions for urban and rural areas whose findings are not discussed here, but which are presented in Table A12 and Table A13 in the appendix. Some interesting observations from the national sample include that while in 1993/94, there is statistically no effect of the sex of the household head, in 2003/04 having a female head was associated with a 9 percent higher probability to be poor. Also in contrast to the OLS results, an absent spouse was not correlated with the poverty status of the household in 1993/94, but the findings point to a small significant (at the 10 percent level) decrease in the probability of being poor if the spouse is absent in 2003/04. As with the OLS findings, this may be related to an absent spouse being more likely by 2003/04 to have migrated somewhere else for work and still contributing to household income.

While having old-aged household members is not found to be statistically correlated with poverty status in 1993/94, there is a positive correlation in 2003/04. This is in line with expectations given that one would predict productivity and incomes to decline with old age (Deaton, 1997). The universal social grant for those aged 60 years and above does not appear to fully compensate for this loss in productivity. Living in a rural location increases the probability of being poor by 16 percent for both survey years. In 2003/04, access to grazing land is found to have had a statistically significant, negative effect on this probability. In terms of the main source of income, as expected those households mainly relying on pensions or remittances are, *ceteris paribus*, the ones most likely to be in poverty.

**Table 23: Marginal effects after logit of probability of being poor**

	2003/04		1993/94	
	Coeff.	S.E.	Coeff.	S.E.
Age of head of household	-0.004	0.00 *	0.007	0.00 *
Age of head (squared)	0.000	0.00 *	0.000	0.00
Female head	0.087	0.02 ***	0.039	0.04
Rural location dummy	0.143	0.02 ***	0.161	0.05 ***
Household size	0.035	0.00 ***	0.033	0.01 ***
Spouse absent (dummy)	-0.039	0.02 *	0.019	0.03
Old-aged present (dummy)	0.067	0.03 ***	-0.035	0.04
Unemployed members (dummy)	0.050	0.02 ***	0.082	0.03 ***
Mean years of education	-0.039	0.00 ***	-0.044	0.01 ***
<b>Education attainment by head (Omitted: No formal education)</b>				
Primary	-0.015	0.02	0.016	0.03
Secondary	-0.101	0.02 ***	-0.089	0.05 **
Tertiary	-0.326	0.01 ***	-0.272	0.18
Access/ownership of fields (dummy)	-0.012	0.03	-0.031	0.04
Access/ownership of grazing land (dummy)	-0.122	0.02 ***	0.030	0.03
<b>Language dummies (Omitted: Oshiwambo)</b>				
San	0.026	0.06	-0.030	0.07
Caprivian	0.018	0.04	0.222	0.04 ***
Otjherero	-0.110	0.04 ***	-0.069	0.06
Rukavango	0.201	0.04 ***	-0.047	0.07
Nama/damara	0.096	0.04 **	0.098	0.04 **
Setswana	-0.154	0.06 **	-0.103	0.12
Afrikaans	-0.089	0.03 ***	-0.251	0.06 ***
German	(omitted)		-0.409	0.16 ***
English	-0.164	0.09 *	-0.428	0.12 ***
Other	-0.034	0.07	0.149	0.10
<b>Main income source dummies (Omitted: Salaries/wages)</b>				
Subsistence farming	0.095	0.03 ***	0.129	0.04 ***
Commercial farming	-0.119	0.14	0.111	0.10
Non-farming business	0.090	0.04 **	0.193	0.05 ***
Remittances	0.229	0.04 ***	0.242	0.03 ***
Pensions	0.274	0.04 ***	0.238	0.04 ***
Other	0.279	0.08 ***	-0.071	0.22
Observations	9385		4109	
Predicted y at sample means of x	0.27		0.58	

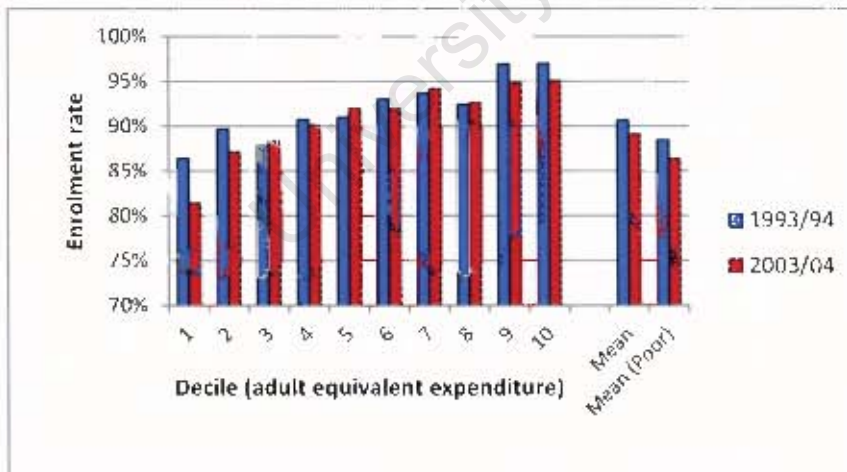
Note: Logit regression of probability of being poor by CBN Poverty Line; data weighted for individuals; S.E. = Standard errors; \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%;

Source: Own calculations from NHIES data.

As with the OLS findings for consumption expenditure, a lack of human capital is a strong predictor of poverty. With each year of mean schooling of adult members in the household, the probability of being poor decreases by 4 percent in both survey years. Educational attainment of the head of the household is only found to have a significantly decreasing relationship with the probability to be poor at the secondary and tertiary level, but it is of a large magnitude. The overall importance of education for household welfare that was found in the OLS regressions is therefore confirmed for the lower end of the distribution.

The above-mentioned expansion of education over the period under review is arguably a key factor in the observed poverty reduction. However, the importance of education for households' economic welfare renders another observation important for future trends: a decline in enrolment rates by expenditure decile over time. This decline was found by calculating enrolment rates for the age group 7 to 16 years, with children enrolled in school at the time of the NHIES interview counting as enrolled. As Figure 17 illustrates, household wealth (proxied by consumption expenditure) is correlated with a household's ability (or willingness) to send their children to school. The poorest decile had an enrolment rate of only 81 percent in 2003/04, compared to 89 percent mean enrolment rate and 95 percent for the richest decile.

Figure 17: Enrolment rate by expenditure decile, 1993/94 – 2003/04



Source: NHIES data; own calculations.

More surprisingly, the changes in mean enrolment rates between 1993/94 and 2003/04 are negative for most expenditure deciles, with the poorest two deciles experiencing the largest decline. The mean decline for poor households was at 2.4 percent slightly higher than the total mean decline of 1.7 percent. The largest decline is found among the poorest decile,

which saw enrolment drop by 5.7 percent. The trend of poorer deciles experiencing a steeper decline in enrolment rates is most pronounced in rural areas (for more details see Schmidt, 2009). Given what has been learned regarding the positive relationship between years of schooling among the adult members, these reductions in enrolment rates, in particular among poor rural households, may have adverse effects on poverty reduction once those deprived of education become economically active. It will be of interest to follow up on this observation once the NHIES 2009/10 data become available.

#### 7.4 Testing for heterogeneity of coefficients: quantile regression

Having estimated the OLS model for the mean of the regressand and the logit model on poverty status, the understanding of the degree to which the coefficients of the regressors differ along the income distribution remains incomplete. It may be the case that the relationship between the variables displays such heterogeneity along the distribution that both OLS and logit estimates give an insufficient picture. This is particularly of interest with regards to productivity-related variables such as human capital and access to land. Access to fields, for example, may not be significant in the two models above, but it may play a role for those households right at the bottom of the distribution. Perhaps more importantly, educational attainment, which does appear to be of importance at the mean and as a determinant of poverty status, may play a much less significant role at different parts of the distribution. There is a need to find out if the conditional means differ along the expenditure distribution.

The OLS and logit analyses are thus extended by semi-parametric regressions in order to take a more detailed look at the shape of the conditional distribution of coefficients along different welfare percentiles (Deaton, 1997). I employ a series of quantile regressions which, unlike the parametric models above, allow the conditional distribution of the dependent variable to be fully characterised (Koenker and Basset, 1978; Koenker and Hallock, 2001; Martins and Pereira, 2004). Quantile regression is a semi-parametric technique of the class of least absolute deviation (LAD) estimators. Based the linear regression model used in section 7.2, the quantile regression model can be written<sup>49</sup> as

$$\ln y_i = \beta_\theta x_i + \epsilon_{\theta i} \text{ with } Quant_\theta(\ln y_i | x_i) = \beta_\theta x_i$$

<sup>49</sup> The following expressions are adapted from Martins and Pereira (2004).

where  $\ln y_i$  is the log of per capita household expenditure of household  $i$ ;  $x_i$  is the vector of regressors and  $\beta_\theta$  is the vector of parameters.  $Quant_\theta(\ln y_i | x_i)$  denotes the  $\theta$ th conditional quantile of  $\ln y$  given  $x$ . The  $\theta$ th regression quantile ( $0 < \theta < 1$ ) is defined as a solution to the optimisation problem:

$$\min_{\beta \in R^k} \left\{ \sum_{i: \ln y_i \geq \beta x_i} \theta |\ln y_i - \beta_\theta x_i| + \sum_{i: \ln y_i < \beta x_i} 1 - \theta |\ln y_i - \beta_\theta x_i| \right\}$$

which can be written as

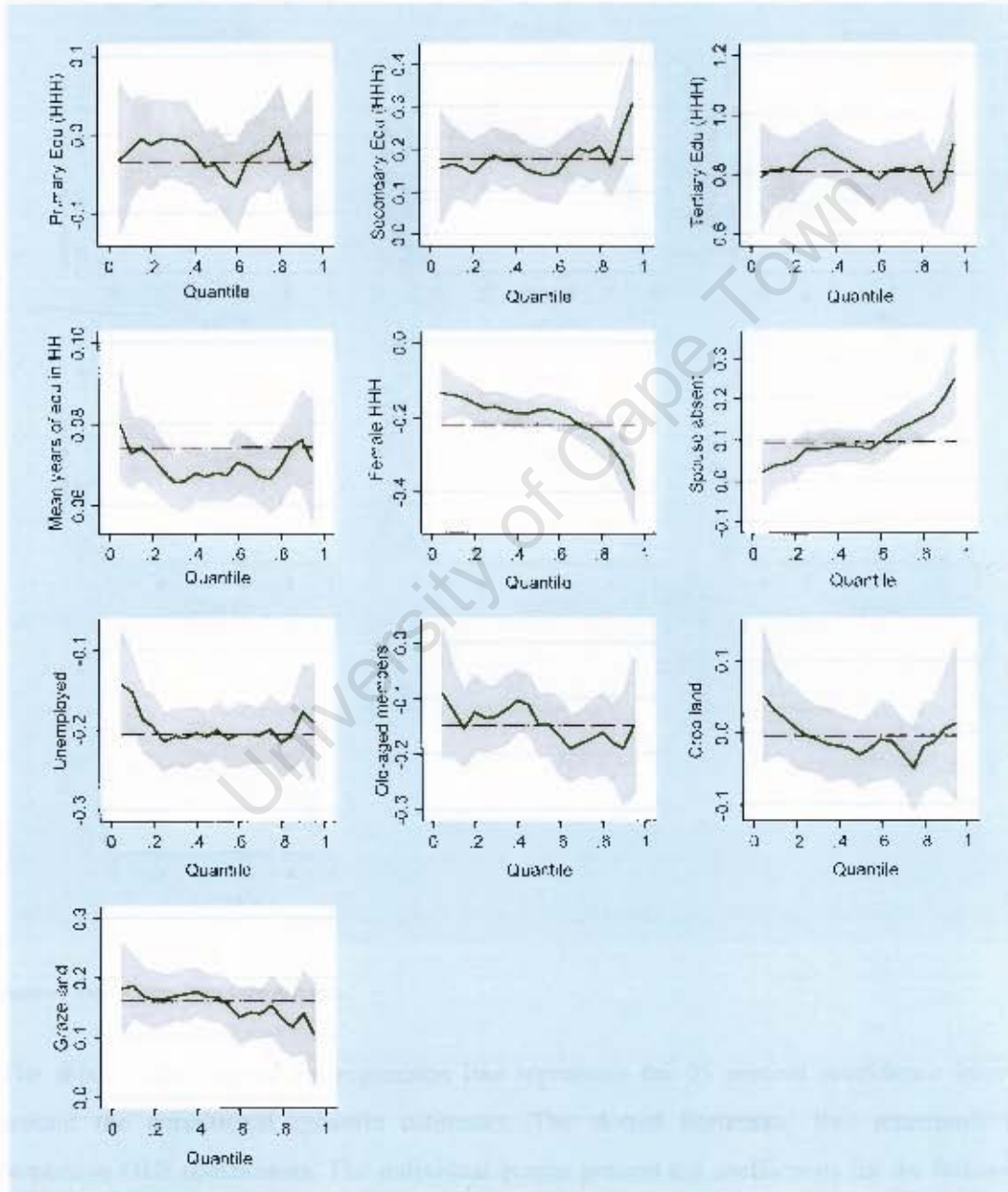
$$\min_{\beta \in R^k} \sum_{i: \ln y_i \geq \beta x_i} \rho_\theta (\ln y_i - \beta_\theta x_i)$$

where  $\rho_\theta(\tau)$  is an absolute value function defined as  $\rho_\theta(\tau) = \theta\tau$  if  $\tau \geq 0$  or  $\rho_\theta(\tau) = (1 - \theta)\tau$  if  $\tau < 0$ . The quantiles are thus derived giving asymmetric weights to the absolute residuals. The minimisation problem of the LAD estimator of  $\beta$  can be solved by linear programming methods (Koenker and Hallock, 2001). Standard errors are obtained via bootstrapping. For the median regression,  $\theta$  takes the value of 0.5. The first decile is obtained by setting  $\theta = 0.1$ ; by increasing  $\theta$  incrementally from 0 to 1, the entire distribution on  $y$ , conditional on  $x$ , can be described. In this way, quantile regression allows variation in the covariates along the welfare distribution.

Based on the covariates from the OLS regression (Table 22), Table A14 and Table A15 in the appendix presents the results of quantile regressions for the 10<sup>th</sup>, 50<sup>th</sup> (median) and 90<sup>th</sup> percentiles, using individual sample weights, for the 2003/04 and 1993/94 surveys. Different specifications of the model were tested (for example excluding main income source or language) but do not alter the findings in a meaningful way. A first point to note is that the coefficients for the median quantile regression, the sign of the coefficients and also their magnitude is comparable to the OLS findings for the mean. In addition, most of the coefficients in the quantile regressions are statistically significant at a similar level as the OLS coefficients. These observations hold for both surveys. When comparing the three chosen quantile regressions (10<sup>th</sup>, 50<sup>th</sup>, 90<sup>th</sup> percentile), most of the regressors have coefficients of comparable magnitude, with virtually no sign changes. This is indicative of a fairly homogeneous relationship with household expenditure along the welfare distribution. In order to get a clearer picture of these relationships, selected covariates are graphed for the full range of quantiles.

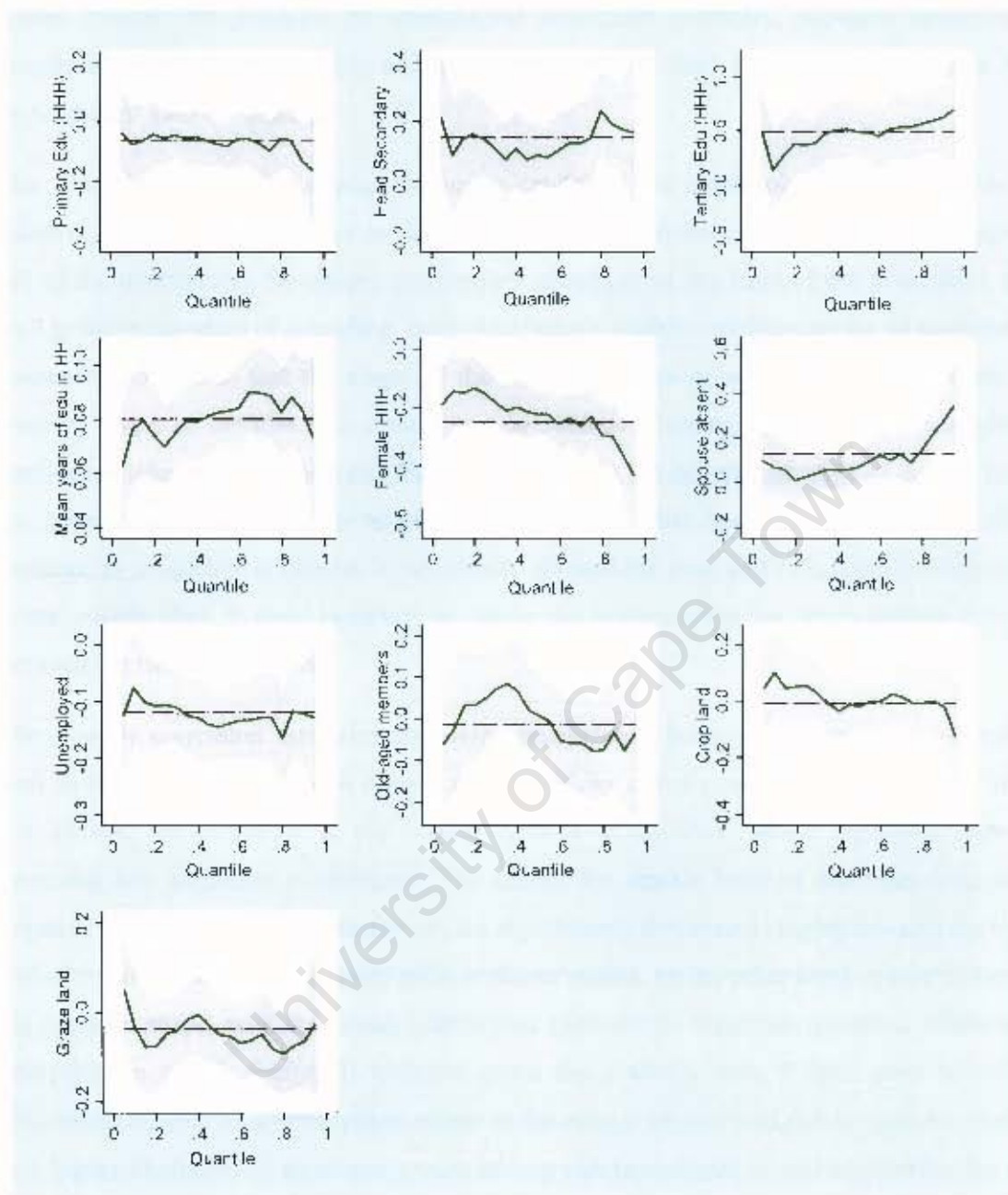
A particular interest in the analysis centres on those household characteristics that are directly related to productivity, such as human capital, labour force participation and access to land. Controlling for all covariates in the log expenditure model, the regressors relating to the above covariates are plotted for a range of percentiles  $\theta$  from 0.05 to 0.95 in 0.05 increments, as depicted in Figure 18 and Figure 19 below.

**Figure 18: Quantile regression estimates and OLS for log welfare model, 2003/04**



Source: NHIES data; own calculations.

Figure 19: Quantile regression estimates and OLS for log welfare model, 1993/94



Source: NHIES data; own calculations.

The shaded area around the regression line represents the 95 percent confidence interval around the conditional quantile estimates. The dotted horizontal line represents the respective OLS coefficients. The individual graphs present the coefficients for the following explanatory variables: dummies for educational attainment (primary, secondary and tertiary) of the household head relative to the base category of no education; mean years of schooling

of working-age members; and dummy variables for having a female household head; an absent spouse; the presence of unemployed household members; old-aged household members above the age of 60; access or ownership of land for crops; and access or ownership of land for grazing.

The educational variables related to human capital in the household are found to have relatively stable coefficients for most quantiles, with somewhat higher values at the upper tail of the distribution. Secondary and tertiary education of the head of the household, as well as the mean years of schooling, have significantly positive coefficients for all quantiles. Interesting to note is that the shape of the curve for years of schooling changed from a concave shape in 1993/94 to a convex one in 2003/04. Bearing in mind the overlapping confidence intervals, this indicates that the relationship has become stronger at the top and the bottom of the distribution relative to the middle. This bears a resemblance to the findings on inequality in chapter 4, which also showed the poor and rich gaining relatively to the middle class. It may, however, be taking the interpretation too far to suggest a link between the two observations.

The quantile regression estimates for having unemployed household members correspond well to the OLS estimates and have a rather uniform effect over the whole range of the distribution. An exception is the bottom quintile in 2003/04, which registered higher (meaning less negative) coefficients. The curves for female head of the household are negative for all quantiles and, moreover, are significantly downward sloping towards the top end of the distribution. Households with an absent spouse, on the other hand, appear to have the opposite shape, with increasing coefficients towards the wealthier quantiles. While an interpretation of this finding is tentative given the available data, it does point towards differences of what an absent spouse means in the context of poor and rich households (such as a higher likelihood of an absent spouse among rich households to still be contributing to household income). The presence of old-aged members in the household appears to have no effect on welfare in 1993/94 and a negative one in 2003/04. In both cases, however, they appear to have had somewhat higher coefficients in the lower half of the distribution than in the upper half. While it is not statistically significant, this may hint at the intuitive notion that the universal social pension makes more of a difference to poorer retired people than to richer ones.

The two land variables confirm broadly the OLS findings. Access to land for crops appears to be positively related to household welfare at the lower end of the distribution, but negatively at the upper end. Bearing in mind the low level of statistical significance, this may be an indication that for households at the bottom of the distribution, it could indeed make a difference to have access to such land. The effect of grazing land having become significant in 2003/04 compared to a coefficient of around zero in 1993/94 is shown to hold along the entire distribution.

## 7.5 Chapter summary

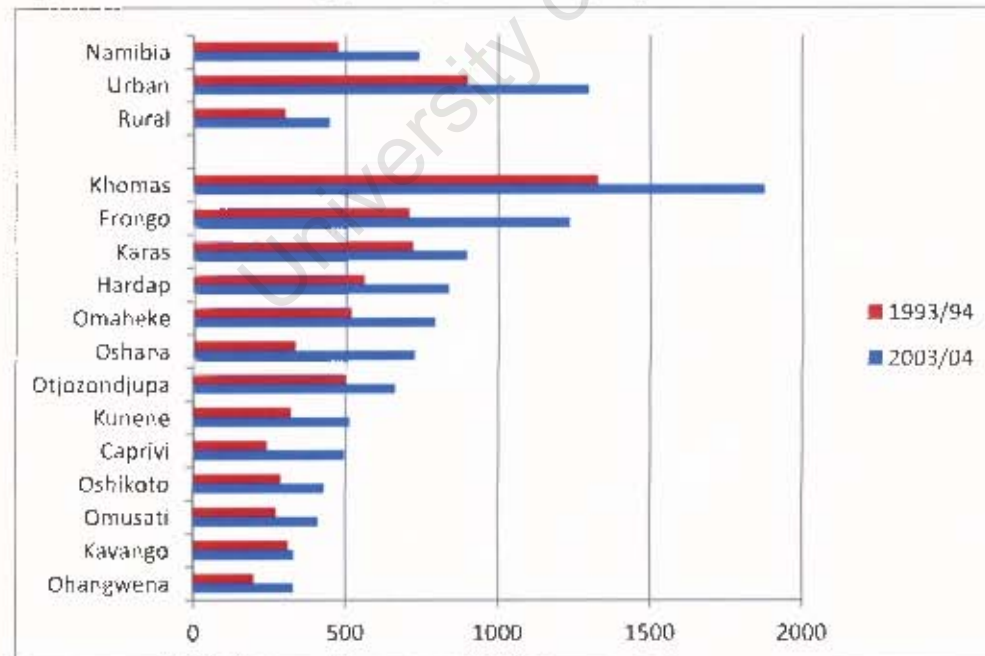
The higher the level of education in the household, the higher household consumption and the lower the probability of being poor – this paradigm is also valid for post-independence Namibia. The importance of education is further confirmed to apply to all quantiles of the welfare distribution, even if there appear to be lower returns in rural areas than in urban areas. There are good reasons to assume that the significant positive relationship is causal, although caution is still advised: access to education may be related to other factors, such as social connections or innate ability, that are conducive to economic productivity, thus leading to spurious correlations. The available data do not allow for the application of techniques to control for such endogeneity (such as a two-stage model with instrumental variable), but the plausibility of education leading to human capital formation and thus to economic returns remains valid.

The returns to education are found to be smaller in rural than in urban areas due to a lack of economic opportunities that pay a premium on human capital. It cannot be confirmed that formerly disadvantaged households may have benefitted differently from access to education. Ethnicity, as measured by language, remains a strong predictor of economic welfare. Those language groups mainly comprising the formerly advantaged white population have not seen a reduction in their “premium” during the period under review, and significant inequalities that are not explained by other differences persist. The hypothesis that the relationship between economic welfare on the one side and education and ethnicity on the other has changed over time, is thus generally not supported by the data. What is confirmed, however, is that educational attainment among the adult population increased significantly, and that educational attainment appears to be strongly correlated with economic welfare for all quantiles of the distribution.

## 8. Regional inequality and poverty: the role of population shifts

The spatial dimension of inequality in developing countries has received increasing interest in the literature and among policy makers (Kanbur and Venables, 2007). The relevance of this dimension also applies to Namibia. As was shown in section 5 of chapter 3, there is quite some variation in poverty incidence between rural and urban areas, as well as between regions. Figure 20 gives an overview of mean household expenditure per capita by rural/urban area and by region. It is striking that mean expenditure in rural areas amounts to only around one third of that in urban areas, even if its growth between the two surveys was slightly higher in rural areas. The difference between the wealthiest region, Khomas, and the poorest, Ohangwena, is even starker with mean expenditure in the latter only amounting to 15-18 percent of that in the former. Given these stark inequalities between regions, it is not surprising that there is evidence of significant inter-regional migration during the period under review (CBS, 2006).

**Figure 20: Mean monthly p.c. expenditure by region, 1993/94 and 2003/04**



Note: Consumption expenditure per adult-equivalent, data weighted by individuals; 2003/04 average prices.

Source: NHIES data; own calculations.

It is well documented in the literature that individuals migrate to areas with better economic opportunities, where they can earn a higher return on their factors of production, most importantly labour (Todaro, 1996). Even if the probability of finding work is limited by the presence of significant unemployment in urban areas, as is the case in Namibia, it may still be rational for individuals to migrate there, given sufficient differentials in income (Harris and Todaro, 1970). The same can also be assumed to hold for migration between regions. Constraints to the migration decision do not only comprise travel cost and risk aversion, but also family ties and cultural norms (Tacoli, 1998).

The impact of internal migration on the regional poverty and inequality profile is not straight-forward, but it depends on the socio-economic strata that decide to migrate (Kanbur and Rapaport, 2005). Even ignoring dynamic effects, for example on local factor prices or via remittances, the migration of mainly non-poor individuals may lead to an increase in the poverty share in their region of origin, while out-migration of the poor would have the opposite effect. The impact on the incidence of poverty (and inequality) in the destination region also depends on how the migrants fare in terms of economic activities. This is also related to the question whether there are structural issues underlying regional disparities, such that individuals with the same endowment of factors earn different returns, or whether the differences are driven by heterogeneity in the factor endowments themselves (Ravallion and Wodon, 1999).

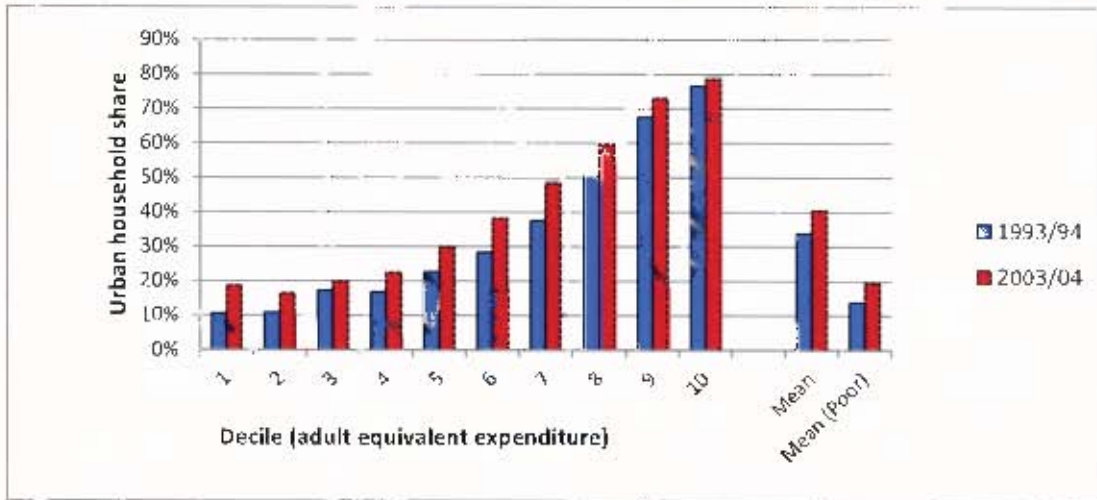
While the NHIES do not contain data on the migration history of households, some stylised facts regarding population shifts between regions in the decade following independence can be traced. Section 8.1 provides evidence from census data and the NHIES that migration has taken place and that there is support for the hypothesis that it is mainly poorer individuals that migrate from rural to urban areas. In section 8.2, the impact of these shifts on regional poverty and inequality between regions is explored. Section 8.3 contains an analysis of the relative contribution by differences in factor endowments and their returns to inter-regional inequality, as well as their changes over time.

## 8.1 Rural-urban migration: evidence from the data

It has been noted that migration dynamics within Namibia have changed considerably since 1990 (Frayne and Pendleton, 2001). In Namibia, labour migration was restricted by policy until independence and, therefore, there may have been a particular backlog of potential migrants from the rural former homelands in the north of the country towards urban centres. This assumption is supported by an increase in the share of the urban population, which increased from 28 percent in 1991 to 33 percent in 2001 (CBS, 2003). Based on the 1991 and 2001 census count of individuals, national average population growth is estimated to have amounted to 2.6 percent per annum nationally. However, when comparing rural and urban areas, there are stark differences: In rural areas, the population only grew by 1.9 percent per annum, while in urban areas annual growth was 4.3 percent. This is reflected in the NHIES, which shows the number of urban households to have grown by 82 percent compared to 37 percent for rural households between 1993/94 and 2003/04. The share of urban households in the total population consequently increased from 34 to 41 percent.

One alternative explanation to internal migration is that the urban population changed preferences regarding their household size relative to rural preferences, with urban members moving out to form smaller households, thus raising their number faster than those in rural areas. The NHIES data do not support this explanation of differential trends between urban and rural household sizes, as average household size between the two survey years has decreased by comparable rates in both areas, by 13 and 11 percent respectively. The common observation that rural households tend to be larger than urban households remains valid: The average rural household size decreased from 6.1 to 5.4, while the average urban household size decreased from 4.8 to 4.2.

Figure 21 below illustrates the urban/rural share of expenditure deciles. It shows that the share of urban households increased at higher expenditure deciles, supporting the evidence of higher poverty rates in rural than in urban areas (see CBS, 2006; Levine and Roberts, 2008a). Indeed, urban households make up less than a fifth of households in the bottom four deciles (and even less in terms of population, due to the lower average urban household size). As mentioned before, these findings rest on the assumption of comparable cost of living between rural and urban areas.

**Figure 21: Share of urban in total households by expenditure decile**

Source: NHIES data; own calculations.

Equally striking as the relatively low shares of urban households among the poorest expenditure deciles is the significant growth of these shares over time. The trend clearly points to an inverse relationship between expenditure decile and the respective growth rate: urban household growth has been particularly strong at the poorer end of the distribution, with the poorest decile experiencing almost a doubling of the urban share to just below one fifth of households in that expenditure bracket. This observation is robust to changes in the relative price levels between urban and rural areas (tested analogously to the poverty profile in section 3.5.2), but it does rest on the assumption of constant relative urban-rural prices over time.

This observation is in line with the hypothesis of poorer rural residents migrating to urban areas in search of employment opportunities (as found by Frayne and Pendleton, 2001, and Ashton *et al.*, 2009), which is supported by the large drop in absolute numbers of the poor in rural areas. It may thus explain why poverty levels decreased more slowly in urban than in rural areas, as the influx of poor people into urban areas has partly offset poverty-reducing drivers, such as economic growth. The migration of the poor into informal settlements in urban areas may also explain the finding that although the provision of households with public services such as piped water, sanitation and electricity increased in absolute numbers over the period under review, there was a deterioration of relative access rates to these services, in particular among poorer urban households (Schmidt, 2009).

Further evidence of internal migration is provided by the census of 2001, which *inter alia* asked about the individuals' birthplace as well as short term migration. According to the census, 40 percent of persons usually residing in urban areas were not born there, while 90 percent of rural residents were born in rural areas (CBS, 2003). It also shows that more than half of the inhabitants of the two most economically prosperous (and urbanised) regions of Khomas and Erongo were not born there, while the share for the poorest regions in the north are around 90 percent. The census also asked about short-term migration within the past five years (between 1996 and 2001), finding that 4 percent of urban residents had in-migrated to urban areas over that period. For Khomas and Erongo, the share of net in-migration in the short term amounted to 7.5 and 8.1 percent respectively, in particular from the poorest northern region (*ibid.*). In sum, there is strong support for the existence of significant inter-regional migration in the decade following independence.

## **8.2 The impact of regional migration on poverty and inequality**

### **8.2.1 Regional decomposition of poverty changes**

The evidence of population shifts between rural and urban areas, as well as between regions, has implications for the observed changes in poverty, as outlined above. In terms of the contribution of internal migration to changes in observed poverty, the available data only allow for a cautious assessment. Given this constraint, it is nonetheless feasible to derive some tentative evidence regarding this impact. The hypothesis to be tested is that poor households migrated to areas with better economic opportunities, thus contributing to a decline in the overall incidence of poverty. Methodologically, Huppi and Ravallion's (1991) decomposition methodology (as introduced in section 6.2 when discussing intra-sectoral effects) is applied to rural and urban areas and the 13 regions respectively. Changes in the FGT poverty indices are thus decomposed into intra-regional components, population-shift components and a residual interaction effect, as outlined in more detail in section 6.2. The underlying assumption of the analysis is, of course, that changes in the relative regional populations are in fact due to migration.

Turning first to population shifts between rural and urban areas, Table 24 exhibits that intra-regional effects were responsible for 91 to 97 percent of the overall poverty reduction.

Among the intra-regional components, poverty reduction in rural areas was significantly more important, contributing 72 percent to the overall reduction in the headcount index and even more in the other two FGT measures. Population-shift effects also contributed positively to the reduction between 8 and 11 percent. Interaction effects were positive (i.e. poverty increasing), but small.

**Table 24: Decomposition of poverty reduction by rural/urban, 1993/94 – 2003/04**

Location (urban/rural)	% of pop. 1993/94	P <sub>0</sub>		P <sub>1</sub>		P <sub>2</sub>	
		Absolute change	% change	Absolute change	% change	Absolute change	% change
Urban	28.89	-3.91	19.2	-1.88	12.5	-1.12	10.5
Rural	71.11	-14.58	71.8	-21.75	83.4	-9.23	86.9
Total intra-regional effects		-18.49	91	-14.4	96	-10.35	97.4
Population-shift effects		-2.23	11	-1.25	8.3	-0.8	7.5
Interaction effects		0.4	-2	0.64	-4.3	0.53	-5
Total change in poverty		-20.32	100	-15	100	-10.62	100

Note: Absolute changes in percentage points.

Source: NHIES data, own calculations.

Population-shift effects were stronger for the poverty headcount index than for the other two indices, indicating that migration had a larger impact on households moving out of poverty, than on those that remained in poverty. While one has to be cautious when interpreting the findings given that households' migration status is not in the data, this may indicate that it is rather the "better-off" rural poor than those right at the bottom of the distribution that benefit mostly from relocating to urban areas.

Applying the decomposition to the 13 regions (see Table 25) yields similar findings to the rural-urban analysis. Intra-regional effects dominate, with poor regions in the north (which according to the 2001 census all experienced net short-term emigration) making the largest absolute contributions to the overall poverty reduction. Population-shifts also contributed to poverty reduction between 5-7 percent for all three FGT indicators. As before, the largest contribution was made to the headcount index. Based on these findings from the rural-urban and regional decompositions, the hypothesis that internal migration has contributed to reducing poverty over the period under review can therefore not be rejected.

**Table 25: Decomposition of poverty reduction by region, 1993/94 – 2003/04**

Region	Pop. share 1993/94 (%)	P <sub>0</sub>		P <sub>1</sub>		P <sub>2</sub>	
		Absolute change	% change	Absolute change	% change	Absolute change	% change
Caprivi	6.6	-2.5	12.3	-1.7	11.2	-1.2	11.3
Erongo	5.4	-1.0	5.0	-0.4	2.7	-0.2	1.9
Hardap	3.9	0.0	0.0	-0.1	0.7	-0.1	1.2
Karas	3.9	-0.4	2.1	-0.3	2.0	-0.2	1.8
Kavango	9.0	0.5	-2.7	0.2	-1.1	0.1	-0.6
Khomas	11.7	-1.6	7.7	-0.8	5.6	-0.5	4.9
Kunene	4.3	-1.5	7.5	-0.9	6.1	-0.7	6.2
Ohangwena	13.7	-3.1	15.4	-3.4	22.5	-2.6	24.9
Omaheke	3.4	-0.7	3.3	-0.4	2.4	-0.2	2.1
Omusati	11.0	-2.8	13.9	-2.2	14.9	-1.5	14.4
Oshana	11.6	-5.1	25.1	-2.8	18.5	-1.7	15.8
Oshikoto	8.4	-1.7	8.5	-1.7	11.3	-1.3	11.9
Otjozondjupa	7.2	-0.6	2.9	-0.6	4.3	-0.5	5.0
Total intra- regional effects		-20.5	100.9	-15.1	100.9	-10.7	101.0
Population-shift effects		-1.4	7.1	-0.8	5.2	-0.5	4.8
Interaction effects		1.6	-8.0	0.9	-6.1	0.6	-5.7
Total change in poverty		-20.3	100.0	-15.0	100.0	-10.6	100.0

Note: Absolute changes in percentage points.

Source: NHIES, own calculations.

### 8.2.2 Regional decomposition of inequality

The existence of significant migration between regions in Namibia may also have led to changes in inequality within and between regions. Based on the Gini coefficient, Theil-L and Theil-T measures, intra-regional inequality mostly decreased, even if most are not statistically significant at any reasonable level (see Table 26). The exception of note here is the region of Hardap, which witnessed a significant increase in all inequality measures. The overall picture of a lack of statistical significance of changes reflects the findings presented in Table 13 for inequality within rural and urban areas, as well as nationally.

**Table 26: Inequality changes within regions, 1993/94 – 2003/04**

	1993/94			2003/04			Delta (1993/94 - 2003/04)		
	Gini	Theil-L	Theil-T	Gini	Theil-L	Theil-T	Gini	Theil-L	Theil-T
Caprivi	0.48	0.41	0.46	0.44	0.32	0.37	-0.04	-0.08*	-0.09
Erongo	0.53	0.50	0.55	0.57	0.58	0.62	0.03	0.07	0.07
Hardap	0.55	0.57	0.55	0.66	0.81	0.97	0.11**	0.24**	0.42***
Karas	0.63	0.75	0.83	0.62	0.71	0.78	-0.01	-0.03	-0.05
Kavango	0.44	0.33	0.37	0.49	0.42	0.53	0.06	0.09	0.16
Khomas	0.59	0.68	0.64	0.57	0.59	0.58	-0.02	-0.09	-0.06
Kunene	0.58	0.62	0.74	0.49	0.42	0.52	-0.09	-0.20	-0.23
Ohangwena	0.43	0.32	0.34	0.36	0.21	0.28	-0.07*	-0.10**	-0.06
Omaheke	0.66	0.80	1.33	0.64	0.74	0.89	-0.02	-0.06	-0.44
Omusati	0.44	0.34	0.35	0.38	0.25	0.33	-0.06**	-0.09**	-0.02
Oshana	0.53	0.49	0.71	0.52	0.45	0.55	-0.02	-0.04	-0.15
Oshikoto	0.51	0.47	0.55	0.46	0.36	0.48	-0.05	-0.11	-0.07
Otjozondjupa	0.58	0.64	0.70	0.58	0.60	0.72	0.00	-0.04	0.02

Note: \* significant at 10%; \*\* significant at 5%;\*\*\* significant at 1%.

Source: NHIES, own calculations.

The analysis here thus turns to changes in inter-regional inequality and how it may have been affected by internal migration. Formulating a hypothesis is not as straight-forward as with poverty: *Ceteris paribus*, between-regional inequality would be reduced if mainly poor individuals migrate to better-off areas. However, if better-off individuals migrate in the expectation of earning higher returns on their factors of production, the effect may be a worsening in intra-regional inequality. This is related to the question whether differences in regional welfare are mainly due to differences in factor endowments or to different returns on those endowments due to fixed, structural features (geography, infrastructure, climate etc.) by region, which is explored in the subsequent section. The following analysis is limited to tracing the degree to which overall inequality is due to inequality within and between locations and whether their relative contributions have changed over time.

Drawing on the decomposition methodology by Bourguignon (1979), which was introduced in section 0, this decomposition of inequality by region can be written as

$$GE(\alpha) = GE_W(\alpha) + GE_B(\alpha)$$

where  $GE_W$  is within-group inequality for all regions and  $GE_B$  is between-region inequality. The regional analysis is applied to rural and urban areas and to the 13 regions in Namibia.

Among rural and urban areas, within-group inequality contributes around 80 percent to overall inequality as measured by the decomposable Theil-L and Theil-T indices. The dominance of within-group inequality was even more pronounced than for the economic sectors discussed in section 0. While the components of the Theil-T index remained virtually unchanged, the contribution of between-regional (i.e. rural/urban) inequality to the Theil-L measure slightly increased over time. This indicates that at the lower end of the income distribution, inequality between rural and urban areas became relatively more important than for higher income quantiles, but the limited size of the effect prohibits any meaningful interpretation. Moreover, in absolute terms inequality between rural and urban areas did not increase.

**Table 27: Within-group and between-group inequality by rural / urban**

Decomposition by Urban/Rural:	Theil-L		Theil-T	
	1993/94	2003/04	1993/94	2003/04
Within-group	0.54	0.5	0.68	0.64
Percentage	80%	78%	82%	82%
Between-Group	0.14	0.14	0.15	0.14
Percentage	20%	22%	18%	18%
<b>Overall:</b>	<b>0.68</b>	<b>0.64</b>	<b>0.83</b>	<b>0.78</b>

Source: NHIES, own calculations.

As for inequality between the 13 regions, it is noted that between-regional inequality contributes more (between 25 and 30 percent) to overall inequality than the inequities between urban and rural areas presented above. Nonetheless, within-regional inequality still dominates the overall situation. Between 1993/94 and 2003/04, the relative importance of spatial disparities marginally increased, while in absolute terms it also did not change (or even slightly decreased in the case of the Theil-T measure). It can therefore not be concluded that the gap between regions closed over the period under review.

**Table 28: Within-group and between-group inequality by regions**

Decomposition by Region:	Theil-L		Theil-T	
	1993/94	2003/04	1993/94	2003/04
Within-group	0.49	0.44	0.62	0.57
Percentage	72%	69%	74%	73%
Between-Group	0.19	0.19	0.21	0.2
Percentage	28%	30%	25%	26%
<b>Overall:</b>	<b>0.68</b>	<b>0.64</b>	<b>0.83</b>	<b>0.78</b>

Source: NHIES, own calculations.

The absence of any significant trend in between-regional inequality, however, is not sufficient as evidence that regional migration did not have any impact on such inequalities. It may be the case that countervailing effects were at play that led, for example, to poor households migrating and then earning higher incomes at their destination, thus potentially cancelling out effects on between-regional inequality. Bearing in mind the limitations of the data, this question is explored in more detail in the following section.

### 8.3 Oaxaca-Blinder decomposition

This section examines whether the primary explanation for the differences in living standards is differences in the characteristics of households living in the poorer or richer areas or differences in the returns to these characteristics between poorer and richer areas.<sup>50</sup> One may posit that the observed differences in regional mean welfare and poverty rates are due to two extreme hypotheses, one focussing on “concentration” and the other on “geography” (Skoufias and Lopez-Acevedo, 2009). The concentration hypothesis holds that certain areas are inhabited largely by individuals whose personal (i.e. “portable”) characteristics inhibit growth and thus their living standards. These attributes include, among others, a lack of productive assets such as access to land and low educational attainment. Following this hypothesis, individuals would have to improve their assets, for example by attaining a higher level of education, in order to raise living standards. The geography hypothesis holds that the main driver of differences in regional welfare is heterogeneity in the return to factors of production, due to differences in the availability of infrastructure and basic services in a particular location. If standards of living were affected by geographic location, after controlling for mobile non-geographic household characteristics, then households should choose to migrate to areas with positive geographic attributes. Equilibrium would be restored when all regional inequality could be explained by differences in non-geographic household endowments (education, age, etc). This is the basic principle behind the human capital theories of migration, on which the Harris-Todaro model is based and which is also followed as an underlying assumption in this chapter.

In practice, both the concentration and geography hypotheses play a role in determining household welfare. The concentration hypothesis is hereafter referred to as the endowments

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<sup>50</sup> For the sake of convenience, rural and urban areas are also referred to as “regions” hereafter.

effect (Jann, 2008), while the geography hypothesis is called coefficients effect (*ibid.*) or returns effect. One would expect that the freer migration is, the larger the endowment effect, because migration will tend to equalise returns to a given set of attributes by shifting supply from lower-return to higher-return locations. In the post-independence context of Namibia, the working assumption is that following the liberalisation of labour markets and movement within the country, individuals relocated between regions in order to earn higher incomes. One would thus expect the difference in returns to household characteristics between lagging and leading regions to have narrowed over time. This section analyses the relative importance of household characteristics and their returns in explaining regional inequality, and tests whether the returns effect decreased in accordance with the above hypothesis.

It should be noted that there may, however, be other dynamics countervailing this convergence of returns, most notably the presence of agglomeration economies (Krugman, 1991; Kanbur and Rapaport, 2005). According to the theory of agglomeration economies, the benefits associated with economies of scale in a market and having more producers of goods and services in the vicinity lead to urbanisation being associated with increases in the real wage in the destination region, rather than decreases. Moreover, even without the presence of these scale effects, there are reasons why households do not migrate until full equalisation of returns. Labour may not be fully mobile across regions due to relocation costs, including family and social ties in the region of origin.

Using a procedure of generating counterfactuals referred to in the literature as Oaxaca-Blinder decomposition (Blinder, 1973; Oaxaca, 1973), I estimate the size of the endowments and returns effects. The Oaxaca-Blinder decomposition has been applied to differences in mean welfare between regions (Ravallion and Wodon, 1999; Skoufias and Lopez-Acevedo, 2009), but to this author's knowledge not in an African context. The objective of the decomposition is to estimate the mean difference in an outcome variable, in this case the log of adult-equivalent monthly consumption expenditure, between two groups, i.e. regions, and to estimate how much of this difference is accounted for by group differences in their mean characteristics.

Returning to the reduced-form linear regression model introduced in chapter 7, the log of household expenditure for two regions A and B can be expressed as

$$\ln y_A = \beta_A X_A + \epsilon_A \quad \text{and} \quad (1)$$

$$\ln y_B = \beta_B X_B + \epsilon_B \quad (2)$$

where  $\epsilon_{A,B}$  is a random error term. Following loosely the notation of Skoufias and Lopez-Acevedo (2009), the mean difference between the two regions A and B be written as

$$\overline{\ln y_A} - \overline{\ln y_B} = \beta_A \overline{X_A} - \beta_B \overline{X_B} \quad (3)$$

Where the bar denotes mean values and the error terms drop out since  $E(\epsilon_{A,B}) = 0$ . By adding and subtracting the term  $\beta_B \overline{X_A}$  the above difference between the means as

$$\overline{\ln y_A} - \overline{\ln y_B} = \beta_A \overline{X_A} - \beta_B \overline{X_B} + \beta_B \overline{X_A} - \beta_B \overline{X_A} \rightarrow \quad (4)$$

$$\overline{\ln y_A} - \overline{\ln y_B} = (\overline{X_A} - \overline{X_B})\beta_B + (\beta_A - \beta_B)\overline{X_A}, \quad (5)$$

which can be expressed as

$$\Delta(\overline{\ln y}) = (\Delta\overline{X})\beta_A + (\Delta\beta)\overline{X_B} \quad (6)$$

Likewise, one could alternatively add and subtract  $\beta_A \overline{X_B}$  from equation (3), deriving

$$\Delta(\overline{\ln y}) = (\Delta\overline{X})\beta_B + (\Delta\beta)\overline{X_A} \quad (7)$$

The decomposition of the difference in mean expenditure is given in equations (6) and (7). The first component is the difference in mean characteristics ( $\Delta\overline{X}$ ) between the two regions; the second is the difference in coefficients ( $\Delta\beta$ ) or returns to these characteristics. The only difference between equations (6) and (7) is the weights attached to each of the components: In equation (6), the difference in characteristics is weighted by the coefficients of region A and the difference in coefficients is weighted by the mean characteristics in region B. In equation (7), on the other hand, the difference in characteristics is weighted by the coefficients of region B and the difference in coefficients is weighted by the mean characteristics in region A. Since none of these two decompositions is per se preferable over the other, I follow Reimers (1983) who proposes the use of weighted averages of the characteristics and of the coefficients, such that

$$\overline{\ln y_A} - \overline{\ln y_B} = (\Delta\overline{X})(0.5 * (\beta_A + \beta_B)) + (\Delta\beta)(0.5 * (\overline{X_A} - \overline{X_B})) \quad (8)$$

This is the set-up for the subsequent analysis, wherein the counterfactuals and differences are estimated following the OLS regression model outlined in chapter 7.<sup>51</sup> The regressors included can be said to be “portable”, i.e. they are not tied to the location of the household. The model includes the variables that were used in the regression analysis of chapter 7, namely household characteristics, including educational attainment by the head and the spouse, economic sector as indicated by the main source of household income and ethnicity as proxied by the language spoken in the household.

First, the Oaxaca-Blinder decomposition is applied to rural and urban areas in each period, followed by regional comparisons. Since the decomposition allows only for pair-wise comparisons of regions, the analysis focuses on the leading and lagging regions in line with the migration hypothesis above. As leading regions, Khomas and Erongo are selected due to their role as dominant economic centres (see Figure 20: M) and because they experienced the most significant in-migration in the 5-year period 1996-2001 for which data are available (CBS, 2003). As lagging regions the eight poorest regions in 1993/94 are chosen, all of which are in the north of the country and most of which experienced net-emigration according to the 2001 Census.

Table 29 below shows the findings of the decomposition for urban and rural areas in Namibia for the survey years 2003/04 and 1993/94. The mean natural logarithm of household expenditure (log expenditure) is as expected higher in urban than in rural areas for both survey years. The difference amounts to 0.98 in 1993/94, decreasing somewhat, but without statistical significance, to 0.90 in 2003/04. Most of the mean difference is explained by mean differences in endowments between urban and rural households. The part of the difference that is explained by the model, which represents the endowments effect, decreased from 0.79 to 0.63, implying that rural and urban households have become more similar in terms of their mean characteristics over time. The unexplained part, or returns effect, on the other hand increased from 0.19 to 0.27. These changes are not statistically significant, but they imply that the returns effect decreased neither in absolute nor in relative terms over time, as would have been expected as a result of rural urban migration.

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<sup>51</sup> The Stata routine employed is *oaxaca*, written by Jann (2008), and accounts for the survey design and individual sampling weights.

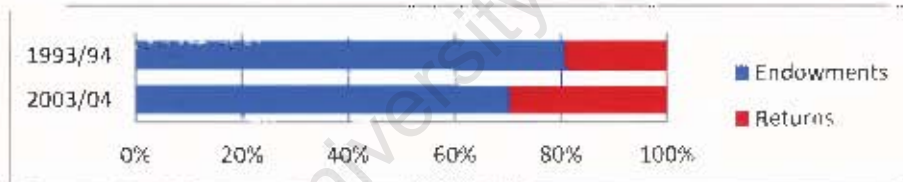
**Table 29: Urban-rural Oaxaca-Blinder decomposition results, 2003/04 and 1993/94**

	2003/04		1993/94	
	Predicted mean	Standard error	Predicted mean	Standard error
Urban	6.56	0.04	6.17	0.08
Rural	5.66	0.02	5.19	0.04
Difference	0.90	0.04	0.98	0.09
Explained by Model	0.63	0.05	0.79	0.10
Unexplained	0.27	0.05	0.19	0.08

Note: The dependent variable is log of adult-equivalent consumption expenditure.

Source: NHIES data, own calculations.

The relative contributions to the mean welfare difference that are explained by the model (endowments) and those that are not explained (returns) are illustrated in Figure 22. Indeed, the relative share of the returns effect in explaining the difference in mean log expenditure between urban and rural areas appears to have increased slightly (from 20 to 30 percent) over time. The observed decrease in the mean welfare difference between urban and rural households is entirely driven by a convergence in household characteristics between the two areas. This convergence is explored when introducing a detailed decomposition of the endowments and returns effect further below.

**Figure 22: Contributions of endowments and returns effect to urban-rural welfare differences**

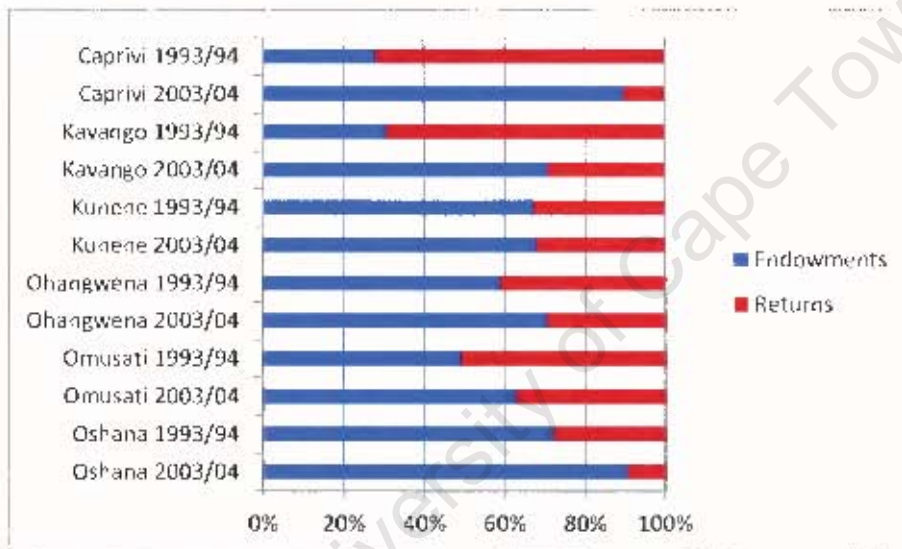
Note: Contributions to mean welfare difference between urban and rural areas, expressed relative to total effects.

Source: NHIES data, own calculations.

Before discussing these results further, I turn to the findings from the decomposition for the leading and lagging regions. When comparing mean welfare in the leading region of Khomas to six poor regions in the north of the country, a rather striking picture emerges (relative contributions in Figure 23, see also A16 in the appendix for details). All of the lagging regions except Kavango experienced a catching up in mean log expenditure relative to Khomas, although the gaps remained significant. As with the rural-urban analysis, the majority of the mean differences tend to be attributed to the endowments effect. In contrast to the above, however, the returns effect decreased in all of the pair-wise comparisons with Khomas, both in relative and absolute terms. The biggest drop in the returns effect is

observed in the case of Caprivi, where it decreased from 1.14 to 0.11. The smallest decline to have occurred, from 0.45 to 0.32, is found in Kunene. Regarding the endowments effect, there is no clear trend observable, with half of the lagging regions (Caprivi, Kavango, Omusati) registering a decrease and the other half (Kunene, Ohangwena, Oshana) registering an increase over time. As noted earlier, caution has to be applied when assessing changes that occurred in those regions affected by rezoning (Caprivi/Kavango and Omusati/Kunene respectively), but the observed trends are confirmed when each of the regional pairs are treated as single units in the analysis (included in Table A16 in the appendix).

**Figure 23: Contributions of endowments and returns to mean welfare differences: Khomas**

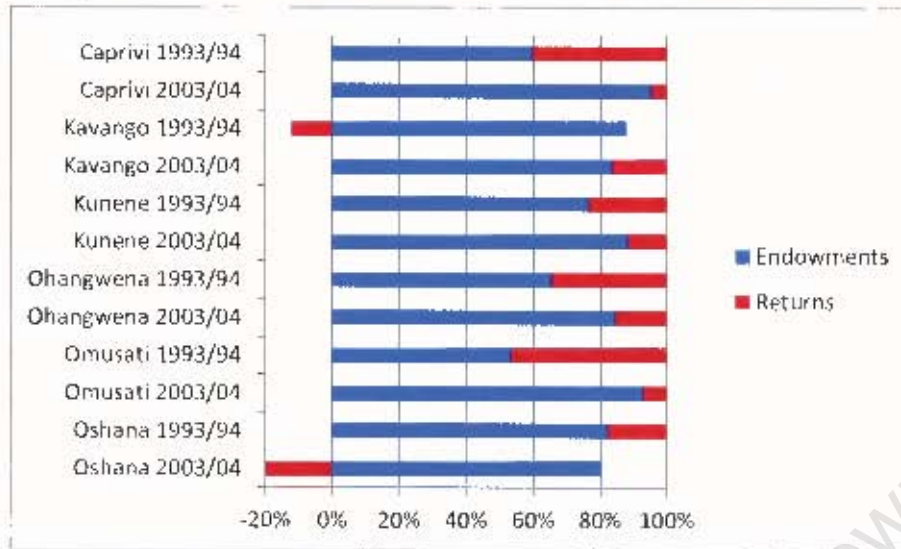


Note: Contributions expressed relative to total effects; welfare differences between Khomas (leading region) and selected lagging regions.

Source: NHIES data, own calculations.

Conducting the Oaxaca-Blinder decomposition for the second leading region of Erongo confirms the findings from Khomas. The endowments effect also drives the observed differences in mean welfare, and overall there appears to have occurred a catching-up of the lagging regions. All of them, with the exception of Kavango, experienced a decline in the returns effect relative to Erongo. What stands out is that for Kavango in 1993/94 and Oshana 2003/04, the returns effect is negative. This implies that for those two cases, the observed mean difference in log expenditure to Erongo is smaller than would be implied by mean household characteristics alone.

**Figure 24: Contributions of endowments and returns to mean welfare differences: Erongo**



**Note:** Contributions expressed relative to total effects; welfare differences between Khomas (leading region) and selected lagging regions.

**Source:** NHIES data, own calculations.

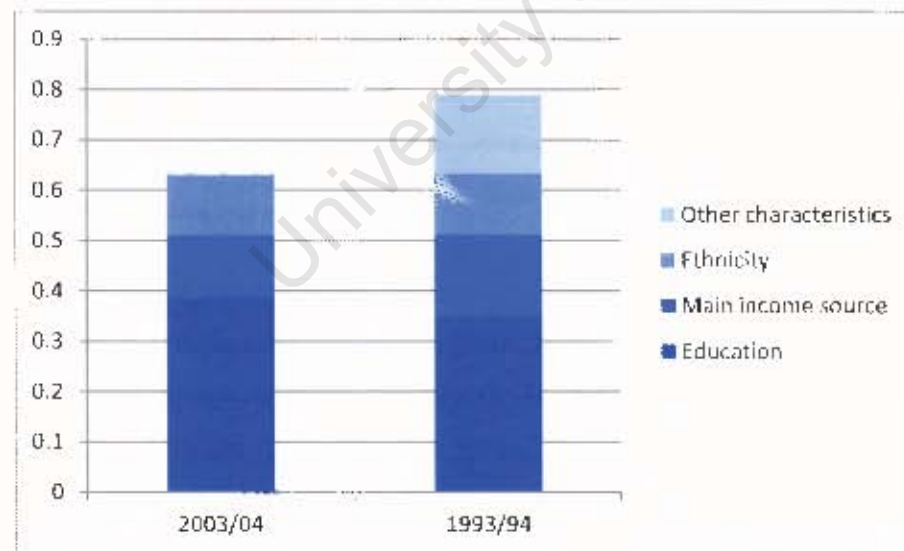
It is thus found that while nationally, there is no evidence to support a reduction in the returns effect between urban and rural areas, the data support some convergence in returns to household assets between leading and lagging regions. Conducting the Oaxaca-Blinder decomposition for rural to urban areas within different regions yields at best mixed evidence regarding the decline in the returns effect.<sup>52</sup> It could further be the case that the rural-urban decomposition for Namibia does not reflect the observed convergence between lagging and leading regions due to “noise” from other regions, or that indeed there are factors such as agglomeration economies in urban areas countervailing the effect. Whatever the case may be, based on the evidence of inter-regional migration patterns from the North to Windhoek and the cities on the coast (Frayne and Pendleton, 2001), the model of leading and lagging regions appears more appropriate than a general rural-urban framework. The lack of urban-rural convergence could also result from the analysis being based on too broad a model, aggregating the returns to a diverse set of explanatory variables. The following paragraphs take a brief look at a detailed Oaxaca-Blinder decomposition, which allows the analysis to separate the contribution of each variable.

<sup>52</sup> Intra-regional migration may be more likely than inter-regional migration because of existing social ties and lower relocation costs. However, the decomposition by region runs into serious significance issues due to small sub-samples, compounding the issues associated with the lack of migration variables in the data.

### 8.3.1 Detailed decomposition: the importance of education

By means of this detailed decomposition, it is possible to disentangle those variables that may have a more direct bearing on welfare outcomes from those with a more indirect impact. This is fairly straightforward since the two terms for the difference in mean characteristics ( $\Delta\bar{X}$ ) and the difference in coefficients ( $\Delta\beta$ ) are additively decomposable by the constituent variables in the model.<sup>53</sup> Again based on the OLS regression model outlined in chapter 7, I group the variables into four categories in order to make the analysis more tractable: “Education” (educational attainment by the household head and mean years of schooling by working-age members); “Economic sector” (main source of income); “Ethnicity” (main language spoken); and “Other characteristics” (including household size, age of household head, dummies for female head, absent spouse, access to agricultural land, presence of unemployed and of old-aged members). The educational attainment variables are therefore treated as a proxy for human capital in the household that can earn a return in the labour market. Applying the detailed decomposition and regrouping to the urban-rural analysis that was presented in Table 29, I compare the contributions of each of the four categories to the endowments and returns effects.

Figure 25: Urban-rural Oaxaca-Blinder detailed decomposition – Endowments effect



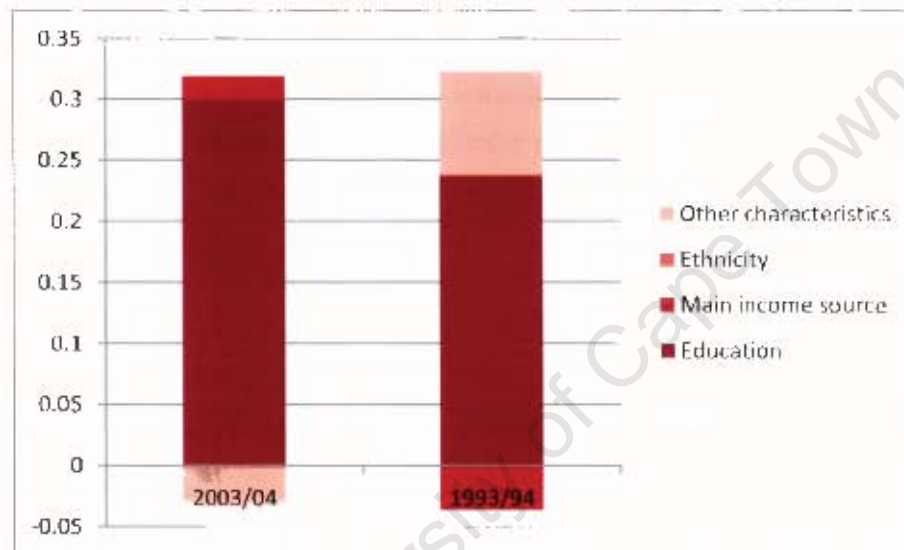
Note: Presented are absolute contributions to difference in log mean expenditure per capita between urban and rural areas.

Source: NHIES data, own calculations.

<sup>53</sup> The Stata implementation by Jann (2008) contains an option to display these individual contributions of the predictors.

Figure 25 illustrates the contributions of the four predictors to the endowments effect for both survey years. What stands out is the scale of mean differences in human capital between urban and rural areas. Their importance increased slightly over time, accounting for almost two thirds of the total endowments effect in 2003/04. The predictive power of differences in ethnic composition and the main source of income between urban and rural areas, on the other hand, saw a decline over time both in absolute and relative terms. It can thus be rejected that rural households gained on urban ones in terms of economic welfare because of closing the gap in educational attainment.

**Figure 26: Urban-rural Oaxaca-Blinder detailed decomposition – Returns effect**



Note: Presented are absolute contributions to difference in log mean expenditure per capita between urban and rural areas.

Source: NHIES data, own calculations.

Turning to the returns effect, differences in education are also responsible for most of the welfare differences not explained by the model. Moreover, their importance increased over time, leading me to reject the hypothesis that there was convergence in the returns to education between rural and urban areas. There appear to have been other forces, such as labour demand in urban areas, to have prevented such a convergence from occurring as a consequence of the observed rural-urban migration. An open question remains as to why individuals do not continue to migrate until returns are equalised across locations. One explanation may be that there is unobserved heterogeneity in household characteristics that prevent them from earning comparable returns. In the case of rural Namibian households, their quality of education may be lower than in urban areas, thus explaining part of the observed difference in returns. Alternatively, there may be costs associated with relocation

or uncertainty over the probability of finding a job, given the high levels of urban unemployment in Namibia, that prevent potential rural migrants from moving.

#### **8.4 Chapter summary**

It has been shown that the spatial dimension of inequality was and continues to be of significant magnitude in post-independence Namibia. Despite the NHIES lacking data on the migration history of households, some general conclusions regarding population shifts between regions can be drawn. Firstly, there is evidence of significant migration to have taken place from census data and the NHIES, showing patterns of migration from rural to urban areas and from lagging to leading regions. Based on descriptive counterfactual analyses, these shifts are assumed to have had a positive impact on regional poverty levels and inequality, albeit that poverty reduction and inequality changes are predominantly driven by intra-regional factors.

An analysis of the relative contribution by differences in factor endowments and their returns to inter-regional inequality shows that nationally, there is little evidence for convergence of the returns effect between urban and rural areas, but there is some support for convergence in returns to household assets between leading and lagging regions. It may be that the convergence between lagging and leading regions is not picked up in the rural-urban decomposition due to opposing trends in other regions, or that indeed there are factors such as agglomeration economies in urban areas countervailing the effect.

A closer look at educational attainment as a key to earnings in the labour market reveals the dominant role of mean educational differences between urban and rural areas in explaining the welfare gap. The importance of education as a predictor increased over time, accounting for almost two thirds of the total endowments effect in 2003/04. This implies that the observed catching up of rural households overall cannot be explained by a closing of the gap in educational attainment compared to urban households. This confirms my previous findings that the mean years of schooling among the working-age population increased in both urban and rural areas in roughly equal measure. Neither has there been any convergence in the returns to education between rural and urban areas. There appear to have been other dynamics preventing such a convergence from occurring as a consequence of the observed rural-urban migration.

## 9. Summary and Conclusions

Namibia is a young country with an agricultural economy that has been undergoing profound social changes since its independence in 1990. Our understanding of what happened to poverty and inequality in the country has been inadequate not only because of a lack of information, but also because the available data on household welfare have not been systematically studied. This thesis is one of the first attempts to use two national household datasets covering the period following Namibian independence to explore changes in poverty and inequality. Working within the limitations of the data, the analysis focussed on establishing the country's welfare profile and its changes over time, while conclusions regarding the underlying causal mechanisms can, for the most part, only be tentative.

The foundation for this kind of analysis was laid by carefully testing and adjusting for comparability between the two datasets. This is not a trivial exercise due to changes in the scope and calculation of consumption aggregates from the two surveys. It was further shown that the official food-share method of deriving a poverty line is inadequate for making welfare comparisons between poorer households and over time. Indeed, households that were labelled as "severely poor" according to their food-share in consumption exhibited higher mean and median consumption per capita than those households classified as "poor". The cost-of-basic-needs (CBN) poverty line that had been derived for 2003/04 was adjusted for the 1993/94 data and applied to the re-aggregated consumption expenditure estimates.

Based on these CBN poverty lines for adult-equivalent consumption, the incidence of poverty (58 percent of individuals in 1993/94; 38 percent in 2003/04) was found to be significantly higher than that based on the food-share measure (33 percent in 1993/94; 27 percent in 2003/04). However, the declining trend in poverty over time is even more pronounced under the CBN approach. This trend holds nationally as well as for rural and urban areas. Contrary to the food-share approach, the CBN-derived measures show a larger absolute decrease in poverty rates in rural than in urban areas.

Developments in rural areas appear to be crucial for understanding the observed poverty reduction in the country. Not least, the decrease in poverty among households relying on subsistence farming was found to constitute around half of the total poverty reduction. This could partly be due to poor households moving out of subsistence farming, as evidenced by

its reduced population share and general rural-urban migration. But migration cannot explain the whole impact. Indeed, as with the other large employment sectors, intra-sectoral effects were found to have been far more important for overall poverty reduction among subsistence farmers than population shifts. The data clearly show that subsistence farming remains the largest sector in terms of the population's income sources. What then did underlie the poverty reduction in rural areas?

A possible indication that land reform has had a positive impact on welfare in the rural areas is that unlike in 1993/94, the later survey shows that having access to grazing land is significantly positively related to mean household expenditure and negatively to the likelihood of being poor. Secondly, the expansion of education as evidenced by the increase in mean years of schooling among working-age adults also holds for rural areas in general and subsistence farmers in particular. Even if their returns to education are found to be lower, they are still significantly positive and it is not implausible that this increase in human capital enabled rural dwellers to make more productive use of their land. Thirdly, the rural population may have benefitted from household members or other relatives moving to urban areas and sending remittances. These income streams cannot be traced in the household data unless they constitute the main source of income, but there is evidence from other studies that this kind of support is a common occurrence (Ashton *et al*, 2009). Further support is lent by the finding that the incidence of poverty was significantly reduced among those rural households mainly relying on remittances, with the headcount poverty index for this group decreasing from 85 percent in 1993/94 to 59 percent in 2003/04. It may thus be a combination of four factors that led to the observed welfare improvements among the rural population: out-migration of poor individuals to urban areas; better access to and use of land; improved education; and remittances from urban areas.

While the poverty situation clearly improved, overall inequality in Namibia remained largely unchanged at one of the highest levels in the world. This is contrary to the official estimates of the Gini coefficient that point towards a significant decrease in inequality over the period. These official findings are likely caused by relying on different methods when calculating each of the estimates. For example, it is not apparent that comparable sample weights and equivalence scales have been used. This is unfortunate given the many citations of these figures. It seems clear that the often-reported decrease in inequality is incorrect. Based on comparable data and calculation methods, new results show largely unchanged levels of inequality. This holds too for the separate rural and urban distributions. Overall

inequality appears to be higher in urban than in rural areas. Only at the top of the distribution is it found to be more pronounced in rural areas, which may be due to the discrepancy between very wealthy commercial farmers and rural non-farming business people vis-a-vis the rest of the rural population.

Namibia experienced significant growth in household consumption expenditure during the period under review. The growth elasticity of poverty was relatively low compared to growth spells in other developing countries, a finding that is in line with international evidence that high initial inequality and high initial poverty levels are associated with lower poverty elasticities. Nonetheless, growth in household consumption expenditure appears to have been pro-poor. The incidence of growth favoured the poorest percentiles, while the richest percentiles also experienced higher growth than the middle of the distribution. It is this pattern which explains why overall inequality does not appear to have decreased. Economic liberalisation after independence may explain the fact that poor and rich households benefitted disproportionately from growth. The poor may have caught up with the middle class because of opportunities for internal migration and demand for unskilled labour, while the rich may have benefitted disproportionately from fewer restrictions on wages and businesses. Some evidence to support these hypotheses is found when decomposing inequality by economic sector: urban wage earners, who constitute the wealthiest group, had a large and increasing contribution to within-group inequality, while subsistence farming, which comprises the least wealthy households among the large sectors, noticed a significant decline in within-group inequality.

In terms of the relative impact on poverty reduction, mean growth appears to have been much more important than changes in the welfare distribution. Descriptively, however, the relatively low growth elasticity of poverty suggests that with less initial inequality, poverty could have declined more rapidly at the given growth rate.

Concerning sectoral inequality, subsistence farming exhibits the lowest levels of inequality among the larger sectors in both periods, but it is also the only large sector that registered a significant reduction in its Gini coefficient. Rural non-farming business emerged as the most unequal sector in 2003/04, which is interesting as it was estimated to be the most equal sector in 1993/94. This radical change is linked to the observed rapid growth in consumption expenditure in the sector, which may have been the result of new opportunities in the wake of liberalisation and land reform in rural areas. Growth may have been skewed

towards those households able to take advantage of these opportunities, resulting in the observed rise in sectoral inequality.

There is evidence of strong heterogeneity among households within the same sector, which was addressed by looking at the relationship between productivity-related characteristics and household expenditure. Both consumption expenditure (OLS and quantile regressions) and poverty status (logit regressions) were modelled conditional on a range of household variables. Education as a proxy for human capital emerged as a strong predictor of economic welfare; it is confirmed that in general, the higher the level of educational attainment in the household, the higher per capita consumption and the lower the probability of being poor.

Moreover, the importance of acquiring human capital through education appears to hold for all strata of the population. The increase in educational attainment among the adult population overall is likely to have been a key driver of the observed welfare improvements. Ethnicity, as measured by language, remains a strong predictor of economic welfare. Those language groups mainly comprising the formerly advantaged white population have not seen a reduction in their “premium” during the period under review and significant welfare differences between language groups persist. In sum, there is tentative evidence in the data to support the hypothesis that following independence, human capital in the form of education has become more important for economic welfare, but that inequalities associated with the former Apartheid regime have not ceased to exist.

The regional dimension of inequality continues to be significant in post-independence Namibia. Patterns of migration from rural to urban areas and from lagging to leading regions during the period under review could be traced in the data. Based on descriptive counterfactual analyses, these shifts are found to have had a positive impact on regional poverty levels and inequality. Nonetheless, poverty reduction and distributional changes are predominantly driven by intra-regional factors. An analysis of the relative contributions of differences in mean factor endowments and their returns to inequality between regions supports the hypothesis of convergence in returns between leading and lagging regions. This is possibly related to the main internal migration flows having occurred between these regions. Between urban and rural areas nationally, however, there is no evidence of a reduction in the returns effect.

Differences in mean educational attainment appear to be a key determinant of the welfare gap between urban and rural areas. The importance of education as a predictor of this gap increased over time, accounting for most of the total mean welfare difference explained by household characteristics in 2003/04. Given the observed educational improvements in rural areas, this implies equivalent or faster improvements to have occurred in urban areas. The returns to education in rural areas are also found to be significant and positive. They are, however, smaller than in urban areas, possibly due to fewer economic opportunities that place a premium on human capital. Neither has there been any convergence in the returns to education between the two areas. There must have been other forces to have countervailed such convergence, for example higher labour demand and agglomeration economies in urban areas. The catching up of rural households overall appears to be related to factors other than education, such as out-migration of the poor, land reform and increased receipt of remittances.

In conclusion, independence has brought rapid poverty reduction but no decline in inequality to Namibia. Changes in the rural sector, especially among subsistence farmers, internal migration and the expansion of education appear to have played an important role in the welfare improvements observed during the decade under review. Large inequalities between regions, but also between ethnic groups, appear to have persisted through the country's first decade under self-rule. However, better data are required to establish the underlying drivers of the observed welfare changes more firmly. It also remains to be seen whether the positive trends in poverty reduction were sustained after 2004, although continued strong economic growth and preliminary findings from the third NHIES 2009/10 appear to confirm this.

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## Appendix

Figure A1: Geographical Map of Namibia



Source: [www.welt-atlas.de](http://www.welt-atlas.de)

Figure A2: Political map of Namibia: The 13 regions.



**Table A1: P<sub>α</sub> Poverty Measures by Urban and Rural Sector, 1993/94 and 2003/04**

	Poverty Line														
	P <sub>0</sub>				P <sub>1</sub>				P <sub>2</sub>						
	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
<b>1993/94</b>															
Overall	0.58	0.02	0.54	0.62	7.09	0.28	0.01	0.25	0.30	7.72	0.17	0.01	0.15	0.19	7.47
Urban	0.31	0.03	0.24	0.37	7.23	0.12	0.02	0.09	0.16	8.35	0.07	0.01	0.04	0.09	8.27
Rural	0.69	0.02	0.66	0.72	3.82	0.34	0.01	0.32	0.37	5.32	0.21	0.01	0.19	0.23	5.81
<b>2003/04</b>															
Overall	0.38	0.01	0.36	0.40	4.76	0.13	0.01	0.12	0.14	5.71	0.06	0.00	0.05	0.07	5.66
Urban	0.17	0.01	0.15	0.19	3.26	0.06	0.01	0.05	0.07	3.70	0.03	0.00	0.02	0.04	3.74
Rural	0.49	0.01	0.46	0.52	5.23	0.16	0.01	0.15	0.18	6.40	0.08	0.00	0.07	0.09	6.27

	Severe Poverty Line														
	P <sub>0</sub>				P <sub>1</sub>				P <sub>2</sub>						
	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
<b>1993/94</b>															
Overall	0.47	0.02	0.44	0.51	6.68	0.21	0.01	0.18	0.23	7.30	0.12	0.01	0.1	0.13	7.17
Urban	0.21	0.03	0.15	0.28	7.20	0.08	0.02	0.05	0.11	7.89	0.04	0.01	0.02	0.06	8.01
Rural	0.58	0.02	0.55	0.61	3.82	0.26	0.01	0.23	0.28	5.56	0.14	0.01	0.13	0.16	5.98
<b>2003/04</b>															
Overall	0.20	0.01	0.18	0.22	5.52	0.06	0.00	0.05	0.07	5.58	0.03	0.00	0.02	0.03	5.37
Urban	0.09	0.01	0.08	0.11	3.06	0.03	0.00	0.02	0.04	3.63	0.01	0.00	0.01	0.02	3.52
Rural	0.26	0.01	0.23	0.29	6.14	0.07	0.01	0.06	0.08	6.15	0.03	0.00	0.03	0.04	5.89

Note: Based on CBN poverty lines; Est is the P<sub>α</sub> indicator; S.E. the robust standard error; 95% CI the 95% level confidence interval; and DEFF reports the DEFF design effect of the stratification.

Source: Own calculations, based on NHIES data.

**Table A2: Regional  $P_{\alpha}$  Poverty Measures for common CBN Poverty Line**

	2003/04														
	$P_0$				$P_1$				$P_2$						
	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
Caprivi	0.37	0.04	0.29	0.44	2.61	0.12	0.02	0.09	0.15	2.79	0.05	0.01	0.04	0.07	2.59
Erongo	0.14	0.03	0.08	0.21	4.45	0.05	0.01	0.03	0.07	3.95	0.02	0.01	0.01	0.04	3.21
Hardap	0.42	0.05	0.32	0.52	3.62	0.18	0.03	0.13	0.23	4.16	0.10	0.02	0.06	0.13	4.07
Karas	0.33	0.04	0.25	0.41	2.50	0.13	0.02	0.09	0.18	3.34	0.07	0.02	0.04	0.10	3.24
Kavango	0.64	0.03	0.59	0.70	3.94	0.28	0.02	0.23	0.32	7.05	0.15	0.02	0.12	0.18	8.15
Khomas	0.08	0.01	0.06	0.10	2.28	0.02	0.00	0.01	0.03	2.13	0.01	0.00	0.01	0.01	1.93
Kunene	0.37	0.09	0.20	0.54	10.72	0.15	0.04	0.06	0.23	11.21	0.08	0.02	0.03	0.12	8.78
Ohangw.	0.56	0.04	0.47	0.64	9.71	0.16	0.02	0.13	0.20	12.32	0.07	0.01	0.05	0.08	10.11
Omaheke	0.41	0.06	0.30	0.53	4.13	0.16	0.03	0.11	0.21	3.38	0.09	0.01	0.06	0.11	2.62
Omusati	0.38	0.03	0.33	0.44	4.56	0.10	0.01	0.08	0.13	6.36	0.04	0.01	0.03	0.06	8.14
Oshana	0.26	0.03	0.20	0.32	4.22	0.07	0.01	0.05	0.09	4.13	0.03	0.00	0.02	0.04	3.19
Oshikoto	0.49	0.03	0.43	0.55	3.57	0.14	0.01	0.11	0.17	4.58	0.06	0.01	0.04	0.07	4.21
Otjozondj.	0.39	0.03	0.32	0.45	3.08	0.15	0.02	0.11	0.19	4.65	0.08	0.01	0.05	0.11	5.38
Namibia	0.38	0.01	0.36	0.40	4.76	0.13	0.01	0.12	0.14	5.71	0.06	0.00	0.05	0.07	5.66

	1993/94														
	$P_0$				$P_1$				$P_2$						
	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
Caprivi	0.75	0.03	0.68	0.81	1.69	0.37	0.04	0.30	0.44	3.82	0.24	0.03	0.18	0.29	3.64
Erongo	0.33	0.06	0.21	0.46	4.03	0.13	0.03	0.07	0.18	3.54	0.06	0.01	0.03	0.09	2.73
Hardap	0.42	0.10	0.23	0.61	6.70	0.21	0.05	0.10	0.31	5.50	0.13	0.04	0.06	0.20	4.90
Karas	0.44	0.10	0.24	0.63	6.82	0.21	0.06	0.09	0.33	8.06	0.12	0.04	0.04	0.20	7.69
Kavango	0.58	0.04	0.5	0.66	2.69	0.26	0.03	0.19	0.32	5.53	0.14	0.02	0.10	0.19	5.86
Khomas	0.22	0.06	0.1	0.33	10.83	0.09	0.03	0.03	0.16	13.58	0.05	0.02	0.01	0.10	13.2
Kunene	0.73	0.06	0.62	0.83	2.85	0.36	0.06	0.25	0.48	6.06	0.23	0.05	0.12	0.34	7.91
Ohangw.	0.78	0.03	0.72	0.84	3.41	0.41	0.03	0.36	0.46	4.35	0.26	0.02	0.21	0.30	4.91
Omaheke	0.61	0.06	0.48	0.73	2.50	0.27	0.05	0.17	0.37	4.81	0.15	0.04	0.08	0.23	4.78
Omusati	0.64	0.04	0.55	0.72	3.93	0.31	0.03	0.25	0.37	5.05	0.18	0.02	0.14	0.23	4.98
Oshana	0.70	0.04	0.61	0.78	4.81	0.31	0.03	0.26	0.36	4.50	0.17	0.02	0.13	0.21	4.56
Oshikoto	0.70	0.05	0.60	0.79	4.07	0.34	0.04	0.26	0.43	7.49	0.21	0.04	0.14	0.28	8.54
Otjozondj.	0.47	0.05	0.37	0.57	3.30	0.24	0.04	0.16	0.33	5.96	0.15	0.03	0.09	0.22	6.43
Namibia	0.58	0.02	0.54	0.62	7.09	0.28	0.01	0.25	0.30	7.72	0.17	0.01	0.15	0.19	7.47

Note:  $P_{\alpha}$  poverty measures calculated for individuals. Est is the  $P_{\alpha}$  indicator; S.E. the robust standard error; 95% C.I. the 95% level confidence interval; and DEFF reports the DEFF design effect of the stratification.

Source: Own calculations, based on NHIES data.

**Table A3: Regional  $P_a$  Poverty Measures for common CBN Severe Poverty Line**

	2003/04														
	$P_0$					$P_1$					$P_2$				
	Est	S.E.	95% C.I.	DEFF		Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF		
Caprivi	0.17	0.02	0.12	0.22	1.94	0.05	0.01	0.03	0.07	2.21	0.02	0.01	0.01	0.03	2.31
Erongo	0.08	0.02	0.04	0.12	2.90	0.02	0.01	0.01	0.04	2.75	0.01	0.00	0.00	0.02	2.67
Hardap	0.31	0.04	0.22	0.39	3.39	0.1	0.02	0.06	0.14	3.81	0.05	0.01	0.03	0.07	3.74
Karas	0.21	0.04	0.14	0.29	3.13	0.08	0.02	0.04	0.11	3.27	0.04	0.01	0.02	0.06	2.88
Kavango	0.44	0.04	0.36	0.51	6.62	0.16	0.02	0.12	0.2	8.71	0.08	0.01	0.05	0.10	8.21
Khomas	0.03	0.01	0.02	0.05	1.88	0.01	0.00	0.00	0.01	1.68	0.00	0.00	0.00	0.00	1.53
Kunene	0.25	0.09	0.07	0.42	13.46	0.08	0.03	0.03	0.13	7.75	0.03	0.01	0.01	0.06	5.03
Ohangw.	0.26	0.04	0.18	0.34	11.45	0.06	0.01	0.04	0.08	8.00	0.02	0.00	0.01	0.03	5.97
Omaheke	0.27	0.05	0.18	0.36	3.19	0.09	0.02	0.05	0.12	2.37	0.04	0.01	0.03	0.06	1.93
Omusati	0.16	0.02	0.11	0.20	4.46	0.04	0.01	0.02	0.06	8.17	0.02	0.01	0.00	0.03	9.04
Oshana	0.10	0.02	0.06	0.14	3.89	0.02	0.00	0.01	0.03	2.55	0.01	0.00	0.00	0.01	1.84
Oshikoto	0.21	0.03	0.16	0.27	3.78	0.05	0.01	0.03	0.07	3.95	0.02	0.01	0.01	0.03	3.57
Otjozondj.	0.25	0.03	0.18	0.31	3.68	0.08	0.02	0.05	0.11	5.54	0.04	0.01	0.02	0.05	5.58
<b>Namibia</b>	<b>0.20</b>	<b>0.01</b>	<b>0.18</b>	<b>0.22</b>	<b>5.52</b>	<b>0.06</b>	<b>0.00</b>	<b>0.05</b>	<b>0.07</b>	<b>5.58</b>	<b>0.03</b>	<b>0.00</b>	<b>0.02</b>	<b>0.03</b>	<b>5.37</b>

	1993/94														
	$P_0$					$P_1$					$P_2$				
	Est	S.E.	95% C.I.	DEFF		Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF		
Caprivi	0.60	0.05	0.50	0.70	3.15	0.29	0.03	0.22	0.36	3.84	0.17	0.02	0.12	0.22	3.27
Erongo	0.24	0.05	0.14	0.34	3.3	0.08	0.02	0.04	0.11	2.76	0.03	0.01	0.02	0.05	1.91
Hardap	0.32	0.08	0.16	0.48	5.37	0.16	0.04	0.07	0.25	4.92	0.09	0.03	0.04	0.15	4.44
Karas	0.36	0.09	0.18	0.55	6.58	0.15	0.05	0.05	0.25	7.86	0.08	0.03	0.02	0.14	6.84
Kavango	0.45	0.05	0.35	0.55	4.06	0.18	0.03	0.12	0.24	5.88	0.09	0.02	0.06	0.13	5.67
Khomas	0.15	0.05	0.04	0.25	11.51	0.07	0.03	0.01	0.12	13.25	0.04	0.02	0.00	0.07	12.07
Kunene	0.59	0.06	0.47	0.71	2.87	0.27	0.06	0.16	0.39	7.04	0.17	0.05	0.07	0.27	8.78
Ohangw.	0.68	0.03	0.61	0.74	3.13	0.32	0.03	0.27	0.37	4.53	0.19	0.02	0.14	0.23	5.32
Omaheke	0.47	0.08	0.31	0.63	3.85	0.19	0.05	0.10	0.28	4.96	0.1	0.03	0.04	0.16	4.35
Omusati	0.54	0.04	0.45	0.63	3.89	0.23	0.03	0.17	0.28	5.00	0.12	0.02	0.09	0.16	4.73
Oshana	0.57	0.04	0.48	0.66	4.10	0.22	0.02	0.17	0.26	4.17	0.11	0.02	0.08	0.14	4.77
Oshikoto	0.59	0.05	0.49	0.70	4.42	0.25	0.04	0.17	0.34	8.24	0.15	0.03	0.08	0.21	8.72
Otjozondj.	0.38	0.06	0.26	0.50	4.96	0.19	0.04	0.11	0.26	6.28	0.11	0.03	0.05	0.17	6.42
<b>Namibia</b>	<b>0.47</b>	<b>0.02</b>	<b>0.44</b>	<b>0.51</b>	<b>6.68</b>	<b>0.21</b>	<b>0.01</b>	<b>0.18</b>	<b>0.23</b>	<b>7.30</b>	<b>0.12</b>	<b>0.01</b>	<b>0.10</b>	<b>0.13</b>	<b>7.17</b>

Note:  $P_a$  poverty measures calculated for individuals. Est is the  $P_a$  indicator; S.E. the robust standard error; 95% C.I. the 95% level confidence interval; and DEFF reports the DEFF design effect of the stratification.

Source: Own calculations, based on NHIES data.

**Table A4:  $P_{\alpha}$  measures for separate CBN poverty lines for rural and urban areas – S.E. and C.I.**

		2003/04														
		$P_0$				$P_1$				$P_2$						
		Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
1	Overall	0.38	0.01	0.36	0.40	4.76	0.13	0.01	0.12	0.14	5.71	0.06	0.00	0.05	0.07	5.66
	Urban	0.17	0.01	0.15	0.19	3.26	0.06	0.01	0.05	0.07	3.70	0.03	0.00	0.02	0.04	3.74
	Rural	0.49	0.01	0.46	0.52	5.23	0.16	0.01	0.15	0.18	6.40	0.08	0.00	0.07	0.09	6.27
2	Overall	0.39	0.01	0.37	0.41	4.80	0.14	0.01	0.13	0.15	5.28	0.07	0.00	0.06	0.08	4.95
	Urban	0.40	0.02	0.37	0.43	3.93	0.17	0.01	0.16	0.19	4.20	0.10	0.01	0.09	0.11	4.08
	Rural	0.39	0.01	0.36	0.42	5.27	0.12	0.01	0.11	0.13	6.38	0.05	0.00	0.05	0.06	6.14
3	Overall	0.34	0.01	0.32	0.36	5.13	0.11	0.00	0.10	0.12	5.68	0.05	0.00	0.04	0.06	5.54
	Urban	0.17	0.01	0.15	0.19	3.26	0.06	0.01	0.05	0.07	3.70	0.03	0.00	0.02	0.04	3.74
	Rural	0.42	0.01	0.40	0.45	5.65	0.13	0.01	0.12	0.15	6.38	0.06	0.00	0.05	0.07	6.18
4	Overall	0.42	0.01	0.40	0.44	4.62	0.15	0.01	0.14	0.16	5.68	0.07	0.00	0.07	0.08	5.73
	Urban	0.17	0.01	0.15	0.19	3.26	0.06	0.01	0.05	0.07	3.70	0.03	0.00	0.02	0.04	3.74
	Rural	0.55	0.01	0.52	0.58	5.07	0.20	0.01	0.18	0.21	6.36	0.10	0.00	0.09	0.10	6.32
		1993/94														
		$P_0$				$P_1$				$P_2$						
		Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
1	Overall	0.58	0.02	0.54	0.62	7.09	0.28	0.01	0.25	0.3	7.72	0.17	0.01	0.15	0.19	7.47
	Urban	0.31	0.03	0.24	0.37	7.23	0.12	0.02	0.09	0.16	8.35	0.07	0.01	0.04	0.09	8.27
	Rural	0.69	0.02	0.66	0.72	3.82	0.34	0.01	0.32	0.37	5.32	0.21	0.01	0.19	0.23	5.81
2	Overall	0.58	0.02	0.55	0.62	5.79	0.27	0.01	0.25	0.3	6.7	0.16	0.01	0.15	0.18	6.81
	Urban	0.4	0.04	0.33	0.47	7.02	0.19	0.02	0.14	0.23	8.61	0.11	0.02	0.08	0.14	8.64
	Rural	0.65	0.02	0.62	0.69	3.96	0.31	0.01	0.29	0.33	5.36	0.18	0.01	0.16	0.2	5.87
3	Overall	0.55	0.02	0.51	0.58	6.53	0.25	0.01	0.23	0.28	7.26	0.15	0.01	0.13	0.16	7.17
	Urban	0.31	0.03	0.24	0.37	7.23	0.12	0.02	0.09	0.16	8.35	0.07	0.01	0.04	0.09	8.27
	Rural	0.65	0.02	0.61	0.68	3.92	0.3	0.01	0.28	0.33	5.38	0.18	0.01	0.16	0.2	5.88
4	Overall	0.61	0.02	0.57	0.65	7.49	0.3	0.01	0.28	0.33	8.21	0.19	0.01	0.17	0.21	7.82
	Urban	0.31	0.03	0.24	0.37	7.23	0.12	0.02	0.09	0.16	8.35	0.07	0.01	0.04	0.09	8.27
	Rural	0.73	0.01	0.7	0.76	3.47	0.37	0.01	0.35	0.4	5.25	0.23	0.01	0.21	0.25	5.74

Note: The poverty line specifications are numbered as follows: 1 = Standard CBN poverty line as derived in section 3.3.1; 2 = Common food-poverty line, separate non-food component; 3 = 10% rural price deflator; 4 = 10% rural price inflator.  $P_{\alpha}$  poverty measures calculated for individuals. Est is the  $P_{\alpha}$  indicator; S.E. the robust standard error; 95% C.I. the 95% level confidence interval; and DEFF reports the DEFF design effect of the stratification.

Source: Own calculations, based on NHIES data.

**Table A5: Regional  $P_{\alpha}$  poverty measures for separate CBN poverty lines in urban and rural areas**

2003/04								
Poverty Line	1		2		3		4	
Region	$P_0$	S.E.	$P_0$	S.E.	$P_0$	S.E.	$P_0$	S.E.
Caprivi	0.365	0.036	0.378	0.037	0.327	0.035	0.401	0.037
Erongo	0.143	0.032	0.376	0.044	0.141	0.032	0.153	0.031
Hardap	0.420	0.049	0.485	0.043	0.393	0.048	0.433	0.049
Karas	0.327	0.041	0.453	0.045	0.315	0.041	0.359	0.041
Kavango	0.641	0.028	0.641	0.032	0.606	0.031	0.675	0.026
Khomas	0.081	0.011	0.254	0.022	0.080	0.011	0.085	0.011
Kunene	0.368	0.087	0.434	0.078	0.341	0.082	0.408	0.092
Ohangwena	0.555	0.043	0.445	0.044	0.484	0.047	0.626	0.041
Omaheke	0.414	0.058	0.417	0.052	0.365	0.050	0.432	0.056
Omusati	0.384	0.030	0.259	0.026	0.297	0.029	0.444	0.034
Oshana	0.257	0.030	0.261	0.031	0.219	0.028	0.321	0.030
Oshikoto	0.492	0.031	0.396	0.029	0.429	0.032	0.562	0.026
Otjozondjupa	0.390	0.033	0.500	0.036	0.366	0.031	0.413	0.032
<b>Namibia</b>	<b>0.377</b>	<b>0.011</b>	<b>0.393</b>	<b>0.011</b>	<b>0.336</b>	<b>0.011</b>	<b>0.418</b>	<b>0.011</b>

1993/94								
Poverty Line	1		2		3		4	
Region	$P_0$	S.E.	$P_0$	S.E.	$P_0$	S.E.	$P_0$	S.E.
Caprivi	0.745	0.033	0.706	0.037	0.686	0.044	0.769	0.035
Erongo	0.334	0.062	0.395	0.052	0.316	0.057	0.341	0.063
Hardap	0.422	0.098	0.477	0.091	0.414	0.097	0.446	0.101
Karas	0.437	0.099	0.492	0.097	0.426	0.099	0.445	0.098
Kavango	0.581	0.041	0.561	0.043	0.535	0.048	0.610	0.044
Khomas	0.215	0.060	0.284	0.061	0.215	0.059	0.218	0.061
Kunene	0.725	0.055	0.737	0.039	0.681	0.046	0.742	0.057
Ohangwena	0.782	0.031	0.755	0.034	0.744	0.034	0.807	0.030
Omaheke	0.608	0.063	0.586	0.073	0.572	0.070	0.637	0.062
Omusati	0.640	0.043	0.592	0.044	0.582	0.043	0.699	0.035
Oshana	0.696	0.045	0.675	0.036	0.645	0.041	0.716	0.047
Oshikoto	0.698	0.048	0.685	0.045	0.667	0.049	0.746	0.044
Otjozondjupa	0.472	0.051	0.513	0.055	0.466	0.052	0.508	0.052
<b>Namibia</b>	<b>0.580</b>	<b>0.020</b>	<b>0.582</b>	<b>0.018</b>	<b>0.547</b>	<b>0.019</b>	<b>0.607</b>	<b>0.020</b>

Note: Only the headcount index  $P_0$  is reported, based on the standard CBN poverty line. The trends for  $P_1$  and  $P_2$  generally follow that for  $P_0$ . The poverty line specifications are numbered as follows: 1 = Standard definition as derived in section 3.3.1; 2 = Common food-poverty line, separate non-food component; 3 = 10% rural price deflator; 4 = 10% rural price inflator. For more details please refer to the text. S.E. is the robust standard error.

Source: Own calculations, based on NHIES data.

**Table A6:  $P_\alpha$  poverty measures with different adult equivalence scales – S.E. and C.I.**

		2003/4														
		$P_0$				$P_1$				$P_2$						
		Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
1	Overall	0.58	0.02	0.54	0.62	7.09	0.28	0.01	0.25	0.30	7.72	0.17	0.01	0.15	0.19	7.47
	Urban	0.31	0.03	0.24	0.37	7.23	0.12	0.02	0.09	0.16	8.35	0.07	0.01	0.04	0.09	8.27
	Rural	0.69	0.02	0.66	0.72	3.82	0.34	0.01	0.32	0.37	5.32	0.21	0.01	0.19	0.23	5.81
2	Overall	0.64	0.02	0.61	0.68	7.35	0.34	0.01	0.31	0.36	8.32	0.21	0.01	0.19	0.23	7.99
	Urban	0.35	0.04	0.28	0.42	7.05	0.15	0.02	0.11	0.19	8.55	0.09	0.01	0.06	0.12	8.58
	Rural	0.76	0.01	0.74	0.79	3.29	0.41	0.01	0.39	0.44	5.18	0.26	0.01	0.24	0.29	5.72
3	Overall	0.41	0.02	0.37	0.45	6.23	0.16	0.01	0.14	0.18	7.21	0.09	0.01	0.07	0.10	7.03
	Urban	0.18	0.03	0.12	0.23	6.49	0.06	0.01	0.04	0.09	7.70	0.03	0.01	0.01	0.05	8.03
	Rural	0.50	0.02	0.47	0.54	4.16	0.20	0.01	0.18	0.23	5.93	0.11	0.01	0.09	0.12	6.11

		1993/94														
		$P_0$				$P_1$				$P_2$						
		Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
1	Overall	0.58	0.02	0.54	0.62	7.09	0.28	0.01	0.25	0.30	7.72	0.17	0.01	0.15	0.19	7.47
	Urban	0.31	0.03	0.24	0.37	7.23	0.12	0.02	0.09	0.16	8.35	0.07	0.01	0.04	0.09	8.27
	Rural	0.69	0.02	0.66	0.72	3.82	0.34	0.01	0.32	0.37	5.32	0.21	0.01	0.19	0.23	5.81
2	Overall	0.64	0.02	0.61	0.68	7.35	0.34	0.01	0.31	0.36	8.32	0.21	0.01	0.19	0.23	7.99
	Urban	0.35	0.04	0.28	0.42	7.05	0.15	0.02	0.11	0.19	8.55	0.09	0.01	0.06	0.12	8.58
	Rural	0.76	0.01	0.74	0.79	3.29	0.41	0.01	0.39	0.44	5.18	0.26	0.01	0.24	0.29	5.72
3	Overall	0.41	0.02	0.37	0.45	6.23	0.16	0.01	0.14	0.18	7.21	0.09	0.01	0.07	0.10	7.03
	Urban	0.18	0.03	0.12	0.23	6.49	0.06	0.01	0.04	0.09	7.70	0.03	0.01	0.01	0.05	8.03
	Rural	0.50	0.02	0.47	0.54	4.16	0.20	0.01	0.18	0.23	5.93	0.11	0.01	0.09	0.12	6.11

Note: The adult equivalence scales are numbered as follows: 1 = Standard scale as used by CBS; 2 = No equivalence scale, all members weighted equally; 3 = OECD-adjusted equivalence scale. Est. is the  $P_\alpha$  indicator; S.E. the robust standard error; 95% C.I. the 95% level confidence interval; and DEFF reports the DEFF design effect of the stratification.

Source: Own calculations, based on NHIES data.

**Table A7: Regional  $P_0$  poverty headcount index measures with different adult equivalence scales**

2003/04						
AES Adjustment:	CBS		AES = 1		OECD	
Region	$P_0$	S.E.	$P_0$	S.E.	$P_0$	S.E.
Caprivi	0.365	0.036	0.439	0.038	0.117	0.021
Erongo	0.143	0.032	0.185	0.036	0.057	0.018
Hardap	0.420	0.049	0.464	0.047	0.237	0.042
Karas	0.327	0.041	0.403	0.042	0.157	0.035
Kavango	0.641	0.028	0.721	0.023	0.313	0.040
Khomas	0.081	0.011	0.121	0.015	0.018	0.004
Kunene	0.368	0.087	0.487	0.080	0.165	0.048
Ohangwena	0.555	0.043	0.697	0.038	0.143	0.027
Omaheke	0.414	0.058	0.483	0.053	0.185	0.033
Omusati	0.384	0.030	0.525	0.032	0.076	0.020
Oshana	0.257	0.030	0.362	0.030	0.050	0.010
Oshikoto	0.492	0.031	0.622	0.022	0.108	0.021
Otjondjupa	0.390	0.033	0.475	0.036	0.185	0.032
<b>Namibia</b>	<b>0.377</b>	<b>0.011</b>	<b>0.472</b>	<b>0.011</b>	<b>0.127</b>	<b>0.008</b>

1993/94						
AES Adjustment:	CBS		AES = 1		OECD	
Region	$P_0$	S.E.	$P_0$	S.E.	$P_0$	S.E.
Caprivi	0.745	0.033	0.813	0.042	0.585	0.059
Erongo	0.334	0.062	0.391	0.059	0.195	0.042
Hardap	0.422	0.098	0.441	0.099	0.300	0.078
Karas	0.437	0.099	0.467	0.102	0.329	0.098
Kavango	0.581	0.041	0.688	0.032	0.408	0.055
Khomas	0.215	0.060	0.245	0.061	0.136	0.055
Kunene	0.725	0.055	0.769	0.048	0.500	0.073
Ohangwena	0.782	0.031	0.834	0.027	0.591	0.032
Omaheke	0.608	0.063	0.664	0.055	0.395	0.082
Omusati	0.640	0.043	0.743	0.031	0.431	0.051
Oshana	0.696	0.045	0.754	0.044	0.456	0.036
Oshikoto	0.698	0.048	0.768	0.040	0.463	0.063
Otjondjupa	0.472	0.051	0.562	0.057	0.380	0.061
<b>Namibia</b>	<b>0.580</b>	<b>0.020</b>	<b>0.645</b>	<b>0.020</b>	<b>0.409</b>	<b>0.019</b>

Note: Only the headcount index  $P_0$  is reported, based on the standard CBN poverty line. The trends for  $P_1$  and  $P_2$  generally follow that of  $P_0$ . The three different adult equivalence scale (AES) specifications are as follows: CBS is the scale by CBS (2008a); AES = 1 represents the case of all household members weighted equally as 1; OECD is the scale by Haagenars *et al* (1995). SE is the robust standard error.

Source: Own calculations, based on NHIES data.

**Table A8: Rural/Urban  $P_{\alpha}$  poverty measures with different economies of scale adjustments**

		2003/4														
		$P_0$				$P_1$				$P_2$						
		Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
1	Overall	0.38	0.01	0.36	0.40	4.76	0.13	0.01	0.12	0.14	5.71	0.06	0.00	0.05	0.07	5.66
	Urban	0.17	0.01	0.15	0.19	3.26	0.06	0.01	0.05	0.07	3.70	0.03	0.00	0.02	0.04	3.74
	Rural	0.49	0.01	0.46	0.52	5.23	0.16	0.01	0.15	0.18	6.40	0.08	0.00	0.07	0.09	6.27
2	Overall	0.28	0.01	0.26	0.30	5.42	0.09	0.00	0.08	0.10	5.82	0.04	0.00	0.03	0.04	5.62
	Urban	0.13	0.01	0.11	0.15	3.13	0.04	0.00	0.03	0.05	3.69	0.02	0.00	0.01	0.02	3.67
	Rural	0.37	0.01	0.34	0.39	6.05	0.11	0.01	0.10	0.12	6.49	0.05	0.00	0.04	0.06	6.20
3	Overall	0.16	0.01	0.14	0.18	5.30	0.05	0.00	0.04	0.05	5.55	0.02	0.00	0.02	0.02	5.40
	Urban	0.08	0.01	0.06	0.10	3.49	0.02	0.00	0.02	0.03	3.55	0.01	0.00	0.01	0.01	3.20
	Rural	0.20	0.01	0.18	0.23	5.82	0.06	0.00	0.05	0.07	6.15	0.02	0.00	0.02	0.03	6.00
4	Overall	0.06	0.01	0.05	0.07	5.05	0.01	0.00	0.01	0.02	4.97	0.01	0.00	0.00	0.01	4.88
	Urban	0.03	0.01	0.02	0.04	2.83	0.01	0.00	0.01	0.01	2.39	0.00	0.00	0.00	0.00	2.10
	Rural	0.07	0.01	0.06	0.09	5.69	0.02	0.00	0.01	0.02	5.65	0.01	0.00	0.00	0.01	5.51
		1993/94														
		$P_0$				$P_1$				$P_2$						
		Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF	Est	S.E.	95% C.I.	DEFF			
1	Overall	0.58	0.02	0.54	0.62	7.09	0.28	0.01	0.25	0.30	7.72	0.17	0.01	0.15	0.19	7.47
	Urban	0.31	0.03	0.24	0.37	7.23	0.12	0.02	0.09	0.16	8.35	0.07	0.01	0.04	0.09	8.27
	Rural	0.69	0.02	0.66	0.72	3.82	0.34	0.01	0.32	0.37	5.32	0.21	0.01	0.19	0.23	5.81
2	Overall	0.50	0.02	0.47	0.54	6.74	0.22	0.01	0.20	0.25	7.48	0.13	0.01	0.11	0.14	7.30
	Urban	0.24	0.03	0.18	0.31	7.29	0.09	0.02	0.06	0.12	8.13	0.05	0.01	0.03	0.07	8.15
	Rural	0.61	0.02	0.58	0.64	3.86	0.28	0.01	0.25	0.30	5.54	0.16	0.01	0.14	0.18	5.99
3	Overall	0.39	0.02	0.35	0.43	6.06	0.15	0.01	0.13	0.17	7.19	0.08	0.01	0.07	0.09	6.93
	Urban	0.17	0.03	0.11	0.22	6.69	0.06	0.01	0.03	0.08	7.78	0.03	0.01	0.01	0.04	8.02
	Rural	0.48	0.02	0.45	0.52	4.05	0.19	0.01	0.17	0.21	5.96	0.10	0.01	0.09	0.12	6.03
4	Overall	0.21	0.02	0.18	0.24	6.47	0.07	0.01	0.06	0.08	6.13	0.03	0.00	0.02	0.04	4.98
	Urban	0.07	0.02	0.04	0.11	6.36	0.02	0.01	0.01	0.04	7.36	0.01	0.00	0.00	0.02	6.28
	Rural	0.27	0.02	0.23	0.31	5.73	0.09	0.01	0.07	0.10	5.49	0.04	0.00	0.03	0.05	4.50

Note: The economies of scale adjustments are numbered as follows: 1 = No Economies of Scale,  $\epsilon$  equals 1; 2 = Economies of Scale Factor  $\epsilon$  equals 0.9; 3 =  $\epsilon$  equals 0.75; 4 =  $\epsilon$  equals 0.5. Est is the  $P_{\alpha}$  indicator; S.E. the robust standard error; 95% C.I. the 95% level confidence interval; and DEFF reports the DEFF design effect of the stratification.

Source: Own calculations, based on NHIES data.

**Table A9: Regional  $P_0$  measures with different economies of scale adjustments**

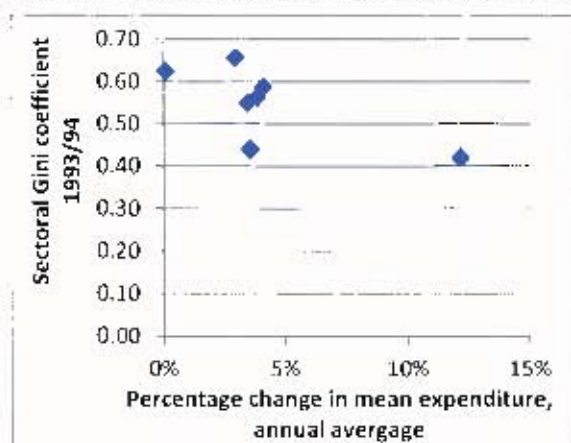
EoS Adjustment ( $\epsilon$ ):	2003/04							
	1		0.9		0.75		0.5	
	$P_0$	SE	$P_0$	SE	$P_0$	SE	$P_0$	SE
Region								
Caprivi	0.37	0.04	0.55	0.03	0.36	0.04	0.17	0.04
Erongo	0.64	0.03	0.39	0.05	0.30	0.05	0.12	0.03
Hardap	0.56	0.04	0.37	0.05	0.23	0.05	0.12	0.03
Karas	0.49	0.03	0.35	0.05	0.22	0.03	0.10	0.02
Kavango	0.42	0.05	0.34	0.03	0.21	0.04	0.07	0.02
Khomas	0.41	0.06	0.33	0.03	0.20	0.05	0.06	0.02
Kunene	0.39	0.03	0.32	0.09	0.18	0.03	0.05	0.01
Ohangwena	0.38	0.03	0.27	0.03	0.15	0.02	0.05	0.01
Omaheke	0.37	0.09	0.27	0.04	0.15	0.02	0.04	0.01
Omusati	0.33	0.04	0.24	0.03	0.12	0.02	0.03	0.01
Oshana	0.26	0.03	0.17	0.02	0.08	0.01	0.03	0.02
Oshikoto	0.14	0.03	0.11	0.03	0.08	0.02	0.02	0.01
Otjozondjupa	0.08	0.01	0.05	0.01	0.02	0.00	0.01	0.00
<b>Namibia</b>	<b>0.38</b>	<b>0.01</b>	<b>0.28</b>	<b>0.01</b>	<b>0.16</b>	<b>0.01</b>	<b>0.06</b>	<b>0.01</b>

EoS Adjustment ( $\epsilon$ ):	1993/94							
	1		0.9		0.75		0.5	
	$P_0$	SE	$P_0$	SE	$P_0$	SE	$P_0$	SE
Region								
Caprivi	0.78	0.03	0.70	0.04	0.57	0.03	0.38	0.05
Erongo	0.75	0.03	0.65	0.05	0.56	0.06	0.33	0.05
Hardap	0.73	0.06	0.63	0.06	0.49	0.07	0.27	0.07
Karas	0.70	0.05	0.62	0.05	0.45	0.06	0.27	0.07
Kavango	0.70	0.05	0.60	0.05	0.43	0.03	0.22	0.04
Khomas	0.64	0.04	0.56	0.04	0.42	0.05	0.22	0.07
Kunene	0.61	0.06	0.50	0.09	0.38	0.05	0.20	0.06
Ohangwena	0.58	0.04	0.50	0.05	0.37	0.08	0.18	0.05
Omaheke	0.47	0.05	0.42	0.06	0.37	0.06	0.18	0.04
Omusati	0.44	0.10	0.39	0.10	0.31	0.10	0.18	0.04
Oshana	0.42	0.10	0.36	0.08	0.30	0.08	0.13	0.05
Oshikoto	0.33	0.06	0.27	0.06	0.18	0.04	0.07	0.05
Otjozondjupa	0.22	0.06	0.17	0.06	0.12	0.06	0.06	0.02
<b>Namibia</b>	<b>0.58</b>	<b>0.02</b>	<b>0.50</b>	<b>0.02</b>	<b>0.39</b>	<b>0.02</b>	<b>0.21</b>	<b>0.02</b>

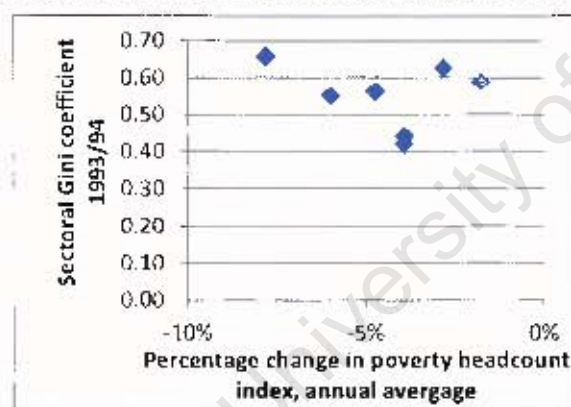
Note: Only the headcount index  $P_0$  is reported, based on the standard CBN poverty line; the trend for  $P_1$  and  $P_2$  generally follows that of  $P_0$ . The four different economies of scale (EoS) specifications range from  $\epsilon = 1$ , which is equivalent to no economies of scale in the household, to  $\epsilon = 0.5$ . For details refer to the text. S.E. is the robust standard error.

Source: Own calculations, based on NHIES data.

**Figure A3: Gini coefficient (1993/94) against changes in mean sectoral expenditure**

Note: Gini index and expenditure changes by economic sector; Changes expressed per annum for period 1993/94 to 2003/04. The weak negative correlation one may see in the graph rests largely on the outlier on the right with high growth and low inequality, which is rural non-farming business activity, a sector on which less than 3 percent of the population depend.

Source: NHIES, own calculations.

**Figure A4: Gini coefficient (1993/94) against rate of poverty reduction**

Note: Gini index and poverty reduction by economic sector; Poverty reduction expressed per annum for period 1993/94 to 2003/04.

Source: NHIES, own calculations.

**Table A10: OLS regression of household expenditure (Urban)**

	2003/04		1993/94	
	Coeff.	S.E.	Coeff.	S.E.
Age of head of household	0.030	0.01 ***	0.019	0.01 **
Age of head (squared)	0.000	0.00 ***	0.000	0.00 **
Female head	-0.246	0.04 ***	-0.249	0.07 ***
Household size	-0.068	0.01 ***	-0.095	0.01 ***
Spouse absent (dummy)	0.040	0.04	0.017	0.06
Old-aged present (dummy)	-0.146	0.07 **	-0.071	0.08
Unemployed members (dummy)	-0.209	0.03 ***	-0.122	0.06 **
Mean years of education	0.130	0.01 ***	0.129	0.01 ***
<b>Education attainment by head (Omitted: No formal education)</b>				
Primary	-0.041	0.06	0.079	0.09
Secondary	0.172	0.07 **	0.196	0.10 *
Tertiary	0.708	0.09 ***	0.333	0.15 **
Access/ownership of fields (dummy)	0.044	0.04	0.044	0.07
Access/ownership of grazing land (dummy)	0.150	0.04 ***	-0.103	0.07
<b>Language dummies (Omitted: Oshiwambo)</b>				
San	-0.348	0.23	(omitted)	
Caprivian	-0.267	0.06 ***	-0.337	0.15 **
Otjiherero	0.064	0.06	-0.010	0.15
Rukavango	-0.310	0.10 ***	-0.056	0.15
Nama/damara	-0.161	0.06 ***	-0.113	0.09
Setswana	0.302	0.13 **	0.308	0.19
Afrikaans	0.322	0.06 ***	0.274	0.10 ***
German	0.907	0.12 ***	0.739	0.16 ***
English	0.587	0.10 ***	0.539	0.13 ***
Other	0.495	0.18 ***	-0.106	0.44
<b>Main income source dummies (Omitted: Salaries/wages)</b>				
Subsistence farming	-0.187	0.14	-0.322	0.20
Commercial farming	0.533	0.70	-0.404	0.08 ***
Non-farming business	0.095	0.07	-0.069	0.10
Remittances	-0.380	0.07 ***	-0.421	0.08 ***
Pensions	-0.281	0.08 ***	-0.290	0.10 ***
Other	0.011	0.11	-0.777	0.12 ***
Constant	4.966	0.16 ***	5.363	0.25 ***
Observations	4236		1611	
R-squared	0.62		0.60	

Note: Dependent variable = Log of adult equivalent monthly consumption expenditure, 2003/04 prices, data weighted for individuals; S.E. = Standard errors; \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Source: Own calculations, based on NHIES data.

**Table A11: OLS regression of household expenditure (Rural)**

	2003/04		1993/94	
	Coeff.	S.E.	Coeff.	S.E.
Age of head of household	0.006	0.00 *	-0.017	0.01 ***
Age of head (squared)	0.000	0.00	0.000	0.00 **
Female head	-0.175	0.03 ***	-0.060	0.06
Household size	-0.056	0.00 ***	-0.053	0.01 ***
Spouse absent (dummy)	0.069	0.03 **	-0.009	0.05
Old-aged present (dummy)	-0.123	0.03 ***	0.058	0.05
Unemployed members (dummy)	-0.119	0.03 ***	-0.118	0.05 **
Mean years of education	0.057	0.00 ***	0.065	0.01 ***
<b>Education attainment by head (Omitted: No formal education)</b>				
Primary	0.027	0.02	-0.038	0.05
Secondary	0.171	0.03 ***	0.132	0.08 *
Tertiary	0.932	0.06 ***	0.702	0.24 ***
Access/ownership of fields (dummy)	-0.029	0.05	0.026	0.09
Access/ownership of grazing land (dummy)	0.204	0.03 ***	-0.013	0.04
<b>Language dummies (Omitted: Oshiwambo)</b>				
San	-0.098	0.09	-0.115	0.13
Caprivian	-0.068	0.06	-0.449	0.08 ***
Otjiherero	0.200	0.09 **	0.113	0.12
Rukavango	-0.320	0.06 ***	0.076	0.12
Nama/damara	-0.181	0.06 ***	-0.193	0.10 *
Setswana	0.158	0.11	0.003	0.22
Afrikaans	0.450	0.13 ***	0.453	0.14 ***
German	1.218	0.25 ***	1.709	0.45 ***
English	1.218	0.47 **	0.939	0.49 *
Other	-0.027	0.15	-0.266	0.23
<b>Main income source dummies (Omitted: Salaries/wages)</b>				
Subsistence farming	-0.181	0.04 ***	-0.218	0.08 ***
Commercial farming	1.021	0.20 ***	-0.062	0.30
Non-farming business	-0.082	0.07	-0.329	0.14 **
Remittances	-0.350	0.06 ***	-0.406	0.10 ***
Pensions	-0.329	0.05 ***	-0.399	0.10 ***
Other	-0.380	0.09 ***	-0.283	0.49
Constant	5.637	0.09 ***	6.113	0.19 ***
Observations		5173	2498	
R-squared		0.47	0.27	

Note: Dependent variable = Log of adult equivalent monthly consumption expenditure, 2003/04 prices, data weighted for individuals; S.E. = Standard errors; \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Source: Own calculations, based on NHIES data.

**Table A12: Marginal effects after logit of probability of being poor (Urban)**

	2003/04		1993/94	
	Coeff.	S.E.	Coeff.	S.E.
Age of head of household	-0.005	0.00 ***	-0.004	0.01
Age of head (squared)	0.000	0.00 **	0.000	0.00
Female head	0.028	0.01 **	0.103	0.06 *
Household size	0.011	0.00 ***	0.057	0.01 ***
Spouse absent (dummy)	-0.005	0.01	0.085	0.06
Old-aged present (dummy)	0.022	0.02	-0.031	0.07
Unemployed members (dummy)	0.015	0.01	0.056	0.05
Mean years of education	-0.021	0.00 ***	-0.085	0.01 ***
<b>Education attainment by head (Omitted: No formal education)</b>				
Primary	0.011	0.02	-0.023	0.07
Secondary	-0.039	0.02 **	-0.101	0.09
Tertiary	-0.091	0.01 ***	-0.011	0.19
Access/ownership of fields (dummy)	-0.002	0.01	-0.062	0.07
Access/ownership of grazing land (dummy)	-0.030	0.01 **	0.032	0.07
<b>Language dummies (Omitted: Oshiwambo)</b>				
San	0.518	0.41	(omitted)	
Caprivian	0.040	0.03	0.324	0.08 ***
Otjiherero	-0.017	0.02	0.110	0.11
Rukavango	0.091	0.04 **	0.120	0.12
Nama/damara	0.064	0.03 **	0.176	0.07 ***
Setswana	-0.025	0.05	-0.166	0.22
Afrikaans	0.003	0.02	-0.154	0.10
German	(omitted)		(omitted)	
English	-0.016	0.05	-0.267	0.18
Other	-0.011	0.03	0.335	0.15 **
<b>Main income source dummies (Omitted: Salaries/wages)</b>				
Subsistence farming	0.093	0.06	0.281	0.15 *
Commercial farming	0.158	0.17	(omitted)	
Non-farming business	0.006	0.02	0.217	0.07 ***
Remittances	0.093	0.04 **	0.198	0.06 ***
Pensions	0.116	0.04 ***	0.162	0.08 **
Other	0.038	0.05	(omitted)	
Observations	4206		1560	
Predicted prob. at sample means of x	0.06		0.57	

Note: Logit regression of probability of being poor by CBN Poverty Line; data weighted for individuals; S.E. = Standard errors; \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Source: Own calculations, based on NHIES data.

**Table A13: Marginal effects after logit of probability of being poor (Rural)**

	2003/04		1993/94	
	Coeff.	S.E.	Coeff.	S.E.
Age of head of household	-0.002	0.00	0.008	0.00 **
Age of head (squared)	0.000	0.00	0.000	0.00
Female head	0.109	0.03 ***	0.019	0.04
Household size	0.044	0.00 ***	0.023	0.01 ***
Spouse absent (dummy)	-0.061	0.03 *	-0.008	0.04
Old-aged present (dummy)	0.073	0.04 **	-0.046	0.04
Unemployed members (dummy)	0.063	0.03 **	0.085	0.03 **
Mean years of education	-0.042	0.01 ***	-0.032	0.01 ***
<b>Education attainment by head (Omitted: No formal education)</b>				
Primary	-0.035	0.03	0.011	0.04
Secondary	-0.106	0.04 ***	-0.065	0.05
Tertiary	-0.493	0.02 ***	-0.487	0.29 *
Access/ownership of fields (dummy)	-0.047	0.05	-0.039	0.04
Access/ownership of grazing land (dummy)	-0.153	0.03 ***	0.020	0.04
<b>Language dummies (Omitted: Oshiwambo)</b>				
San	0.041	0.08	-0.039	0.07
Caprivian	-0.005	0.06	0.169	0.05 ***
Otjiherero	-0.166	0.07 **	-0.102	0.06 *
Rukavango	0.215	0.05 ***	-0.078	0.07
Nama/damara	0.055	0.06	0.063	0.06
Setswana	-0.243	0.12 **	0.109	0.03 ***
Afrikaans	-0.158	0.07 **	-0.240	0.07 ***
German	(omitted)		-0.294	0.30
English	(omitted)		(omitted)	
Other	0.009	0.13	0.092	0.10
<b>Main income source dummies (Omitted: Salaries/wages)</b>				
Subsistence farming	0.125	0.03	0.136	0.04 ***
Commercial farming	(omitted)		0.090	0.10
Non-farming business	0.173	0.05 *	0.185	0.07 ***
Remittances	0.240	0.04	0.272	0.04 ***
Pensions	0.295	0.04	0.237	0.04 ***
Other	0.323	0.06	-0.046	0.21
Observations	5057		2485	
Predicted prob. at sample means of x	0.47		0.64	

Note: Logit regression of probability of being poor by CBN Poverty Line; data weighted for individuals; S.E. = Standard errors; \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Source: Own calculations, based on NHIES data.

**Table A14: Quantile regressions, 2003/04**

Variables	10th Percentile			50th Percentile (Median)			90th Percentile		
	Coeff	S. E.	t-stat	Coeff	S. E.	t-stat	Coeff	S. E.	t-stat
Age of head of household	0.01	0.00	2.53	0.01	0.00	3.16	0.01	0.00	2.49
Age of head (squared)	0.00	0.00	-1.97	0.00	0.00	-2.86	0.00	0.00	-1.79
Female head	-0.13	0.03	-4.15	-0.18	0.02	-7.51	-0.30	0.05	-6.25
Rural location dummy	-0.24	0.03	-6.84	-0.33	0.02	-13.99	-0.34	0.04	-7.78
Household size	-0.05	0.00	-14.1	-0.06	0.00	-15.45	-0.06	0.01	-7.54
Spouse absent (dummy)	0.03	0.03	0.85	0.04	0.02	1.77	0.17	0.05	3.36
Old-aged present (dummy)	-0.11	0.04	-2.45	-0.11	0.03	-3.56	-0.22	0.05	-4.24
Unemployed members (dummy)	-0.12	0.03	-4.58	-0.15	0.02	-7.68	-0.13	0.03	-3.72
Mean years of education	0.07	0.01	13.28	0.07	0.00	18.72	0.07	0.01	10.05
<b>Education level dummies (Omitted: No formal education)</b>									
Primary education by Head	-0.01	0.04	-0.33	-0.02	0.03	-0.73	0.03	0.04	0.72
Secondary education by Head	0.22	0.05	4.63	0.13	0.03	3.72	0.26	0.06	4.16
Tertiary education by Head	0.95	0.07	14.24	0.90	0.05	16.95	0.91	0.10	9.05
Access/ownership of fields (dummy)	0.02	0.03	0.71	-0.05	0.03	-1.66	-0.03	0.05	-0.53
Access/ownership of grazing land (dummy)	0.19	0.03	6.39	0.19	0.02	8.60	0.17	0.04	4.77
<b>Language dummies (Omitted: Oshiwambo):</b>									
San	-0.10	0.09	-1.21	-0.07	0.07	-1.03	-0.03	0.11	-0.25
Caprivian	-0.17	0.05	-3.62	-0.13	0.03	-3.96	-0.07	0.06	-1.06
Otjiherero	0.12	0.05	2.50	0.16	0.03	4.84	0.23	0.05	4.26
Rukavango	-0.33	0.04	-7.44	-0.33	0.03	-10.24	-0.29	0.06	-4.95
Nama/damara	-0.32	0.04	-7.92	-0.18	0.03	-5.88	-0.14	0.05	-2.58
Setswana	0.25	0.11	2.25	0.22	0.12	1.76	0.19	0.21	0.89
Afrikaans	0.15	0.05	3.41	0.48	0.03	14.59	0.63	0.06	11.06
German	1.36	0.09	14.79	1.13	0.13	8.63	1.21	0.19	6.42
English	0.44	0.11	4.04	0.85	0.08	10.34	0.99	0.13	7.88
Other	-0.09	0.15	-0.64	0.40	0.09	4.40	0.86	0.22	3.86
<b>Main income source dummies (Omitted: Salaries/wages):</b>									
Subsistence farming	-0.12	0.04	-2.76	-0.13	0.03	-4.42	-0.24	0.05	-4.72
Commercial farming	0.08	0.15	0.53	1.15	0.10	11.54	1.14	0.13	9.07
Non-farming business	-0.13	0.05	-2.63	-0.03	0.04	-0.73	0.19	0.08	2.44
Remittances	-0.37	0.06	-5.84	-0.28	0.04	-6.35	-0.40	0.06	-6.23
Pensions	-0.23	0.05	-4.30	-0.28	0.04	-6.79	-0.38	0.07	-5.63
Other	-0.30	0.08	-3.97	-0.22	0.06	-3.69	-0.23	0.09	-2.62
Constant	4.97	0.11	43.24	5.82	0.08	72.65	6.44	0.14	44.86
Pseudo R2	0.30			0.37			0.47		

**Note:** Dependent variable = Log of adult equivalent monthly consumption expenditure, 2003/04 prices, data weighted for individuals; S.E. = Standard errors; \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%. Calculated with *qreg* command in Stata.

**Source:** Own calculations, based on NHIES data.

**Table A15: Quantile regressions, 1993/94**

Variables	10th Percentile			50th Percentile (Median)			90th Percentile		
	Coeff	S.E.	t-stat	Coeff	S.E.	t-stat	Coeff	S.E.	t-stat
Age of head of household	-0.02	0.01	-2.99	-0.01	0.00	-1.52	0.00	0.01	-0.30
Age of head (squared)	0.00	0.00	2.50	0.00	0.00	0.95	0.00	0.00	-0.12
Female head	-0.03	0.07	-0.42	-0.10	0.04	-2.32	-0.22	0.07	-3.05
Rural location dummy	-0.33	0.07	-4.56	-0.32	0.04	-7.34	-0.08	0.07	-1.25
Household size	-0.07	0.01	-12.24	-0.07	0.01	-13.10	-0.06	0.01	-5.02
Spouse absent (dummy)	-0.10	0.07	-1.39	-0.05	0.04	-1.07	0.14	0.07	1.94
Old-aged present (dummy)	-0.10	0.08	-1.24	0.02	0.05	0.35	-0.06	0.08	-0.76
Unemployed members (dummy)	-0.07	0.05	-1.34	-0.12	0.03	-3.68	-0.11	0.05	-1.95
Mean years of education	0.08	0.01	7.24	0.08	0.01	12.02	0.09	0.01	8.19
<b>Education level dummies (Omitted: No formal education):</b>									
Primary education by Head	-0.01	0.07	-0.20	-0.02	0.04	-0.43	-0.11	0.07	-1.53
Secondary education by Head	0.14	0.10	1.31	0.14	0.06	2.45	0.15	0.10	1.51
Tertiary education by Head	0.38	0.19	1.97	0.57	0.12	4.99	0.49	0.19	2.58
Access/ownership of fields (dummy)	0.07	0.07	0.92	0.02	0.05	0.38	-0.03	0.07	-0.42
Access/ownership of grazing land (dummy)	-0.08	0.06	-1.25	-0.06	0.04	-1.36	-0.03	0.05	-0.54
<b>Language dummies (Omitted: Oshiwambo):</b>									
San	0.07	0.19	0.35	-0.17	0.11	-1.52	0.10	0.19	0.51
Caprivian	-0.40	0.14	-2.83	-0.43	0.08	-5.42	-0.54	0.11	-4.71
Otjiherero	0.09	0.08	1.12	0.13	0.06	2.36	0.10	0.09	1.09
Rukavango	-0.09	0.11	-0.81	-0.01	0.06	-0.12	0.08	0.13	0.64
Nama/damara	-0.08	0.09	-0.89	-0.20	0.05	-3.94	-0.18	0.07	-2.43
Setswana	0.56	0.21	2.63	0.11	0.19	0.55	0.56	0.23	2.49
Afrikaans	0.41	0.09	4.33	0.42	0.05	7.73	0.51	0.09	5.92
German	1.10	0.18	6.17	1.24	0.12	10.14	1.02	0.17	5.83
English	0.80	0.19	4.18	0.60	0.11	5.36	0.89	0.17	5.29
Other	-0.42	0.13	-3.22	-0.30	0.08	-3.51	-0.05	0.15	-0.33
<b>Main income source dummies (Omitted: Salaries/wages):</b>									
Subsistence farming	-0.19	0.08	-2.27	-0.17	0.05	-3.56	-0.17	0.09	-1.79
Commercial farming	-0.32	0.11	-2.85	-0.25	0.16	-1.55	0.23	0.17	1.31
Non-farming business	-0.30	0.10	-2.99	-0.22	0.07	-2.98	0.02	0.12	0.14
Remittances	-0.26	0.12	-2.21	-0.51	0.07	-6.93	-0.55	0.10	-5.64
Pensions	-0.32	0.11	-2.89	-0.38	0.06	-5.95	-0.36	0.11	-3.13
Other	-0.92	0.18	-5.00	-0.38	0.28	-1.33	0.22	0.18	1.19
Constant	5.64	0.23	25.05	6.23	0.14	44.43	6.73	0.23	29.73
Pseudo R2	0.22			0.28			0.37		

**Note:** Dependent variable = Log of adult equivalent monthly consumption expenditure, 2003/04 prices, data weighted for individuals; S.E. = Standard errors; \*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%. Calculated with *qreg* command in Stata. Source: Own calculations, based on NHIES data.

Source: Own calculations from NHIES data.

**Table A16: Oaxaca-Blinder decomposition for leading and lagging regions**

	Leading region: Khomas				Leading region: Erongo			
	2003/04		1993/94		2003/04		1993/94	
	Est.	S.E.	Est.	S.E.	Est.	S.E.	Est.	S.E.
<b>Leading region: mean ln(y)</b>	7.15	0.06	6.86	0.17	6.80	0.11	6.32	0.13
<b>Ohangwena: mean ln(y)</b>	5.76	0.07	5.09	0.06	5.76	0.07	5.09	0.06
<b>Mean diff. in ln(y)</b>	1.39	0.09	1.77	0.18	1.04	0.13	1.22	0.14
<b>Explained</b>	0.97	0.12	1.03	0.20	0.88	0.11	0.80	0.16
<b>Unexplained</b>	0.41	0.11	0.73	0.18	0.16	0.09	0.43	0.15
<b>Oshana: mean ln(y)</b>	6.33	0.06	5.49	0.10	6.33	0.06	5.49	0.10
<b>Mean diff. in ln(y)</b>	0.82	0.09	1.37	0.20	0.47	0.13	0.83	0.17
<b>Explained</b>	0.75	0.11	0.99	0.19	0.62	0.10	0.68	0.16
<b>Unexplained</b>	0.08	0.09	0.39	0.10	-0.15	0.09	0.15	0.11
<b>Caprivi: mean ln(y)</b>	6.04	0.05	5.29	0.10	6.04	0.05	5.29	0.10
<b>Mean diff. in ln(y)</b>	1.11	0.08	1.57	0.20	0.76	0.12	1.03	0.17
<b>Explained</b>	1.00	0.11	0.43	0.17	0.72	0.11	0.61	0.18
<b>Unexplained</b>	0.11	0.10	1.14	0.13	0.04	0.10	0.41	0.15
<b>Kavango: mean ln(y)</b>	5.57	0.06	5.58	0.08	5.57	0.06	5.58	0.08
<b>Mean diff. in ln(y)</b>	1.58	0.09	1.28	0.19	1.23	0.13	0.74	0.15
<b>Explained</b>	1.11	0.14	0.39	0.17	1.03	0.13	0.86	0.17
<b>Unexplained</b>	0.47	0.12	0.89	0.16	0.20	0.10	-0.12	0.17
<b>Omusati: mean ln(y)</b>	5.92	0.05	5.38	0.07	5.92	0.05	5.38	0.07
<b>Mean diff. in ln(y)</b>	1.23	0.08	1.48	0.19	0.87	0.12	0.94	0.15
<b>Explained</b>	0.77	0.13	0.72	0.16	0.81	0.10	0.50	0.13
<b>Unexplained</b>	0.46	0.13	0.76	0.13	0.06	0.10	0.44	0.12
<b>Kunene: mean ln(y)</b>	6.17	0.10	5.51	0.15	6.17	0.10	5.51	0.15
<b>Mean diff. in ln(y)</b>	0.98	0.12	1.35	0.23	0.63	0.15	0.81	0.20
<b>Explained</b>	0.66	0.11	0.90	0.19	0.56	0.13	0.62	0.17
<b>Unexplained</b>	0.32	0.07	0.45	0.15	0.07	0.08	0.19	0.11
<b>(Caprivi + Kavango): mean ln(y)</b>	5.74	0.04	5.45	0.08	5.74	0.04	5.45	0.08
<b>Mean diff. in ln(y)</b>	1.41	0.08	1.41	0.19	1.06	0.12	0.87	0.16
<b>Explained</b>	1.00	0.11	0.50	0.14	0.85	0.11	0.87	0.13
<b>Unexplained</b>	0.41	0.10	0.91	0.13	0.21	0.09	0.00	0.14
<b>(Omusati+ Kunene): mean ln(y)</b>	5.99	0.05	5.42	0.07	5.99	0.05	5.42	0.07
<b>Mean diff. in ln(y)</b>	1.16	0.08	1.44	0.19	0.81	0.12	0.90	0.15
<b>Explained</b>	0.75	0.12	0.96	0.17	0.75	0.11	0.65	0.14
<b>Unexplained</b>	0.42	0.10	0.48	0.12	0.06	0.08	0.24	0.10

Note: Oaxaca-Blinder decompositions were conducted pair-wise for two leading regions Khomas and Erongo with the six lagging regions listed above. The first row presents the mean estimates of log of consumption expenditure (adult-equivalent) for the leading regions. For each of the lagging regions, there are four rows: the first presents mean log of expenditure; the second presents the difference to mean expenditure of the respective leading region; the third row presents the part of the difference that is explained by differences in mean characteristics ("endowments effect"); the fourth row presents the part of the difference that is not explained by the characteristics in the model ("returns effect"). (Caprivi + Kavango) and (Omusati + Kunene) are also analysed jointly to test the robustness of the findings from the individual regions that had been subject to some rezoning between surveys.

Source: Own calculations, based on NHIES data.