Figure A.1.   Inflation, Interest and Exchange Rates, and Net Barter Terms of Trade (1985-2002)
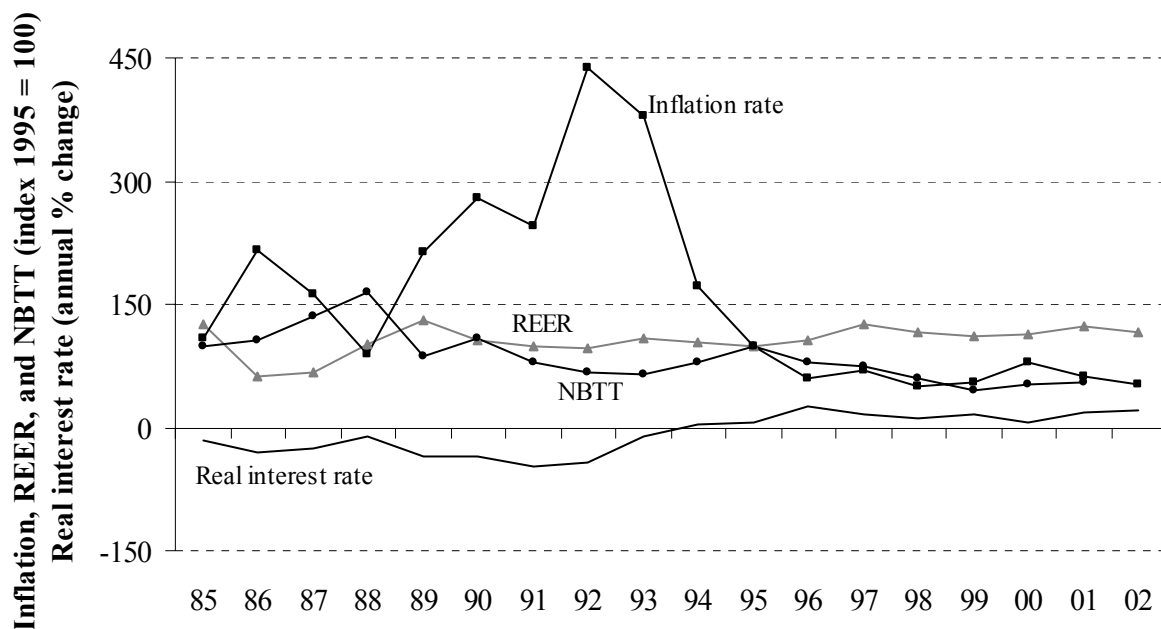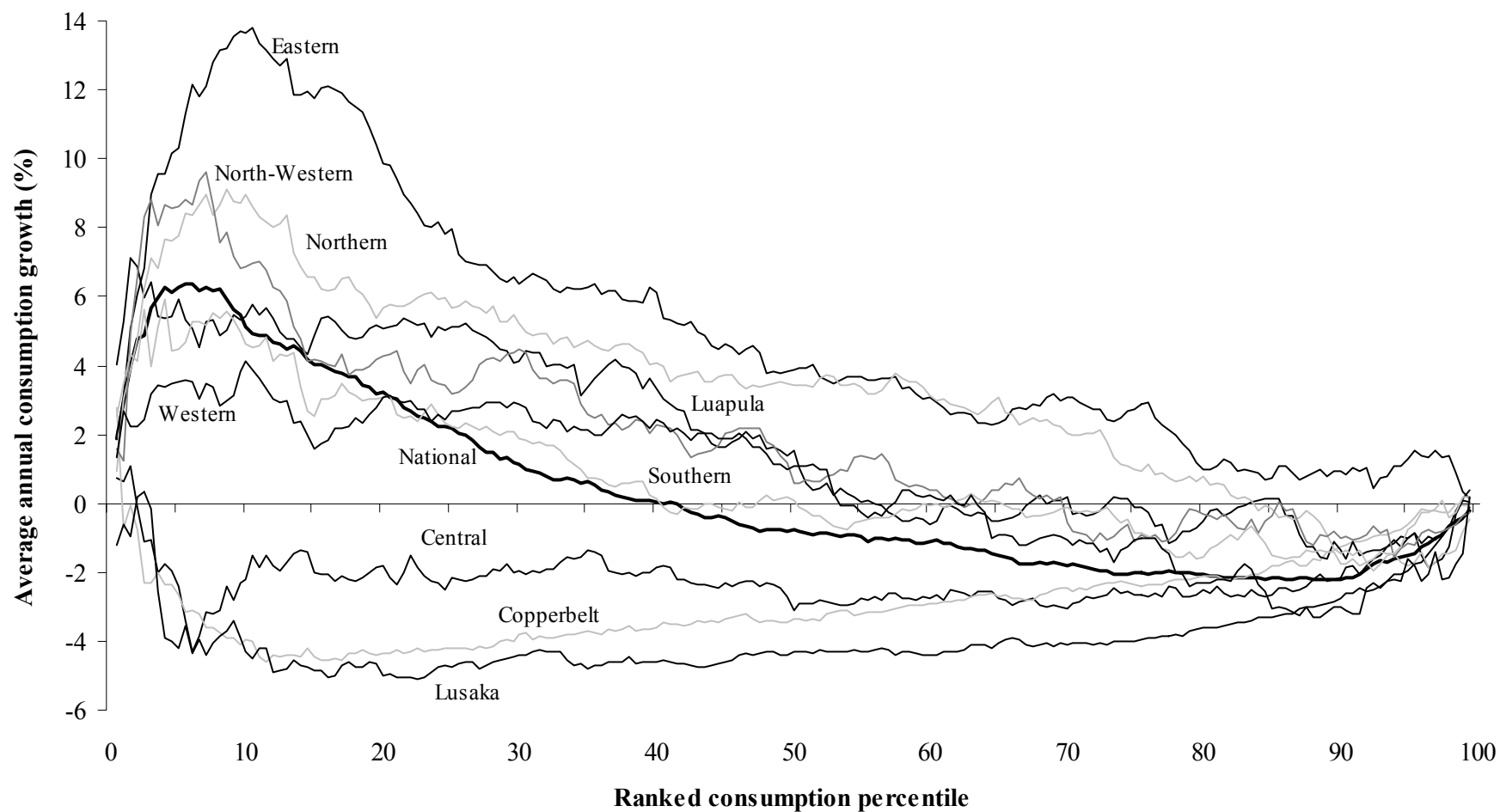

Source: World Development Indicators (2004).

Figure A.2.   Inflation, Interest and Exchange Rates, and Net Barter Terms of Trade (1985-2002)

Figure A.3. **National and Provincial Growth Incidence Curves (1991-1998)**

Source: Own calculations using Priority Survey (1991) and Living Conditions Monitoring Surveys (1996 and 1998).

Note: The national growth incidence curve is not strictly decomposable into provincial curves but changes in provincial population shares have been relatively small (see Section III). Bottom end of the distribution for both years are dropped (see Appendix B).

Table A.1.   Poverty Headcount and Household Distribution by Province and Sector of Employment (1991)[1]

	Agri.	Mining	Manu.	Energy	Const.	Trade	Hotels	Trans.	Finance	Public	Other	All
Poverty headcount												
Share of provincial employment (Share of sector employment)												
Central												
Poverty	63.6	38.0	17.2	26.8	41.5	33.7	34.3	20.6	14.2	19.3	34.7	49.4
Population	62 (10)	2 (6)	5 (6)	1 (7)	3 (8)	7 (10)	1 (11)	5 (9)	2 (7)	10 (9)	3 (6)	100 (9)
Copperbelt												
Poverty	55.2	24.8	26.0	27.3	26.0	23.6	10.7	18.9	39.0	17.2	34.4	29.4
Population	15 (3)	21 (84)	18 (36)	2 (21)	3 (13)	7 (14)	2 (23)	9 (24)	5 (27)	10 (12)	8 (22)	100 (13)
Eastern												
Poverty	84.0	-	30.1	-	53.1	29.0	-	30.7	0.0	47.8	37.0	75.3
Population	81 (21)	0 (0)	1 (3)	0 (2)	1 (5)	5 (11)	0 (5)	1 (3)	1 (5)	7 (11)	2 (5)	100 (15)
Luapula												
Poverty	80.7	-	44.5	42.0	36.5	39.5	9.4	54.3	34.8	25.5	37.1	67.1
Population	69 (14)	0 (1)	2 (3)	3 (26)	3 (11)	7 (12)	1 (7)	2 (5)	1 (7)	9 (10)	2 (5)	100 (11)
Lusaka												
Poverty	47.5	25.0	12.4	5.0	9.9	14.2	7.2	4.9	4.0	5.7	15.5	14.6
Population	13 (3)	1 (5)	12 (30)	2 (20)	7 (40)	13 (29)	3 (39)	11 (35)	6 (46)	18 (27)	13 (43)	100 (15)
Northern												
Poverty	84.1	-	39.4	15.0	46.5	21.8	-	16.9	28.1	23.3	67.2	70.2
Population	75 (17)	0 (0)	2 (5)	1 (11)	1 (7)	4 (8)	0 (0)	5 (14)	1 (5)	8 (10)	2 (5)	100 (13)
North-Western												
Poverty	83.0	-	23.0	20.1	9.6	58.0	22.3	21.4	-	26.3	31.8	66.9
Population	71 (7)	0 (1)	3 (2)	1 (3)	4 (7)	3 (3)	1 (3)	1 (1)	0 (0)	14 (7)	2 (2)	100 (5)
Southern												
Poverty	78.9	19.7	43.5	25.9	61.6	50.0	41.4	29.1	-	30.9	33.1	66.6
Population	70 (12)	1 (3)	5 (9)	1 (5)	2 (6)	5 (7)	1 (8)	4 (8)	0 (2)	8 (8)	4 (8)	100 (10)
Western												
Poverty	87.2	-	70.0	32.3	57.3	34.5	18.5	0.0	-	38.9	44.5	77.2
Population	77 (12)	0 (0)	4 (6)	1 (4)	1 (3)	5 (7)	1 (4)	1 (1)	0 (2)	8 (7)	2 (4)	100 (9)
Zambia												
Poverty	79.0	26.1	26.8	25.8	26.5	27.7	15.5	16.7	17.6	22.1	28.6	55.2
Population	57 (100)	3 (100)	6 (100)	1 (100)	3 (100)	7 (100)	1 (100)	5 (100)	2 (100)	10 (100)	5 (100)	100 (100)

Source: Own calculations from 1991 PS survey (CSO, 1993).

[1] *Sector of employment for households is determined by sector of employment of the household head. Employment includes both formal and informal sectors.*

Notes: Poverty headcounts with low household population shares (less than 0.5% of provincial households) can be misleading and have therefore been removed.
    Agri. is agriculture; *Manu.* is manufacturing; *Const.* is construction; *Trans.* is transport; *Finance* is financial services; *Public* is public services.

Table A.2.   Poverty Decomposition Across Household Stratum (1991-1998)

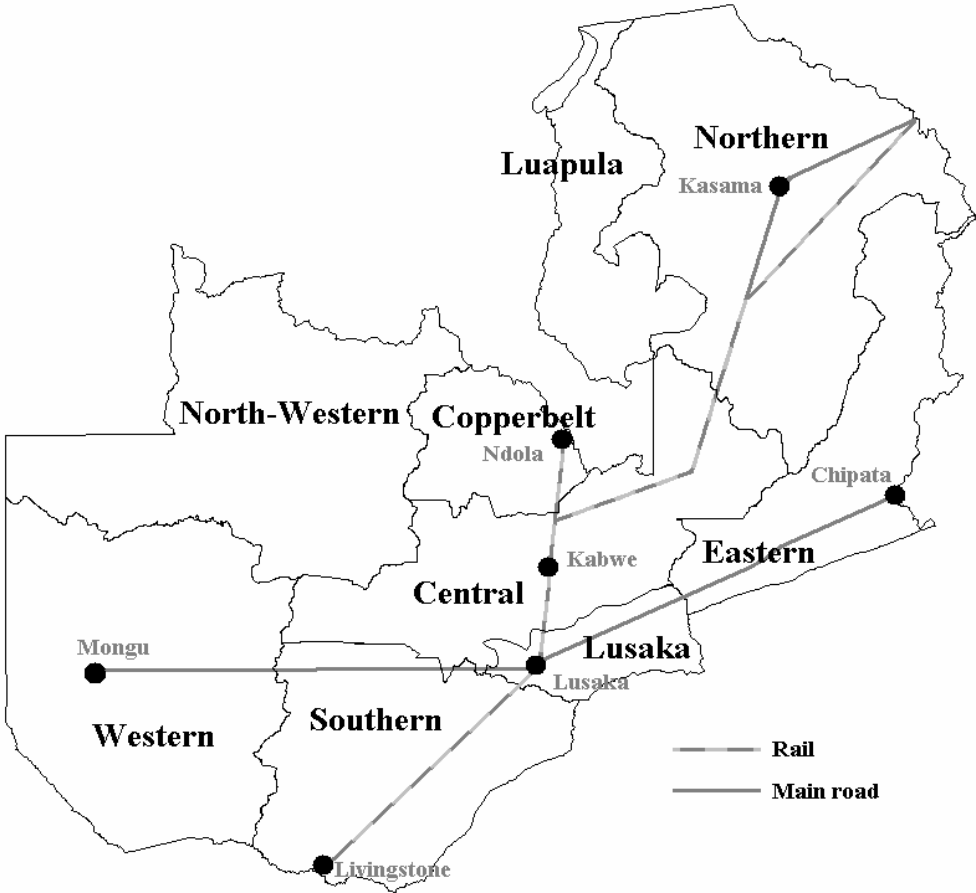|	Upper poverty line			Lower poverty line		
	Population Share	Absolute Headcount Change	Percentage Headcount Change	Population Share	Absolute Headcount Change	Percentage Headcount Change
Rural						
Small-scale	48.0	-1.6	-25.3	48.0	-3.9	-121.1
Medium-scale	2.7	0.0	-0.6	2.7	-0.2	-4.6
Large-scale	0.2	-0.1	-1.0	0.2	-0.1	-2.2
Non-farm	3.7	0.4	5.7	3.7	0.3	10.1
Urban						
Low-cost	24.0	2.7	41.8	24.0	2.6	78.9
Medium-cost	14.9	1.6	24.6	14.9	0.4	11.4
High-cost	6.5	-0.1	-1.6	6.5	-0.4	-10.9
Within group change		2.8	43.6		-1.3	-38.5
Population shift		4.3	67.1		4.7	144.2
Interaction		-0.7	-10.6		-0.2	-5.7
Total change		6.4	100.0		3.3	100.0

Source: Own calculations using the 1991 PS survey (CDO, 1993) and 1998 LCMS survey (CSO, 1999a).

Table A.3.   Poverty Decomposition Across Provinces (1991-1998)

|	Upper poverty line			Lower poverty line		
	Population Share	Absolute Headcount Change	Percentage Headcount Change	Population Share	Absolute Headcount Change	Percentage Headcount Change
Province						
Central	9.1	0.8	12.9	9.1	0.8	24.0
Copperbelt	15.0	1.7	26.8	15.0	2.1	63.0
Eastern	12.8	-0.2	-3.3	12.8	-1.3	-39.9
Luapula	9.5	0.1	2.1	9.5	0.0	0.6
Lusaka	16.1	3.8	58.6	16.1	2.8	85.1
Northern	12.6	0.2	2.6	12.6	-0.3	-9.2
North-western	5.2	-0.1	-1.4	5.2	-0.3	-7.6
Southern	11.9	0.0	-0.2	11.9	-0.4	-13.0
Western	7.8	0.5	7.0	7.8	0.3	9.5
Within group change		6.8	105.1		3.7	112.5
Population shift		-0.4	-6.1		-0.6	-19.1
Interaction		0.1	1.1		0.2	6.6
Total change		6.4	100.0		3.3	100.0

Source: Own calculations using the 1991 PS survey (CSO, 1993) and 1998 LCMS survey (CSO, 1999a).

Figure A.4.   Major Transport Routes in Zambia

Note: Stylized mapping of Zambian rail lines and roads. Northern rail line is less developed than and incompatible with the southern line.

Figure A.5.   Lower Poverty Line Poverty Headcount by Province (1991)
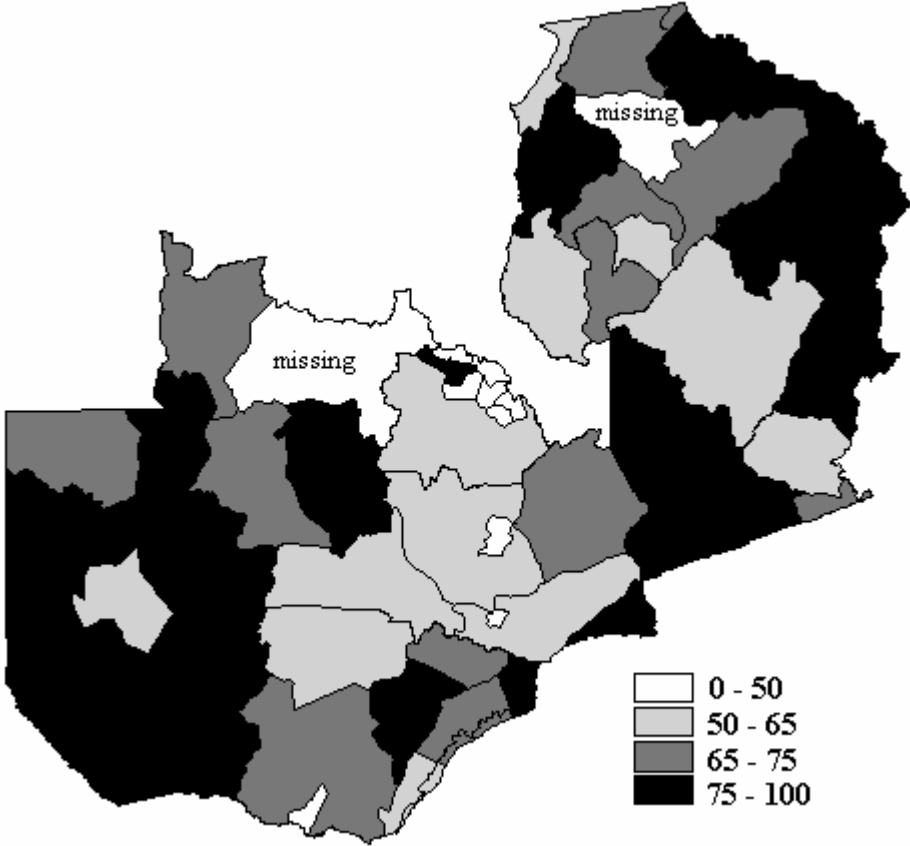
Source: Own calculations using the 1991 PS survey (CSO, 1993).
Note: There was a change in the definition of the sampling districts between the Priority Surveys of 1991 and 1993, and the LCMS surveys of 1998. Two districts in 1991 were missing.

**Figure A.6. Lower Poverty Line Poverty Headcount by Province (1998)**
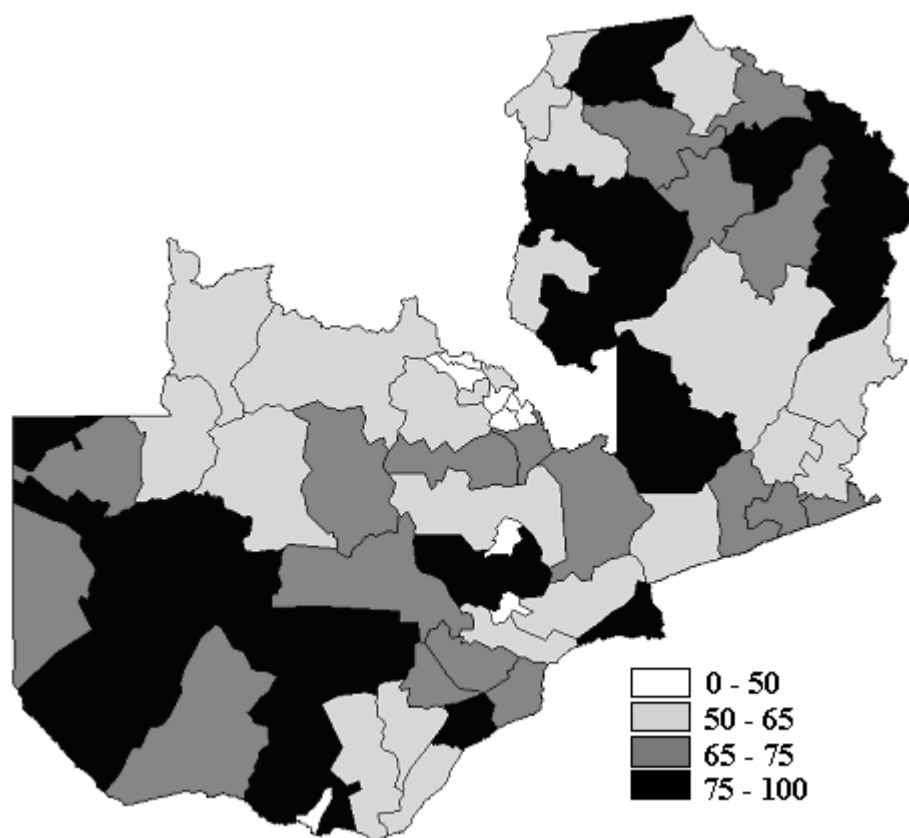
Source: Own calculations using the 1998 LCMS survey (CSO, 1999b).

Table A.4. Annual Production of Key Agricultural Crops (1990-1999)

|	Annual production (millions of metric tons)						
	Maize	**Millet**	**Sorghum**	**Cassava**	**Ground-nuts**	**Sugar**	**Cotton**
1990	1093	32	20	640	25	1127	31
1991	1096	26	21	682	28	1150	49
1992	483	48	13	682	21	1300	26
1993	1598	37	35	744	34	1220	48
1994	1021	63	35	744	35	1311	33
1995	738	55	27	744	36	1310	17
1996	1409	55	36	744	35	1400	41
1997	960	61	31	702	46	1500	80
1998	638	62	25	817	57	1550	105
1999	822	70	25	971	51	1650	140

Source: Food and Agriculture Organization (FAOSTAT, 2003).

Figure A.7. Relative Crop Prices (1994-1998)
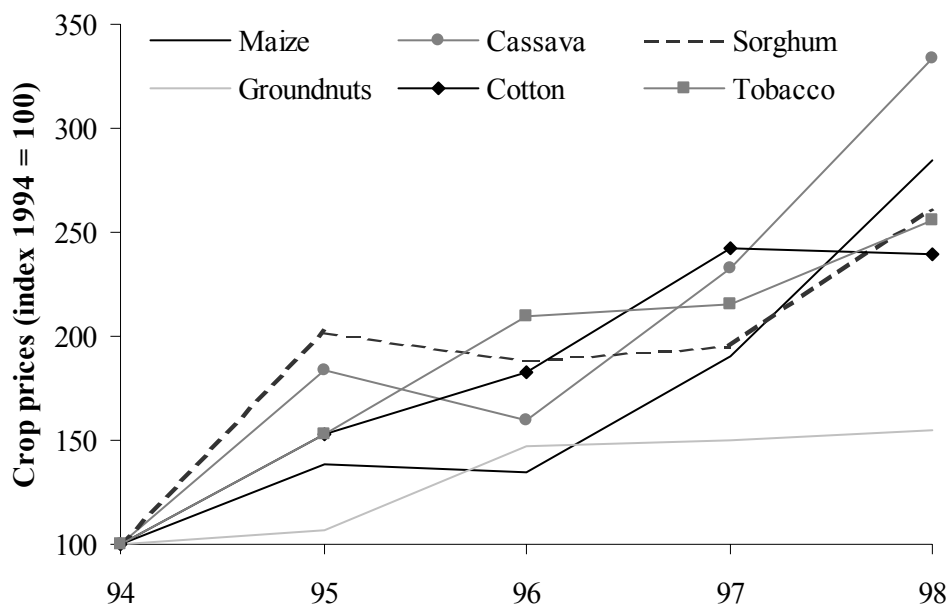
Source: Own calculations using Post-Harvest Crop Surveys (various years).

Figure A.8. Provincial Maize Prices (1993-1998)
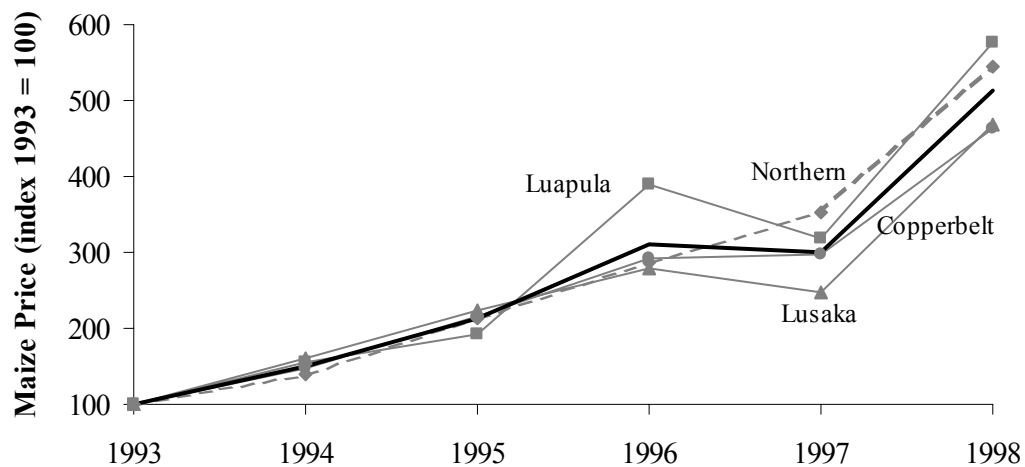
Source: Famine Early Warning System (FEWS).

Table A.5.   HIV/AIDS Prevalence Rates in Zambia (2001)

	Adult prevalence rate (%)		
	Male	**Female**	**Total**
National	12.9	17.8	15.6
Urban	19.2	26.3	23.1
Rural	8.9	12.4	10.8
Central	13.4	16.8	15.3
Copperbelt	17.3	22.1	19.9
Eastern	11.0	16.1	13.7
Luapula	8.6	13.3	11.2
Lusaka	18.7	25.0	22.0
Northern	6.2	10.0	8.3
North-Western	9.5	8.8	9.2
Southern	14.6	20.2	17.6
Western	8.3	16.9	13.1

Source: *2001/02 Demographic and Health Survey (CSO, 2002).*

Table A.6.   Governance Indicators (1996-2002)[1]

	1996	**1998**	**2000**	**2002**
Voice and Accountability				
Point estimate (-2.5 to 2.5)	-0.15	-0.11	-0.24	-0.4
Percentile rank	48.2	46.6	43.5	39.4
Political Stability				
Point estimate (-2.5 to 2.5)	-0.39	-0.04	-0.48	-0.02
Percentile rank	27.4	45.5	30.9	44.3
Government Effectiveness				
Point estimate (-2.5 to 2.5)	-0.81	-0.39	-0.79	-0.93
Percentile rank	16.2	38.3	22.3	14.4
Regulatory Quality				
Point estimate (-2.5 to 2.5)	0.18	0.32	0.43	-0.6
Percentile rank	64.1	59.8	65.4	29.9
Rule of Law				
Point estimate (-2.5 to 2.5)	-0.33	-0.34	-0.47	-0.52
Percentile rank	41.0	41.6	43.8	35.6
Control of Corruption				
Point estimate (-2.5 to 2.5)	-0.91	-0.56	-0.85	-0.97
Percentile rank	16.0	33.3	20.7	17.0

Source: World Bank Governance Indicators (Kaufman et al., 2004).
[1]. Each of the following governance indicators are composites of a series of existing measures reflecting different dimensions of each area of governance. The estimates range from –2.5 (bad) to 2.5 (good). For information on the calculation of these measures and on their standard errors, see Kaufman et al. (2004).

Table A.7.   Detailed Macroeconomic Results for Simulations, 2001-2015

	Initial value (Kw bil., 2001)	Average annual growth rate (%), 2001-2015							
		current growth path	*copper-led growth*	*agriculture-led growth*	*non-agric-led growth*	*staples-led growth*	*staples market access*	*cash-crop-led growth*	*cash-crops market access*
Gross domestic product	12,007	4.0	5.0	5.0	5.0	5.0	5.1	5.0	5.6
Private consumption	10,864	2.9	5.9	3.9	3.7	3.9	4.4	3.7	4.5
Investment	2,634	2.2	8.1	3.7	3.6	3.5	4.2	4.7	6.1
Government	1,709	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Agriculture	2,963	4.6	3.3	7.7	4.2	7.8	8.1	7.1	8.6
Staples	2,709	4.1	3.7	7.3	4.0	8.0	8.4	4.0	3.4
Cash-crops	168	10.2	-7.2	13.4	7.1	7.0	3.5	22.8	27.2
Industry	3,276	3.6	6.3	3.4	4.5	3.4	3.6	3.3	3.6
Mining	1,325	1.9	8.6	1.9	1.9	1.9	1.9	1.9	1.9
Manufacturing	1,951	4.5	4.2	4.3	5.8	4.3	4.7	4.2	4.6
Services	5,768	3.9	4.9	4.1	5.6	4.0	4.0	4.7	4.7
Real exchange rate		0.9	-3.5	-0.2	0.1	-0.1	-0.4	-1.3	-1.9
Exports	3,804	5.5	6.2	6.5	7.1	6.4	6.8	7.5	9.9
Agriculture	368	11.3	-12.5	18.8	6.8	18.4	19.9	22.2	26.9
Staples	122	10.7	-10.8	22.9	5.4	26.1	28.9	-0.8	-5.5
Cash-crops	244	11.6	-13.5	15.7	7.4	8.4	3.8	25.7	30.6
Industry	3,070	3.9	7.6	2.6	4.3	2.8	2.5	1.6	1.1
Mining	2,501	1.3	9.1	1.2	0.8	1.2	1.2	1.2	1.0
Manufacturing	394	10.1	-14.0	6.3	13.1	6.8	6.1	3.2	1.5
Services	366	8.5	-5.2	3.9	17.6	4.2	3.4	2.1	1.1
Imports	5,860	2.6	8.5	3.5	3.7	3.4	3.9	4.5	6.3
Agriculture	416	0.3	11.9	-4.0	3.4	-2.4	-0.7	3.0	12.7
Staples	292	-0.4	13.0	-7.0	2.9	-7.2	-6.4	4.5	14.2
Cash-crops	116	1.6	7.4	0.8	4.4	3.6	5.6	-3.3	6.5
Industry	4,887	2.8	8.3	3.8	3.7	3.7	4.2	4.6	5.6
Mining	76	3.1	10.5	1.3	5.0	1.6	1.6	0.1	0.3
Manufacturing	4,812	2.8	8.2	3.8	3.7	3.7	4.2	4.6	5.6
Services	557	2.9	7.8	4.0	4.0	3.8	3.9	5.1	5.5

Source: Zambia CGE-micro model results.

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Table A.8.   Sectoral Shares for Simulations, 2001-2015

	Initial share of GDP in 2001	Final share of total in 2015							
		current growth path	*copper-led growth*	*agriculture-led growth*	*non-agric-led growth*	*staples-led growth*	*staples market access*	*cash-crop-led growth*	*cash-crops market access*
Gross domestic product	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	24.7	26.7	19.8	35.2	22.3	35.9	36.5	32.5	36.4
Staples	22.6	22.9	18.9	30.4	19.7	33.4	34.7	19.5	16.9
Cash-crops	1.4	3.1	0.2	4.1	1.9	1.8	1.1	12.4	18.9
Industry	27.3	25.8	32.4	22.0	25.5	22.1	22.4	21.7	20.8
Mining	11.0	8.3	17.8	7.2	7.3	7.3	7.1	7.2	6.7
Manufacturing	16.2	17.4	14.6	14.8	18.2	14.8	15.2	14.5	14.2
Services	48.0	47.5	47.8	42.8	52.1	42.1	41.1	45.8	42.8
Exports	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	9.7	20.4	0.7	45.1	9.2	43.1	48.8	58.6	72.1
Staples	3.2	6.3	0.3	24.1	2.6	34.6	44.4	1.1	0.4
Cash-crops	6.4	14.1	0.4	20.7	6.6	8.3	4.3	57.5	71.7
Industry	80.7	65.3	97.4	48.0	55.4	49.7	45.1	36.7	25.0
Mining	65.8	37.0	96.7	32.6	27.9	32.9	30.7	28.2	20.3
Manufacturing	10.4	18.9	0.5	10.2	22.0	10.9	9.4	5.8	3.4
Services	9.6	14.3	2.0	6.9	35.4	7.2	6.1	4.7	3.0
Imports	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Agriculture	7.1	5.1	10.8	2.5	6.8	3.2	3.8	5.8	16.0
Staples	5.0	3.3	8.8	1.1	4.5	1.1	1.2	5.0	13.6
Cash-crops	2.0	1.7	1.7	1.4	2.2	2.0	2.5	0.7	2.0
Industry	83.4	85.1	80.5	87.3	83.3	86.8	86.7	83.9	75.5
Mining	1.3	1.4	1.7	1.0	1.5	1.0	0.9	0.7	0.6
Manufacturing	82.1	83.7	78.9	86.3	81.8	85.8	85.8	83.2	75.0
Services	9.5	9.8	8.6	10.3	9.9	10.0	9.5	10.3	8.5

Source: Zambia CGE-micro model results.

Table A.9.   Detailed Poverty Results for Simulations, 2001-2015 (Upper Poverty Line)

	Initial poverty (2001)	Final poverty rate in 2015							
		current growth path	*copper-led growth*	*agriculture-led growth*	*non-agric-led growth*	*staples-led growth*	*staples market access*	*cash-crop-led growth*	*cash-crops market access*
Poverty headcount (P0)	75.4	68.3	56.6	59.4	63.9	59.5	54.5	62.0	55.8
Rural	85.6	78.4	74.7	68.1	76.4	68.1	61.2	72.3	64.2
Small-scale	86.4	79.0	76.5	68.1	77.2	68.0	60.4	73.0	64.4
Medium-scale	80.3	69.5	63.3	56.3	65.2	59.0	54.5	55.9	45.1
Non-farm	80.9	78.0	61.3	74.8	74.4	75.5	74.0	74.5	72.8
Urban	58.3	51.4	26.5	45.0	42.9	45.2	43.3	44.8	41.8
Low-cost	64.3	56.2	32.2	48.9	46.4	49.0	47.1	48.1	44.9
Medium-cost	50.1	47.1	12.6	43.6	41.9	44.1	41.9	45.4	42.3
High-cost	33.0	28.7	8.9	24.5	24.1	24.6	23.3	25.5	23.6
Province									
Central	78.9	73.8	60.5	66.4	70.1	66.5	64.2	67.7	61.9
Copperbelt	67.0	61.6	39.5	55.9	54.5	56.1	54.1	56.2	52.1
Eastern	82.6	67.1	70.0	56.0	68.3	62.5	58.1	51.0	36.7
Luapula	85.4	79.2	67.9	68.4	76.1	65.8	61.8	74.1	68.4
Lusaka	54.4	45.5	28.0	40.3	36.3	40.2	39.1	40.7	39.1
Northern	85.0	79.7	70.1	65.9	76.5	62.5	55.1	75.8	70.9
North-western	76.0	71.1	62.4	54.2	67.5	52.6	47.9	66.5	61.3
Southern	78.4	72.7	63.8	65.6	68.4	65.6	58.9	68.0	59.2
Western	90.3	87.3	78.4	77.9	83.9	76.6	56.7	83.3	78.0
Poverty severity (P2)	25.6	20.4	15.9	15.1	18.3	15.0	12.5	16.8	13.5
Rural	33.3	26.5	23.0	19.2	24.7	19.1	15.4	21.9	17.2
Small-scale	33.7	26.6	23.7	18.7	24.9	18.5	14.6	21.9	16.9
Medium-scale	27.7	21.1	18.6	15.5	19.6	15.9	12.9	16.1	11.3
Non-farm	32.2	29.3	17.6	26.4	25.7	27.0	25.8	26.0	24.6
Urban	12.6	10.2	4.0	8.2	7.7	8.3	7.7	8.2	7.3
Low-cost	14.9	11.8	4.9	9.3	8.7	9.4	8.8	9.1	8.1
Medium-cost	8.3	7.6	1.9	6.7	6.3	6.7	6.2	7.1	6.4
High-cost	4.8	4.3	0.9	3.5	3.4	3.5	3.2	3.9	3.3

<u>Source</u>: *Zambia CGE-micro model results.*
[1.] *The initial poverty rates in 2001 are the same as those 1998 (see Table 4) since the 2002 household survey containing information on poverty and distribution was not yet available.*

Table A.10.   Pro-Poor Growth Rates for Simulations (Upper Poverty Line)

	Average annual pro-poor growth rate (%)								
	1991-98	**2001-15**	**2001-15**	**2001-15**	**2001-15**	**2001-15**	**2001-15**	**2001-15**	**2001-15**
	structural adjustment	*current growth path*	*copper-led growth*	*agriculture-led growth*	*non-agric-led growth*	*staples-led growth*	*staples market access*	*cash-crop-led growth*	*cash-crops market access*
Upper poverty line									
National	1.1	1.3	2.9	2.9	2.0	2.9	3.7	2.4	3.4
Rural	4.0	1.5	2.4	3.4	2.0	3.4	4.5	2.7	4.1
Urban	-1.8	0.8	4.2	1.7	1.9	1.6	1.9	1.7	2.1
Central	-2.3	1.1	2.9	2.5	1.6	2.5	3.0	2.1	3.3
Copperbelt	-3.5	0.9	3.8	1.8	1.9	1.8	2.0	1.7	2.3
Eastern	5.7	2.5	2.0	4.4	2.2	3.6	4.2	5.2	7.6
Luapula	2.4	1.4	3.0	3.3	2.0	3.6	4.4	2.2	3.3
Lusaka	-4.2	1.1	3.6	2.0	2.4	2.0	2.2	1.8	2.2
Northern	4.1	1.3	2.7	3.5	1.9	3.9	4.9	2.0	2.9
North-western	2.6	1.2	2.5	3.5	1.8	3.9	4.4	2.0	2.9
Southern	1.3	1.3	2.6	2.6	2.0	2.6	3.8	2.3	3.8
Western	1.1	1.1	2.4	2.8	1.6	3.0	6.2	1.8	2.7

Source: Zambia CGE-micro model results; own calculations using Priority Survey (1991) and Living Conditions Monitoring Survey (1998) for 1991-1998.
[1.] *The initial poverty rates in 2001 are the same as those 1998 (see Table 4) since the 2002 household survey was not yet available.*

Figure A.9.   National and Provincial Growth Incidence Curves for Current Growth Path Simulation (2001-2015)
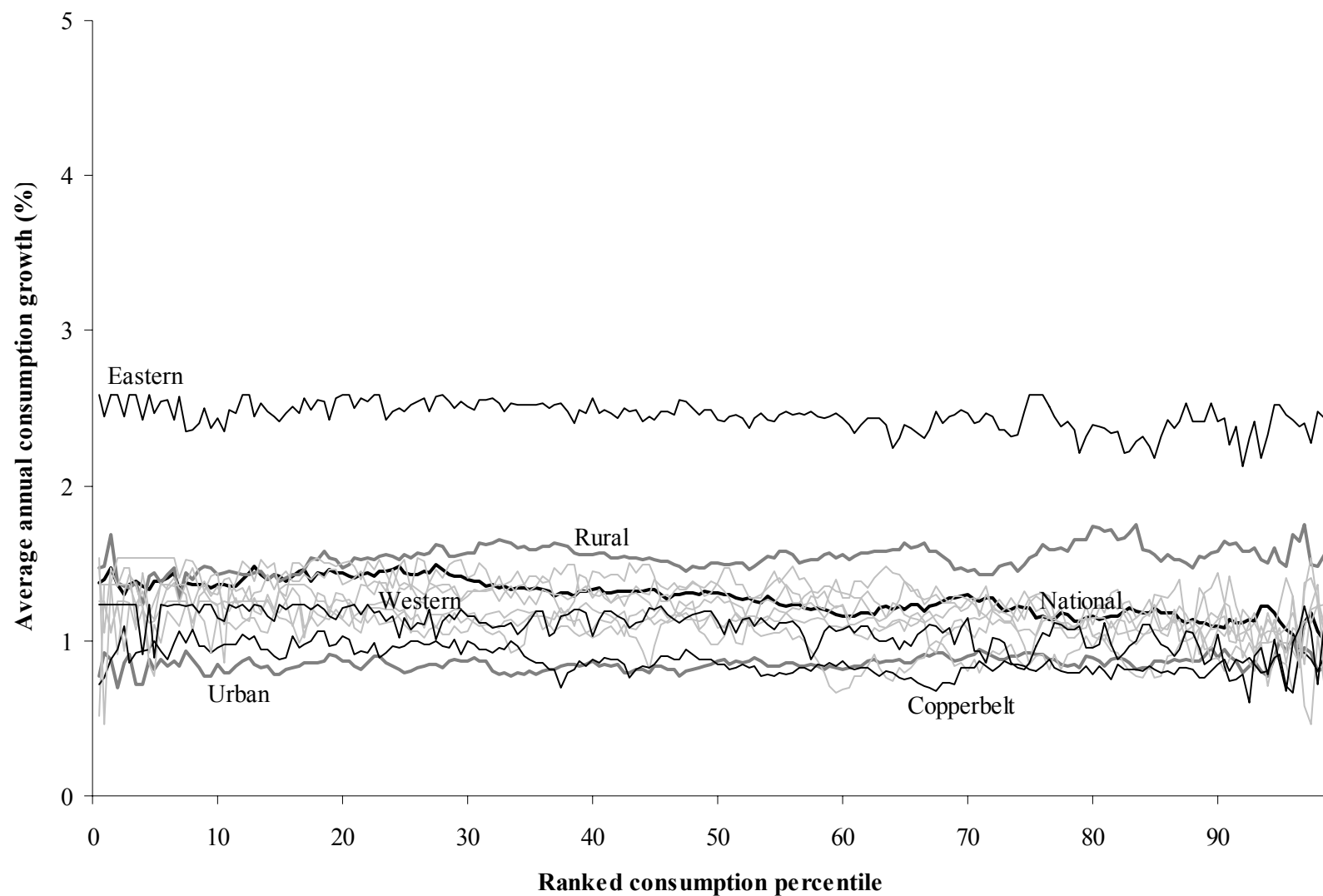
Figure A.10. National and Provincial Growth Incidence Curves for Copper-Led Growth Simulation (2001-2015)
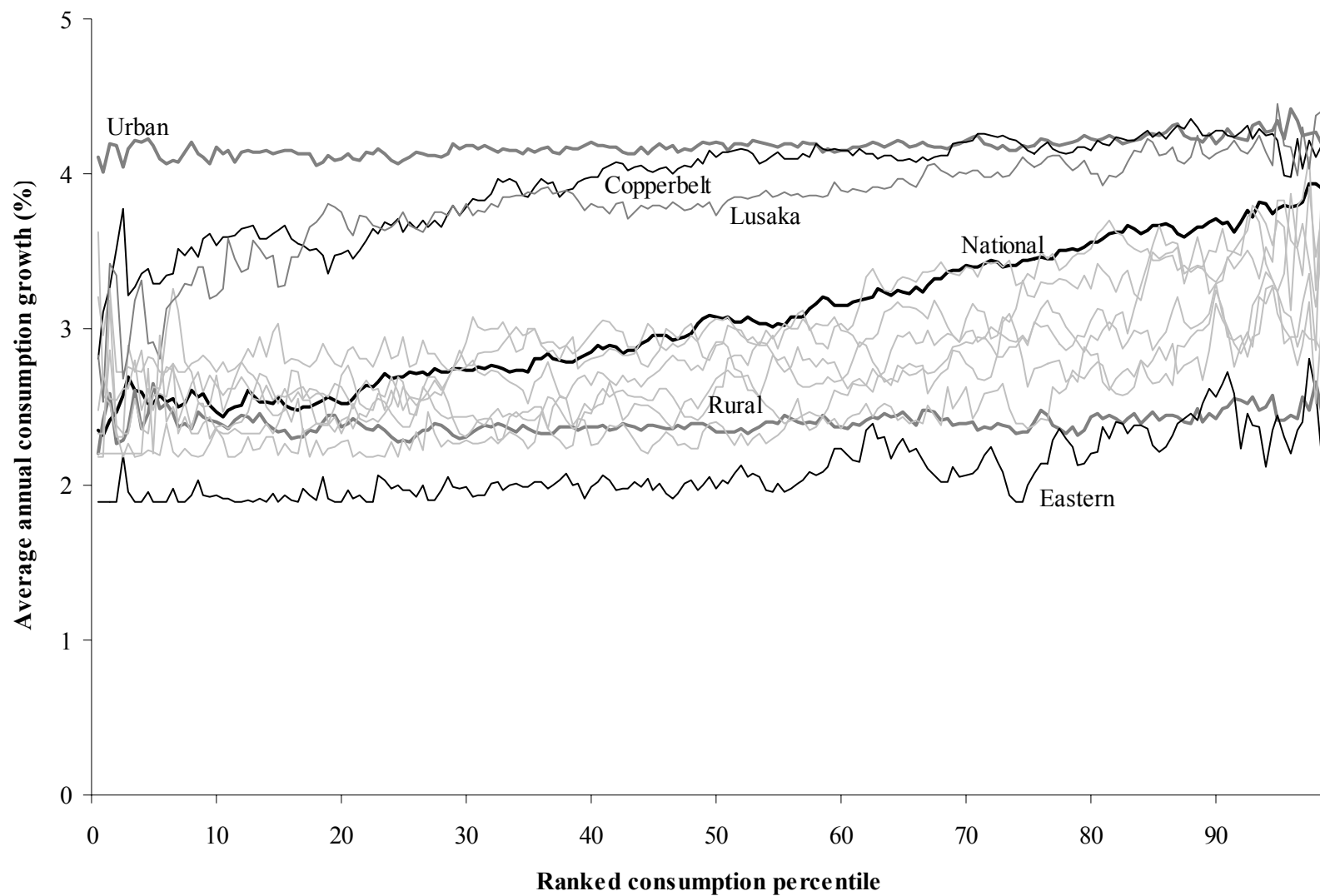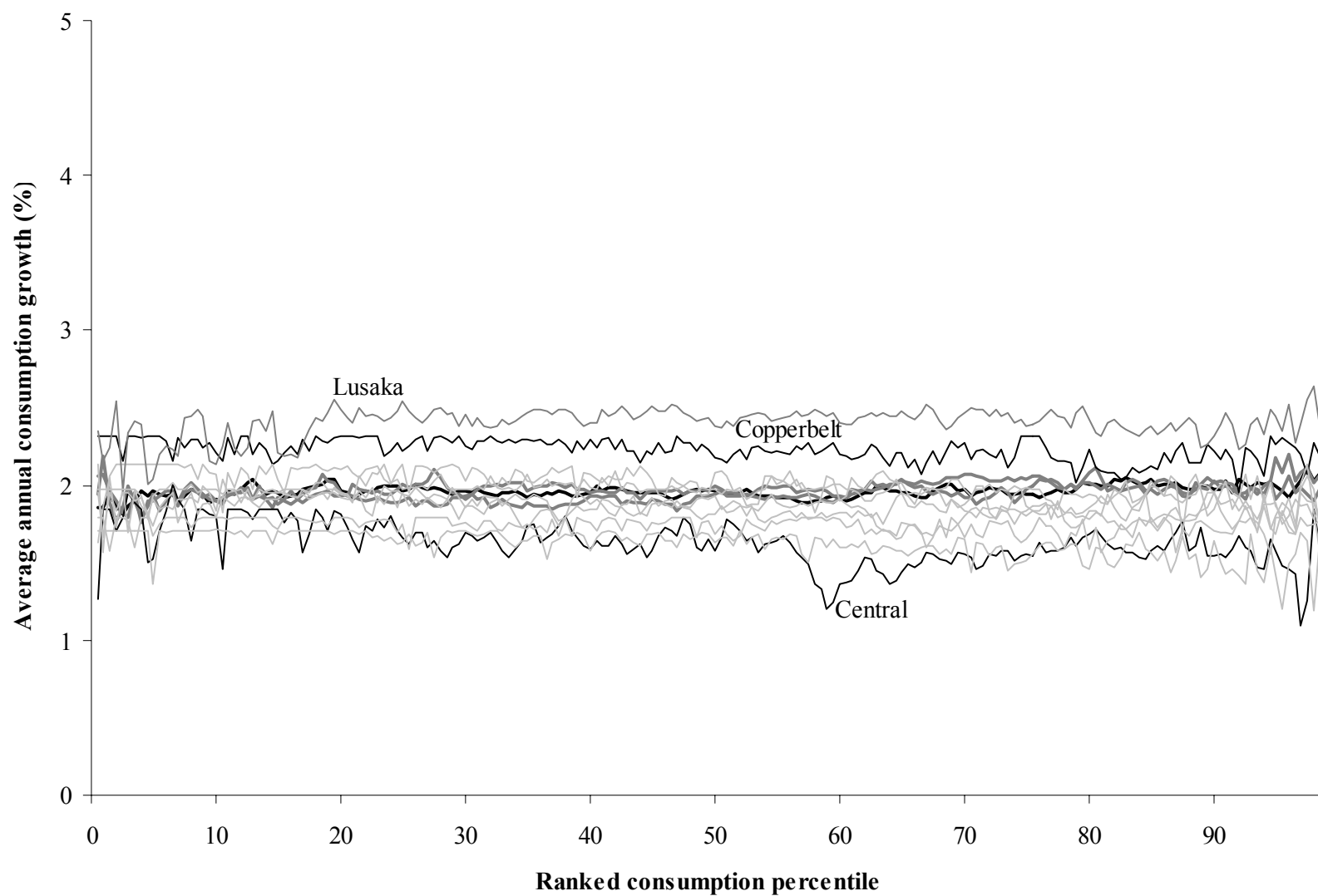

Source: Zambia CGE-micro model results

Figure A.11. National and Provincial Growth Incidence Curves for Agriculture-Led Growth Simulation (2001-2015)
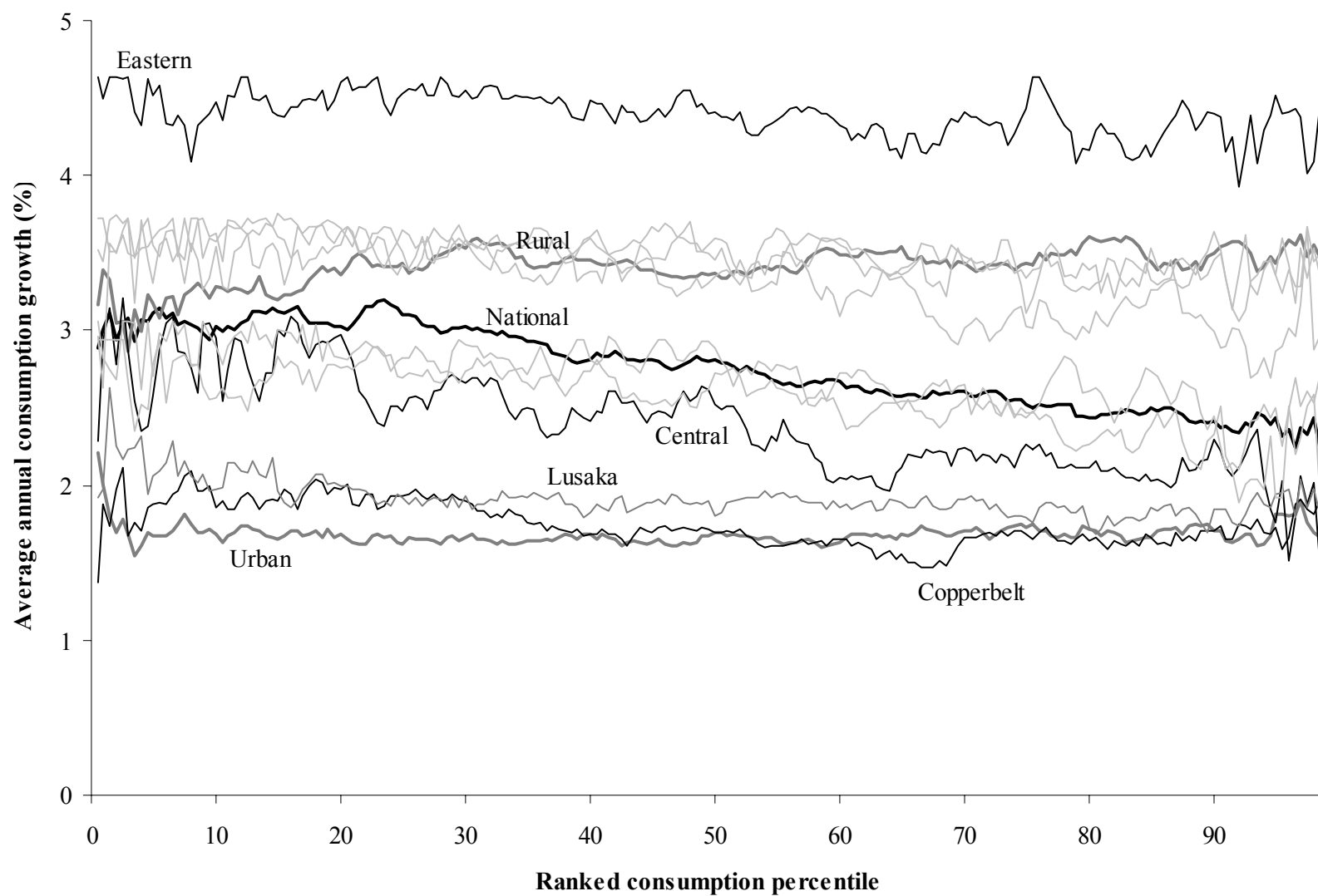
Source: *Zambia CGE-micro model results*

Figure A.12.   National and Provincial Growth Incidence Curves for Non-Agriculture-Led Growth Simulation (2001-2015)

Table A.11.   Growth Decomposition for Simulations

	Contribution to average annual GDP growth rate (%), 2001-2015				
	agriculture-led growth[1]	*staples-led growth*	*staples with market access*	*cash-crop-led growth*	*cash-crops with market access*
GDP at factor cost	5.0	5.0	5.1	5.0	5.6
Physical capital	1.4	1.4	1.5	1.6	1.7
Human capital	0.8	0.8	0.8	0.8	0.8
Total factor productivity	2.8	2.8	2.8	2.7	3.1
GDP at factor cost	5.0	5.0	5.1	5.0	5.6
Agriculture	2.3	2.4	2.7	2.2	3.1
Mining	0.1	0.1	0.1	0.1	0.1
Manufacturing	0.7	0.7	0.7	0.6	0.6
Services	1.9	1.8	1.7	2.2	1.8

Source: Zambia CGE-micro model results.
[1]. *Simulation results from Table 17.*

Table A.12.   Poverty Changes for Simulations (Upper Poverty Line)

	Final poverty rate in 2015				
	agriculture-led growth[1]	*staples-led growth*	*staples with market access*	*cash-crop-led growth*	*cash-crops with market access*
Headcount (P0)	59.4	59.5	54.4	62.0	55.8
Rural	68.0	68.1	61.1	72.3	64.2
Small-scale	68.1	68.0	60.4	73.0	64.5
Medium-scale	56.3	59.0	54.5	55.9	45.1
Urban	45.0	45.2	43.3	44.8	41.8
Squared poverty gap (P2)	15.1	15.0	12.5	16.8	13.5
Rural	19.2	19.1	15.4	22.0	17.2
Small-scale	18.7	18.5	14.6	21.9	16.9
Medium-scale	15.5	15.9	12.8	16.1	11.3
Urban	8.2	8.3	7.7	8.2	7.3

Source: Zambia CGE-micro model results.
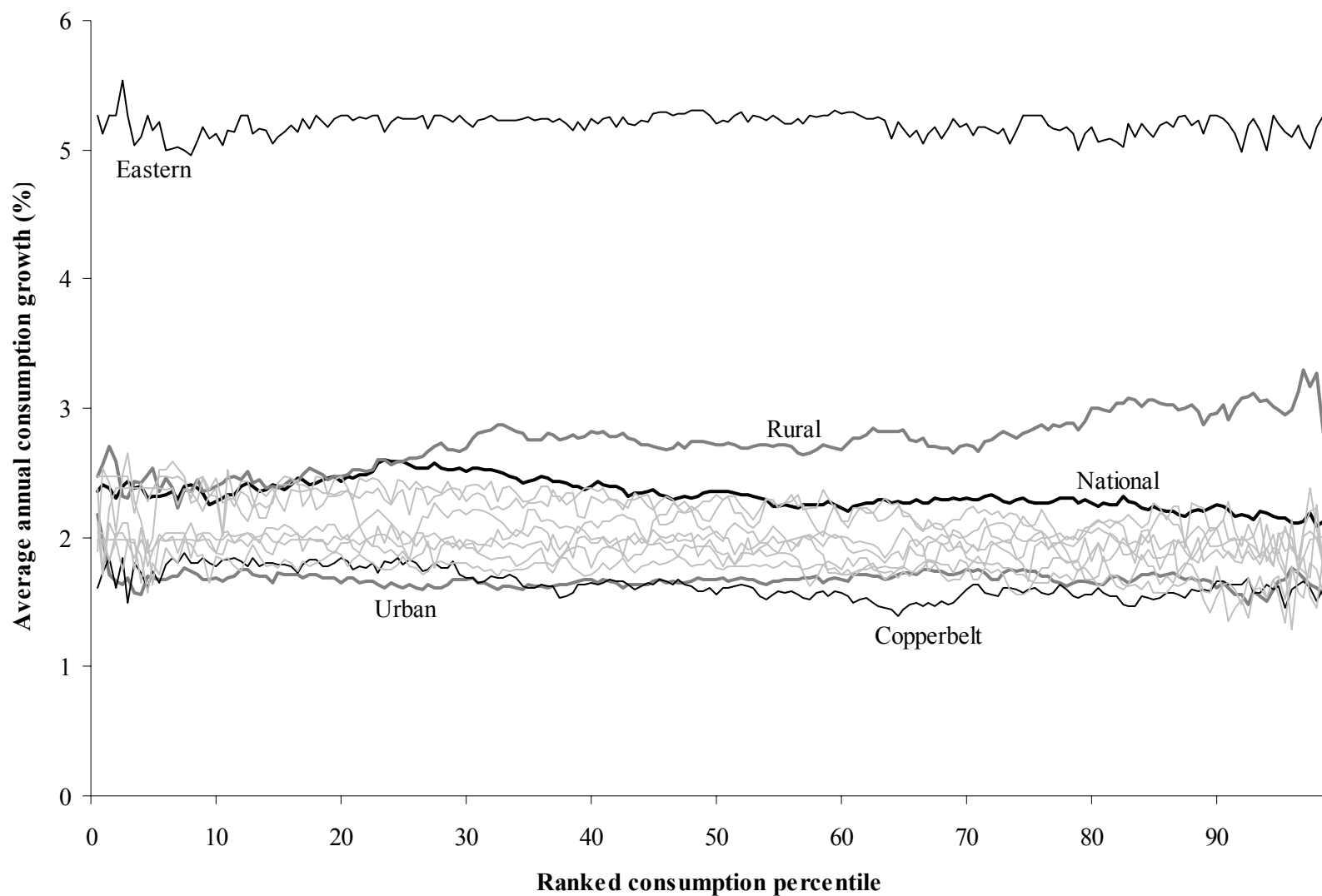[1]. *Simulation results from Table 17.*

Figure A.13. National and Provincial Growth Incidence Curves for Staples-Led Growth Simulation (2001-2015)
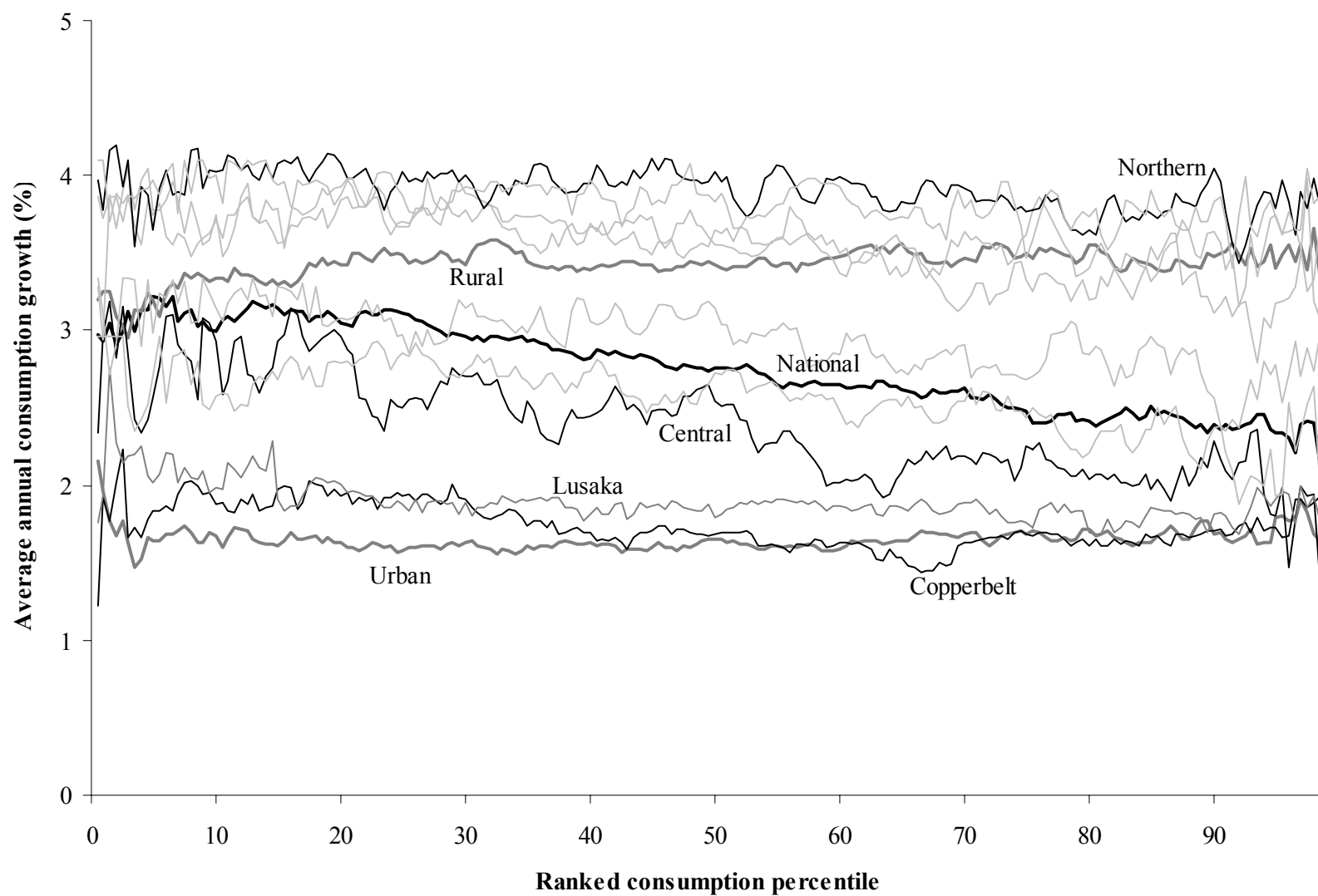
Source: *Zambia CGE-micro model results*

Figure A.14.   National and Provincial Growth Incidence Curves for Cash-Crop -Led Growth Simulation (2001-2015)

Source: Zambia CGE-micro model results

APPENDIX B.   POVERTY ANALYSIS AND HOUSEHOLD SURVEYS

Household Surveys

Three nationally representative household surveys (1991, 1996 and 1998) were used for the poverty and inequality analysis. McCulloch *et al*. (2001) describe the cleaning of the surveys in detail. A brief summary is provided here. The first survey is the 1991 Priority Survey (PS) (CSO, 1993), which was conducted between October and November and included information on household income and cash expenditures for a sample of 9,886 households. The 1991 PS failed to capture information on home produced consumption. Although the 1991 PS is representative at the provincial level (using the 1990 census), it did exclude a number of districts. The second and third surveys were the 1996 and 1998 Living Conditions Monitoring Surveys (LCMS). These surveys covered additional questions regarding migration and access to facilities. The 1996 LCMS sampled 11,752 households, again representative at the provincial level, but covering all districts based on a revised classification. The larger 1998 LCMS effectively sampled 16,800 households between November and December. Stratification in rural areas was based on farm scale and non-agricultural activity, while urban areas was based on housing cost areas (as defined by local government councils).

Expenditure Measure

Household consumption expenditure was the chosen welfare indicator. McCulloch et al. (2001) describe in detail the calculation of the per capita adult equivalent consumption measure used in this study. The measure included household spending on food, education, health, clothing, housing and transport. Amongst other items, the expenditure measure excluded alcohol, entertainment and cigarettes. The 1991 did not account for home produced consumption, but rather imputed a value for each household, which is included in the expenditure measure used in this study. As described in McCulloch *et al*. (2001), the bottom end of the consumption distribution for the 1991 PS shows implausibly low food consumption values. These are excluded from the sample.

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Poverty Lines

Upper and lower national poverty lines were computed by McCulloch *et al.* (2001). These were set at K46, 286 and K32,232 per adult equivalent per month in 1998 prices, and correspond to the official basic needs (moderate) and food (extreme) poverty lines. The lower poverty line satisfies nutritional requirements (corresponds to US$0.50 per day). The upper poverty line adds another 30% for basic non-food needs (corresponds to US$0.78 per day). The US$1 per day per capita (PPP) poverty line, which is useful for international comparison, produces extremely high poverty rates (above 90%) and is therefore not useful for our purposes.

Pro-Poor Growth

The growth process is defined as 'pro-poor' if and only if poor people benefit in absolute terms (Ravallion, 2004; Ravallion and Chen, 2003). Based on this *absolute* definition of pro-poor growth, the pro-poor growth rate is the average annual growth rate of real per capita consumption between two periods for each percentile of the population falling below the poverty line. In other words, it is the mean consumption growth rate of the poor, which can be derived from the growth incidence curves.

Growth Incidence Curves

The growth incidence curve indicates the average annual real consumption growth for each percentile of the population ranked according to per capita consumption (Ravallion and Chen, 2003). As already described above, the differences in design and methodology of the 1991, 1996 and 1998 surveys lead to unreliable consumption changes at the very bottom end of the distribution. The annual growth rates for the very poor appear to be implausibly high due to very low food expenditure in 1991, thus making the growth incidence curves steeply downward sloping. Accordingly, a cut-off point (ten percent of the lower poverty line) is arbitrarily adopted for the consumption measure. The growth incidence curves and pro-poor growth rates therefore do not include households that reported total adult equivalent per capita consumption of less than ten percent of the lower poverty line. Poverty and inequality measures shown other than the

pro-poor growth rate and growth incidence curve do not have this cut-off. The number and share of individuals eliminated from the 1991 survey are shown in Table B1. Although not shown, the households eliminated from the 1991 survey broadly match the stratification and distribution of the households eliminated from the 1996 and 1998 households and therefore does not greatly effect the *decomposition* of pro-poor growth across provinces and strata.

Table B1.   Household Eliminated from the 1991 Priority Survey

	Number of People		Percentage eliminated
	Original	Eliminated	
National	7,636,990	584,685	7.7
Rural	4,171,814	572,452	13.7
Small-scale	3,667,405	528,679	14.4
Medium-scale	205,948	18,705	9.1
Large-scale	17,598	639	3.6
Non-farm	280,863	24,429	8.7
Urban	3,465,176	12,233	0.4
Low-cost	1,835,440	5,626	0.3
Medium-cost	1,135,274	4,276	0.4
High-cost	494,462	2,331	0.5

Source: Own calculations using Priority Survey (1991) and Living Conditions Monitoring Surveys (1996 and 1998).

APPENDIX C.   THE MACRO-MICRO MODEL

The poverty and distributional impact of alternative development strategies is modeled using a extended regional version of the 2001 recursive dynamic computable general equilibrium (CGE) model described in Lofgren *et al.* (2004).[60] This class of model developed from the neoclassical-structuralist modeling originally tradition presented in Dervis, de Melo and Robinson (1982). The results from the economy-wide CGE model are passed down to the micro-level household survey.

CGE Model Specification

In accordance with the Zambian social accounting matrix (SAM), the model distinguishes between 243 productive activities (27 sectors in nine provinces) and the 27 commodities that they produce.[61] While production is generated within provinces, commodities are bought and sold on national markets. The model identifies 48 factors of production: 36 types of labor (male/female, low/high-educated, and by province); land (by province) and three types of capital (agricultural, mining, and other). Producers in the model make decisions in order to maximize profits, with the choice between province-specific factors being governed by a constant elasticity of substitution (CES) function. Once determined, these factors are combined under a fixed-share Leontief specification. Profit maximization implies that the factors receive income where marginal revenue equals marginal cost based on endogenous relative prices.

Substitution possibilities also exist between production for the domestic and the foreign markets. This decision of producers is governed by a constant elasticity of transformation (CET) function which distinguishes between exported and domestic goods, and by doing so, captures any time or quality differences between the two

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[60] A detailed description of the workings of the model can be found in Lofgren *et al.* (2001) and Thurlow (2003), while a generic version of the model is presented in Robinson and Thurlow (forthcoming). Although the regionalized SAM has not yet been documented, a national version of the SAM is described in Evans, Robinson and Thurlow (2004).

[61] The actual number of activities in the model differs since certain sectors are not present in all provinces (the actual total in 2001 is 232 activities).

products. Profit maximization drives producers to sell in those markets where they can achieve the highest returns. These returns are based on domestic and export prices (where the latter is determined by the world price times the exchange rate adjusted for any taxes). Under the small-country assumption, Zambia is assumed to face a perfectly elastic world demand at fixed world prices. The final ratio of exports to domestic goods is determined by the endogenous interaction of relative prices for these two commodity types.

Further substitution possibilities exist between imported and domestic goods under a CES Armington specification. Such substitution can take place both in final and intermediates usage. The Armington elasticities vary across sectors, with lower elasticities reflecting greater differences between domestic and imported goods. Again under the small country assumption, South Africa is assumed to face infinitely elastic world supply at fixed world prices. The final ratio of imports to domestic goods is determined by the cost minimizing decision-making of domestic demanders based on the relative prices of imports and domestic goods (both of which include relevant taxes).

The model distinguishes between various 'institutions' within the Zambian economy, including enterprises, the government, and 63 types of households. The household categories are disaggregated across provinces and according to economic stratum.[62] Households and enterprises receive income in payment for producers' use of their factors of production. Both institutions pay direct taxes to government (based on fixed tax rates), save (based on marginal propensities to save), and make transfers to the rest of the world. Enterprises pay their remaining income to households in the form of dividends. Households, unlike enterprises, use their income to consume commodities under a linear expenditure system (LES) of demand.

The government receives income from imposing activity, sales and direct taxes and import tariffs, and then makes transfers to households, enterprises and the rest of the world. The government also purchases commodities in the form of government

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[62] Stratum include rural small, medium and large-scale farmers; rural non-farm households; and urban low, medium, and high cost areas (defined according cost-of-living).

consumption expenditure, and the remaining income of government is (dis)saved. All savings from households, enterprises, government and the rest of the world (foreign savings) are collected in a savings pool from which investment is financed.

Macro Adjustment Rules

The model includes three broad macroeconomic accounts: (i) the savings and investment account; (ii) the current account, and (iii) the government balance. In order to bring about balance between the various macro accounts, it is necessary to specify a set of 'macroclosure' rules, which provide a mechanism through which macroeconomic balance can be achieved.

(i) A savings-driven closure was assumed in order to balance the Zambian savings-investment account. Under this closure, real investment quantities are fixed, and the marginal propensities to save of households and enterprises adjust to ensure that the level of investment and savings are equal at equilibrium.[63]

(ii) For the current account it was assumed that a flexible exchange rate adjusts in order to maintain a fixed level of foreign savings. In other words, the external balance is held fixed in foreign currency indicating the government is not able to borrow in order to cover additional expenditure. Finally, the domestic price index was chosen as the numéraire.

(iii) In the government account the level of direct and indirect tax rates, as well as real government consumption expenditure, are held constant. As such the balance on the government budget is assumed to adjust to ensure that public expenditures equal receipts.

On the microeconomic side, firms are assumed always to be on their factor demand curves. In the Zambian model it was assumed that all land and labor is fully employed and hence is paid a flexible real rental rate or wage under the condition of fixed supply. Capital is constrained to be sector-specific and earning flexible activity-specific returns.

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[63] There is no explicit specification of the financial sector in the CGE model.

CGE Model Dynamics

In order to account for the full 'dynamic' effect of policy and non-policy changes, the static model described above is extended to a recursive dynamic model in which selected parameters are updated based on the modeling of inter-temporal behavior and results from previous periods. Current economic conditions, such as the availability of capital, are endogenously dependent on past outcomes but remain unaffected by forward-looking expectations. The dynamic model is also exogenously updated to reflect demographic and technological changes that are based on observed or separately calculated projected trends. Most of these time-trends are taken from the World Bank's Zambian Revised Minimum Standards Model (RMSM) as described in detail in Lofgren et al. (2004).

The process of capital accumulation is modeled endogenously, with previous-period investment generating new capital stock for the subsequent period. Although the allocation of new capital across sectors is influenced by each sector's initial share of aggregate capital income, the final sectoral allocation of capital in the current period is dependent on the capital depreciation rate and on sectoral profit-rate differentials from the previous period. Sectors with above-average capital returns receive a larger share of the new capital stock than their current share in capital income. The converse is true for sectors where capital returns are below-average.

Population growth is exogenously imposed on the model based on separately calculated growth projections. It is assumed that a growing population generates a higher level of consumption demand and therefore raises the supernumerary income level of household consumption within the LES demand system. Both labor supply and total factor productivity (TFP) growth are updated exogenously based on AIDS-adjusted estimates (see Lofgren *et al*., 2004). Finally, mining production is assumed to be predominantly driven by a combination of changes in world demand and prices, and other factors external to the model. Accordingly, GDP growth in these sectors and in the world price of exports are updated exogenously between periods based on detailed sector-level projections (World Bank, 2004).

The dynamic model is solved as a series of equilibria each one representing a single year. By imposing the above policy-independent dynamic adjustments, the model produces a projected or counterfactual growth path. Policy changes can then be expressed in terms of changes in relevant exogenous parameters and the model is re-solved for a new series of equilibriums. Differences between the policy-influenced growth path and that of the counterfactual can then be interpreted as the economy-wide impact of the simulated policy.

Poverty Analysis

The poverty and distributional impact of policy changes are modeled inside the same 1998 LCMS household survey that was used to construct the CGE model. Each representative household in the CGE model is linked to its corresponding household within the survey. The use of 'representative' households in the model is identical to the use of sample weights in surveys. Each household is an average representative of a larger number of households within the greater population. Since poverty in this study is defined according to per capita expenditure, changes in household expenditure from the CGE model are passed down to the survey, where poverty and inequality are calculated (see Appendix A).

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