Economic Growth in Ghana and Convergence in Prevalence of Malnutrition between Agricultural and Non-agricultural Children

Roland Pongou
Department of Economics
Population Studies and Training Center
Brown University
Robinson Hall
64 Waterman Street
Providence, RI 02912
Tel: 402-863-6186
E-mail: Roland_Pongou@brown.edu

Jemima A. Frimpong
Health Care Systems Department
The Wharton School
University of Pennsylvania
3641 Locust Walk, Rm G7
Philadelphia, PA 19104
Tel: 215-417-8230
E-mail: frimpong@wharton.upenn.edu

Orly Clerge
Department of Sociology
Population Studies and Training Center
68 Waterman Street
Providence, RI 02912
Brown University
Tel: 402-863-6187
E-mail: Orly_Clerge@brown.edu

Abstract: Studies have documented increasing economic inequalities during periods of economic growth, the benefits of growth accruing more to the rich. We study trends in prevalence of malnutrition among children born to mothers engaged in the agricultural sector and those born to mothers engaged in the non-agricultural sector during economic growth of the 1980s and 1990s in Ghana. Malnutrition was significantly higher in the former group in 1988, but the gap substantially decreased during the period of macroeconomic improvement, indicating that policies implemented during this period were directed toward improving the conditions of the poor. This finding is contrary to expectations that richer households experience greater benefits of economic growth.

Introduction

Following the severe economic reversals experienced by many African countries in the 1980s and 1990s (Easterly and Levine, 1997), a major public policy goal has been to promote growth with the intent of restoring macroeconomic stability and improving social and individual well-being. At the country level, higher income has been found to be associated with better child health by most measures (Haddad et al., 2003; Behrman and Rosenzweig, 2004; Smith and Haddad, 2002; Prichett and Summers, 1996), leading to the conclusion that economic growth will improve health status (Smith and Haddad, 2002; Prichett and Summers, 1996). Studies have documented increased economic inequalities between the poor and the rich during period of growth. Such findings imply that the well-being of the poor improves less than that of the rich during periods of growth. In this study, we study trends in malnutrition among agricultural children and non-agricultural children during the period of economic growth in Ghana during the 1980s and 1990s (see figure 1). We find that malnutrition improved more in the former group compared to the latter group between 1988 and 2003, and the gap entirely closed when maternal and household characteristics were controlled for.

Economic growth in Ghana: Impact on the agricultural sector

The agricultural sector, the largest segment of the economy, which makes up 60% of total employment and 50% of total GDP, has been identified as the major contributor of the recent economic growth. The sector employs over half of the country's workforce, and also has the highest poverty rate. Poverty in Ghana has been associated with macroeconomic downturn attributed to import tax policies that were overly liberal, slowed down foreign assistance, and constrained the agriculture industry by inducing the withdrawal of government support (Kraev, 2004). Although the agricultural sector experienced a decline between years 1990-2003, it still accounts for a majority of the total economy and recent economic growth (Food Security Assessment, 2005). In recent years, the long-term importance of agriculture has declined as other industry such as manufacturing and services gains momentum.

Beginning with the drop in cocoa prices in the 1920s, men migrated to the city to seek opportunities in other sectors. The exodus of men from the agricultural sector lead to a greater role for women in rural areas, thus greater responsibilities in farming (Grier, 1989). This trend fluctuated over the years, with women taking more responsibility for agricultural work as men moved with changes in the economy and explore to emerging industries. It is also important to note that in Ghana, women produced a little over 80% of food consumed at the household and sold in the market (Valentine, 1995). In some regions (mostly rural coastal and rural forest), 40% of agriculture activities are operated by women, with women dominating agricultural processing activities (World Bank, 1995). Inflation dropped from 122% before reform to about 10% in 1992 (Figure 2). While this number may seem staggering, there exists a historical backdrop for countries like Ghana. Some studies that examined the production of cocoa in the colonial period stated that women and girls were the primary sources of labor in the country. Women are the primary producers of food, while men tend to produce cash crops. The author also reports that the disenfranchisement and practice of pawning women lead to the large number of Ghanaian women working on farms (Grier, 1989).

Ghana took advantage of the *Heavily Indebted Poor Country* (HIPC) initiative and reached its decision point in 2002. The improvements in macroeconomics allowed the

government to implement its reform agenda for the Ghana Poverty Reduction Strategy (GPRS). GPRS emphasizes wealth creation, improved government and reductions in income inequalities (World Bank, 2004). The agriculture sector has benefited from reforms that began in the 1980s, largely from government programs and policies that focused primary on developing and expanding the sector. Government policies such as the Cocoa and Pests Control Program, Agricultural Rehabilitation Project, Presidential Special Initiatives and Vaccination of Livestock programs have significantly aided the agricultural and livestock sectors. The effects of higher producer prices, access to credit and other favorable incentives to these sectors have had an impact on efficiencies in production of output (African Economic Outlook, 2006). The efforts from government lead to growth in the agricultural sector of 4-5% from 1995-2003 and had a significant impact on the economy of Ghana (Food Security Assessment, 2005).

Changes in the economy may offer some explanations to the increase in women involved in the agriculture sector. Given that recent growth has been dominated by growth in manufacturing and service sectors the possible migration of men may again explain the presence of women in the agriculture sector. Although women are predominant in the agricultural sector, they tend to have more presence in the production of food crops, an area where credit and technology is less available (International Fund for Agriculture and Development, 2002). Gender inequalities have disempowered women and negatively impact their use of land resources. Agricultural policy must then seriously consider the role of women, both historically and present in the economy (World Bank, 1995).

Recent reforms have begun to address inequalities as they relate to women in agriculture sector. Policies have begun to focus on the food crops sector. Women tend to have access to less fertile land, and mostly cultivate cassava (World Bank group, 1999). One of the key concerns is access to land, independent farming and access to financial gains from farming their own land. Changes to access to land has positively impacted women and improved to development opportunities and access and credits and knowledge (IFAD, 2006). Ghana's strategy is to emphasize the development of the market driven agriculture sector, with a goal to improve women's access to development opportunities.

Recent programs and projects such as the Root and Tuber Improvement and Marketing Program aims to increase income and value regenerated from root-based food crops. The root-based food crops sector is one that is predominately cultivated by women (IFAD, 2007). The International Foundation for Agricultural Development (IFAD), a specialized agency of the UN, was established in 1977 to address the food crisis of the early 1970s and sub-Saharan Africa. The IFAD has been investing in Ghana since the 1980s. The goal of the organization is to eradicate poverty by enabling the rural poor the opportunity to improve their lives in a manner that leads sustainability. The Foundation operates in partnership with country strategies to support policies in the agricultural and rural sector. The foundation also provides assistance to smallholder agriculture by supporting food production and agro-processing, especially for women engaged in production of food crops such as cassava (IFAD, 2007).

IFAD was implemented in 1993, the same time as the Economic Recovery Program (ERP) in Ghana. The ERP was introduced to reform areas such as trade a limitation of subsidies and price controls and put privatization of direct production and marketing of activities dominated by the public sector (IFAD, 2007). Under ERP the agricultural industry rate of growth was 1.7% annually from the years 1984 - 1992 and fell to 1.2% in 1990. The Medium-Term Agricultural Development Strategy (MTADS) was introduced in 1990 to address the lackluster performance of the sector, with the objective to emphasize the promotion of exports and liberalization of an agriculture prices, among other issues. Another reform, The Poverty Prevention Strategy (PPS) was initiated in 1993 to address the continuing poverty problem to agricultural policy from EPS emphasize policy alleviation. The Ghana vision 2020 published in 1995 identified those underprivileged in the agricultural sector to receive priority in resource allocation (IFAD, 2007).

It has been established that a significance numbers of rural farmers are women, and is mostly disenfranchised. To that end, this population is most likely to gain from policies such as the country's growth and poverty reduction strategy (GPRS). Those who produce food crops are more than 50% of the country's poor. Women are predominant in

production of food crops, sector with the highest poverty rates. Those greatly hit by poverty are mostly from the rural areas (IFAD, 2006). There has been a shift to farming of cash crops that require less landmass, and has lead to an increased need for labor (MacLean, 2004). Consequently in Ghana, women tend to have less access to land, thus are only able to explore cash crops (MacLean, 2004). Production of cassava grew rapidly in the year in 1991 to 2003. As noted earlier, lack of access to technology and an increase in production of crops mainly produced by women is indicative of the increase in the number of women in the agricultural sector (IFAD, 2007). Given gender inequalities in the country, rural poverty with a focus on vulnerable populations', with a focus on agricultural policies and rural women has become the objective of donor groups (IFAD, 2006). The focus on women addresses Millennium Development Goals 1, 3, and 7 (World Bank, 2007).

Recent agricultural policy has emphasized the importance of cassava production and the importance of smallholders who are producers of food crops. Several nongovernmental agencies (NGOs) have also influence agricultural policy formation and training of women in agriculture (Villars, 1999). While men dominated production of cocoa, there has been a shift to cash crop production making headway. Women have started tomato farms, and these new cash crop farmers are surpassing their male counterparts in terms of the value of producing tomatoes (MacLean, 2004). The Government of Ghana (GOG) put a multidisciplinary National Cassava Task Force in place in 1996 to promote production, consumption, and processing of the crop. The IFAD target's smallholders and near landless and women, especially those who are heads of households and producers of food crops (IFAD, 2007).

Methods

Data

Demographic and Health Surveys (DHS) were conducted in Ghana in 1988, 1993, 1998 and 2003. Designed to be representative at the national, urban-rural and regional levels, each survey used a two-stage probabilistic sample technique to select clusters at the first

level and households at the second level. In each household, information was collected on household socio-economic characteristics. The survey also included a questionnaire administered to women aged 15 to 49 years old, comprising a birth history, information on individual characteristics and health behaviors, and details on their children.

For children alive at survey (those aged 2-35 months in 1988, 0-35 months in 1993, 0-59 months in 1998, and 0-59 months in 2003), weight and height were measured and used to calculate anthropometric indicators: height-for-age (HAZ), weight-for-age (WAZ) and weight-for-height (WHZ) z scores using the United States National Center for Health Statistics/World Health Organization (NCHS/WHO) international reference. For comparability across years, we restrict our study to children aged 2-35 months at each survey.

Nutritional status is measured using anthropometric indicators. Stunting is defined as height-for-age (HAZ) 2 standard deviations (SDs) below the median of the NCHS/WHO international reference. Underweight and wasting are similarly defined, using weight-for-age (WAZ) and weight-for-height (WHZ) z-scores, respectively. HAZ is a measure of linear growth and reflects cumulated and chronic health insults. WHZ measures the nutritional effects of short-term shocks, while WAZ is though of as a composite index of HAZ and WHZ, and has been used in many epidemiological studies on the impact of child nutrition on mortality (Pelletier et al., 2003). While many studies have used each of these three indicators in isolation, we consider them altogether to assess their different and common underlying factors. Malnutrition is dummy indicator for whether a child presents any of the three forms of malnutrition just described.

Variables descriptions: Agricultural versus non-agricultural children

Children born to mothers engaged in the agricultural sector are similar to their counterparts born to mothers working in the non-agricultural sector along several characteristics. Among agricultural children, the fraction of boys decreased from 54 percent in 1988 to 48 percent 2003, while it alternated between 50 and 51 percent among non-agricultural children during this period. Average child age at survey was around 17-18 months old in both sectors, and was stable during the period of growth. The average birth order of agricultural children was higher in all years, indicating a higher fertility rate in agricultural households. While it decreased during the period of growth in general, the decrease was higher in non-agricultural households. The fraction of first born children was low in the agricultural sector, but increased by 4 percentage points from 8 percent to 12 percent between 1988 and 2003. A greater increase in this fraction was noted in the non-agricultural sector (22 percent in 1988 and 30 percent in 2003), indicating a higher drop in the fertility rate in this latter sector. While preceding birth interval remained stable at around 35-36 months among agricultural children, it increased from 30 to 35 months among non-agricultural children, which also indicates a higher drop in fertility rates in this latter group. Mother's age at a child birth increased by one year from 28.4 years in 1988 to 29.4 in 2003 in agricultural households, while it remains around 26-27 years in non-agricultural. Among agricultural households, the fraction of children born to married mothers at survey declined from 85 percent in 1988 to 75 percent in 1998, but rose to 88 percent in 2003, while in non-agricultural households, it declined from 85 percent in 1988 to 76 percent in 2003. While there was an overall decline in the proportion of children whose mothers were receiving monetary compensation for their work in agricultural households, this proportion increased by about 100% in non-agricultural households. While maternal education was nearly at the same level in agricultural households (4.45 years) and non-agricultural households (4.79 years), it decreased to 2.90 years in the former group, but increased to 5.93 years in the latter group. Agricultural households were poorer than non-agricultural households in all years, and the benefit of growth accrued more to the latter group as measured by the level of durable income index and access to health care. In the former group, the durable income index decreased from -0.15 to -0.18 between 1988 and 1993, but increased to -0.10 in

2003; in the latter group, it sharply rose from -0.03 in 1988 to 0.26 in 2003. As for the index of access to health care, it rose from -0.16 in 1988 to 0.17 in 1998 in agricultural households, but dropped to -0.13 in 2003. In non-agricultural households, there was a sharp increase in this index from 0.01 to 0.70 between 1988 and 1998, followed by a decrease to 0.55 in 2003. The decline in access to health care noted after 1998 may be attributable to the decentralization of the health care system in 1996 (MOH, 1998; Bossert and Beauvais, 2002; Nyonator and Kutzia, 1999), which resulted in an overall increase in user fees, and general decline in financing of health care sector, as evident in the drop of per capita health care expenditure between 1998 and 2003 (Figure 3). The fraction of children living in male-headed households increased from 64 percent in 1988 to 83 percent in 2003 in agricultural households, while in non-agricultural households, it decreased from 67 percent in 1988 to 57 percent in 1993, but increased again to 67 percent in 2003. The average age of household head declined from 42.6 years to 38.4 between 1988 and 1998 in agricultural households, but increased to 41.6 in 2003. In non-agricultural households, it decreased from 43.2 years in 1988 to 39.8 years in 2003. Agricultural children mostly lived in rural households, contrary to non-agricultural households. While the fraction of agricultural children living in urban areas decreased from 10 percent in 1988 to 4 percent in 1998, it increased to 9 percent in 2003, it sharply increased from 31 percent in 1988 to 52 percent in 2003.

Methods

$$(1) \qquad y_{ir} = \beta_0 + Year\eta + \delta Agric \sum_{t=1993,1998,2003} \beta_t \, Agric{*}year_t + X\alpha + \mu_r + \varepsilon_{ir}$$

where y_{ir} is a dichotomous outcome variable (stunting, wasting, underweight or malnutrition) for a child *i* in a community *r*, Year a vector of dummy indicators for years 1988, 1993 and 2003, Agric a dummy indicator for whether a child is born to a mother engaged in the agricultural sector, Agric*year (t) an interaction term between Agric and

year t, and β_t the differential change in prevalence of malnutrition between agricultural children and non-agricultural children during the period from 1988 and year t. Note the year 1998 is omitted and serves as the reference year. *X* is an array of variables including child bio-demographics, and maternal and household characteristics, which effects α are a vector of parameters to be estimated. We estimate (1) using OLS, and we correct for heterokedasticity and clustering of observations within sub-regions in the estimated standard errors. The results of this exercise are reported in Tables 2-5.

Preliminary results

Stunting: Trends and determinants of difference in stunting among agricultural and non-agricultural children.

According to the trends of stunting among agricultural and non-agricultural children in Ghana during the base year of 1988 to 2003, it is evident that there are several relationships that deserve attention. In the baseline year of 1988, we see that the difference between stunting among agricultural and non agricultural children in Ghana is 13.6 percentage points (see figure 4 and table 2). This difference decreases by 5 percentage points in fifteen years, revealing that the gap in stunting between nonagricultural and agricultural children sharply declined by 2003. This sharp decrease is a testament of the decline in the stunting of the latter group in comparison to the former. When child characteristics, such as age, sex and birth order are controlled for, the results demonstrate that the sharp decrease persists with a 7.1 percentage point difference between non-agricultural children and agricultural children overtime. However, it is not notably different from the test that did not control for children's characteristics in Column I.

Importantly, when we control for both the mother and the child characteristics, the gap between non-agricultural children and agricultural children shrinks, with a 6.6 percentage

point decrease from 1988 to 2003. The decrease in 1998 was statistically significant, which marks the importance of the 4.6 percentage point decline in that year.
However, the more fascinating results appear after controls are added. When we control for the child, mother and household characteristics, the gap between the stunting of non-agricultural and agricultural children practically closes during the fifteen year period, with a 2.4 percentage point difference.

The results for wasting (table 3, figure 5), underweight (table 4, figure 6), and malnutrition (figure 5, table 7) are similar to those for stunting.

Conclusion

The data indicates that there is much research to be done on the sharp decline in the differences in stunting, underweight and malnutrition among children born to agricultural and non-agricultural mothers. This near convergence of the prevalence of stunting in these two groups is noteworthy. The most important question is what are the factors behind the sharp decrease in stunting in agricultural children and what are the implications for future generation Ghanaian children. It is also important to note that our findings are contrary to general expectations, as studies have documented increased economic inequalities during periods of economic growth.

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Table 1: Summary statistics

	Agriculture								Non-Agriculture							
	1988		1993		1998		2003		1988		1993		1998		2003	
Variable	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
Child is male	0.54	0.50	0.50	0.50	0.48	0.50	0.48	0.50	0.50	0.50	0.51	0.50	0.50	0.50	0.51	0.50
Child age (months)	18.00	9.05	17.82	10.15	17.31	9.79	17.94	9.65	17.43	9.76	17.11	9.80	17.51	9.62	18.18	9.72
Child is first born	0.08	0.28	0.13	0.34	0.15	0.35	0.12	0.33	0.22	0.41	0.27	0.44	0.29	0.45	0.30	0.46
Preceding birth interval (months)	36.39	19.85	35.71	22.42	35.12	23.35	36.99	24.64	30.10	23.03	33.91	29.80	33.30	30.36	35.42	35.76
Birth order	4.54	2.43	4.05	2.33	4.25	2.58	4.30	2.46	3.71	2.42	3.07	2.01	3.08	2.19	2.96	2.00
Mother’s age at birth	28.40	6.43	28.32	7.02	28.56	7.01	29.39	7.09	26.96	6.87	26.46	6.30	26.71	6.68	26.96	6.56
Mother is Married	0.85	0.36	0.81	0.39	0.75	0.43	0.88	0.33	0.85	0.36	0.74	0.44	0.71	0.46	0.76	0.43
Mother works for cash	0.87	0.34	0.71	0.45	0.78	0.42	0.79	0.41	0.49	0.50	0.95	0.22	0.95	0.21	0.97	0.18
Mother’s education	4.45	4.33	3.04	3.91	2.87	3.73	2.90	3.71	4.79	4.52	6.14	4.44	5.99	4.65	5.93	4.56
Income (durable)	-0.15	0.14	-0.18	0.16	-0.15	0.17	-0.10	0.16	-0.03	0.32	0.10	0.49	0.14	0.49	0.26	0.56
Health care index	-0.16	1.35	-0.07	1.42	0.17	1.33	-0.13	1.35	0.01	1.38	0.51	1.22	0.70	1.03	0.55	1.08
Household head is male	0.64	0.48	0.73	0.45	0.73	0.44	0.83	0.37	0.67	0.47	0.57	0.49	0.61	0.49	0.67	0.47
Age of household head (years)	42.60	16.62	38.87	12.96	38.45	12.05	41.56	13.84	43.26	14.91	36.88	12.60	39.22	14.20	39.83	13.71
Urban	0.10	0.31	0.05	0.21	0.04	0.20	0.09	0.29	0.31	0.46	0.45	0.50	0.36	0.48	0.52	0.50
Western	0.10	0.31	0.11	0.31	0.15	0.36	0.10	0.30	0.10	0.29	0.08	0.28	0.11	0.31	0.11	0.32
Central	0.25	0.43	0.11	0.31	0.12	0.33	0.10	0.30	0.08	0.28	0.10	0.30	0.11	0.32	0.08	0.27
Greater Accra	0.03	0.18	0.01	0.08	0.02	0.15	0.02	0.13	0.12	0.32	0.16	0.36	0.16	0.36	0.17	0.38
Eastern	0.13	0.34	0.09	0.28	0.12	0.32	0.10	0.30	0.16	0.37	0.13	0.33	0.16	0.36	0.11	0.31
Volta	0.10	0.30	0.11	0.31	0.10	0.30	0.09	0.28	0.14	0.34	0.10	0.31	0.11	0.31	0.08	0.27
Ashanti	0.06	0.24	0.19	0.39	0.16	0.37	0.16	0.37	0.15	0.36	0.17	0.38	0.17	0.38	0.21	0.41
Brong Ahafo	0.28	0.45	0.12	0.32	0.11	0.31	0.14	0.35	0.13	0.34	0.09	0.29	0.06	0.24	0.08	0.28
Upper West, East, Northern	0.04	0.21	0.28	0.45	0.20	0.40	0.29	0.45	0.12	0.33	0.16	0.37	0.12	0.32	0.15	0.36
# Observations	202		723		569		879		1634		1028		1033		975	

Table 2: Trends in prevalence of stunting among agricultural and non-agricultural children in Ghana, 1988-2003

	I	II	III	IV
Year 1993	-0.071***	-0.056***	-0.053***	-0.052**
	[0.011]	[0.011]	[0.014]	[0.016]
Year 1998	-0.099***	-0.090***	-0.082***	-0.077***
	[0.014]	[0.013]	[0.012]	[0.014]
Year 2003	-0.044	-0.039	-0.028	-0.018
	[0.030]	[0.024]	[0.027]	[0.027]
Agriculture	0.136**	0.121**	0.126***	0.114***
	[0.046]	[0.041]	[0.032]	[0.026]
Agriculture*Year 1993	-0.006	-0.004	-0.02	-0.039
	[0.040]	[0.034]	[0.028]	[0.030]
Agriculture*Year 1998	-0.075	-0.064	-0.086**	-0.098**
	[0.042]	[0.041]	[0.034]	[0.032]
Agriculture*Year 2003	-0.057	-0.05	-0.069*	-0.092**
	[0.053]	[0.047]	[0.035]	[0.033]
Constant	0.285***	-0.038	0.309***	0.335***
	[0.022]	[0.035]	[0.048]	[0.075]
Child characteristics	N	Y	Y	Y
Mother's characteristics	N	N	Y	Y
Household characteristics	N	N	N	Y
Observations	7043	7043	7043	7043
R-squared	0.02	0.10	0.11	0.13

Note: Child characteristics include sex, age and its square, whether a child is a first born, preceding birth interval and its square, and birth order and its square. Mother's characteristics include age at child birth, marital status, education, and whether she works for cash. Household characteristics include income (durable), health care index, sex of household head, age of household head, place of residence, and a set of dummies for region of residence.

Standard errors are in brackets and are corrected for heterokedasticity and clustering of observations within regions.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: Trends in prevalence of wasting among agricultural and non-agricultural children in Ghana, 1988-2003

	I	II	III	IV
Year 1993	0.023	0.027	0.025	0.026
	[0.016]	[0.015]	[0.016]	[0.016]
Year 1998	0.042*	0.046**	0.045*	0.046*
	[0.019]	[0.019]	[0.020]	[0.021]
Year 2003	0.019	0.024	0.023	0.023
	[0.016]	[0.014]	[0.016]	[0.018]
Agriculture	0.006	-0.004	-0.002	-0.004
	[0.017]	[0.019]	[0.019]	[0.017]
Agriculture*Year 1993	0.027	0.036	0.035	0.03
	[0.021]	[0.020]	[0.020]	[0.020]
Agriculture*Year 1998	0.032	0.038	0.035	0.034
	[0.027]	[0.027]	[0.029]	[0.028]
Agriculture*Year 2003	-0.005	-0.001	-0.004	-0.008
	[0.025]	[0.026]	[0.026]	[0.024]
Child characteristics	N	Y	Y	Y
Mother's characteristics	N	N	Y	Y
Household characteristics	N	N	N	Y
Constant	0.078***	-0.055	-0.074	-0.087
	[0.010]	[0.033]	[0.052]	[0.065]
Observations	7043	7043	7043	7043
R-squared	0.01	0.03	0.03	0.04

Note: Child characteristics include sex, age and its square, whether a child is a first born, preceding birth interval and its square, and birth order and its square. Mother's characteristics include age at child birth, marital status, education, and whether she works for cash. Household characteristics include income (durable), health care index, sex of household head, age of household head, place of residence, and a set of dummies for region of residence.

Standard errors are in brackets and are corrected for heterokedasticity and clustering of observations within regions.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Trends in prevalence of underweight among agricultural and non-agricultural children in Ghana, 1988-2003

	I	II	III	IV
Year 1993	-0.060*	-0.046	-0.035	-0.041
	[0.026]	[0.027]	[0.032]	[0.029]
Year 1998	-0.058**	-0.051**	-0.033	-0.032
	[0.018]	[0.020]	[0.022]	[0.021]
Year 2003	-0.071**	-0.065**	-0.045	-0.042
	[0.026]	[0.024]	[0.031]	[0.031]
Agriculture	0.116**	0.095*	0.109**	0.097**
	[0.038]	[0.042]	[0.038]	[0.032]
Agriculture*Year 1993	0.009	0.021	-0.005	-0.022
	[0.039]	[0.044]	[0.028]	[0.027]
Agriculture*Year 1998	-0.042	-0.027	-0.059	-0.07
	[0.043]	[0.049]	[0.042]	[0.041]
Agriculture*Year 2003	-0.063*	-0.054	-0.083**	-0.105**
	[0.032]	[0.039]	[0.031]	[0.032]
Child characteristics	N	Y	Y	Y
Mother's characteristics	N	N	Y	Y
Household characteristics	N	N	N	Y
Constant	0.290***	-0.051	0.185*	0.252*
	[0.022]	[0.054]	[0.095]	[0.116]
Observations	7043	7043	7043	7043
R-squared	0.01	0.07	0.08	0.10

Note: Child characteristics include sex, age and its square, whether a child is a first born, preceding birth interval and its square, and birth order and its square. Mother's characteristics include age at child birth, marital status, education, and whether she works for cash. Household characteristics include income (durable), health care index, sex of household head, age of household head, place of residence, and a set of dummies for region of residence.

Standard errors are in brackets and are corrected for heterokedasticity and clustering of observations within regions.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Trends in prevalence of malnutrition among agricultural and non-agricultural children in Ghana, 1988-2003

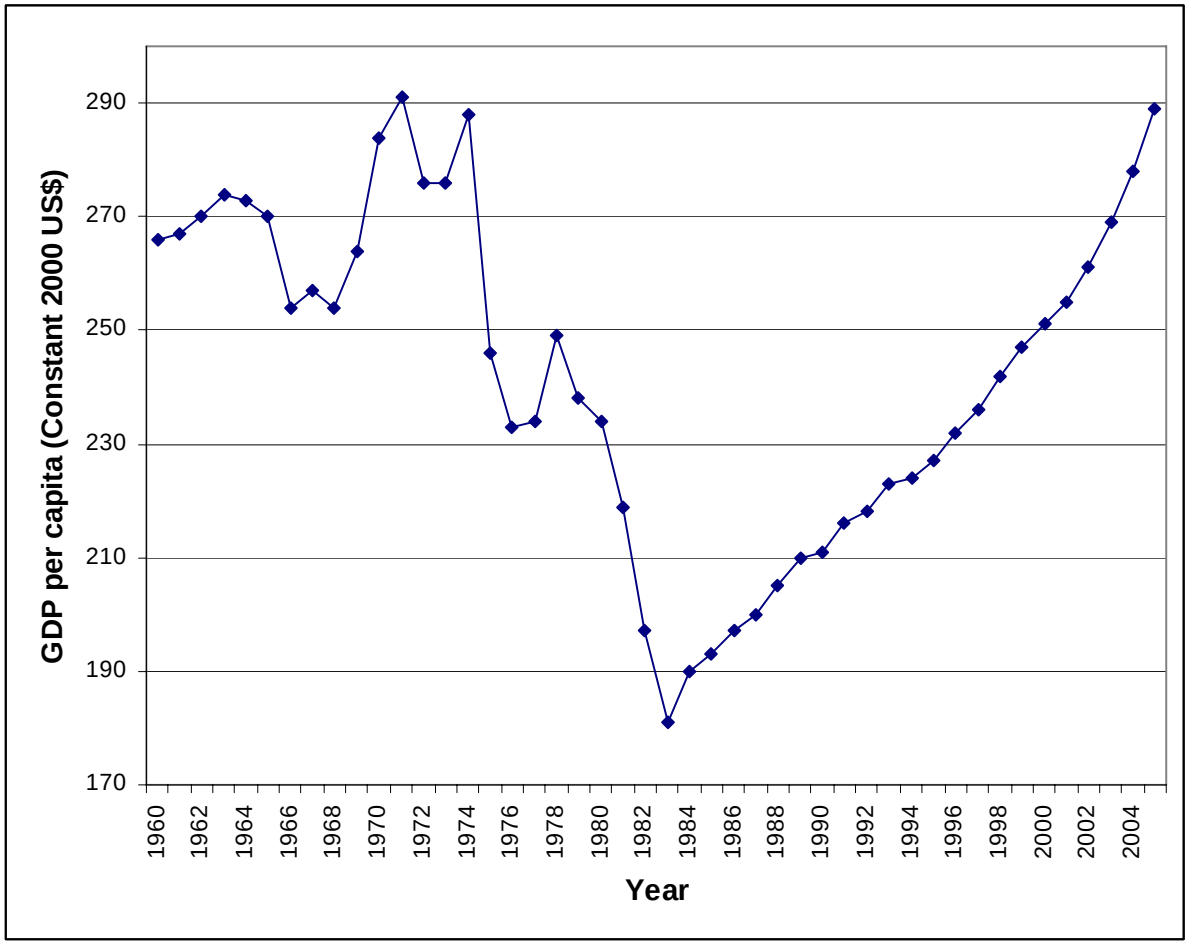
	I	II	III	IV
Year 1993	-0.058***	-0.039**	-0.034	-0.031
	[0.015]	[0.017]	[0.023]	[0.021]
Year 1998	-0.049**	-0.037**	-0.025	-0.02
	[0.016]	[0.014]	[0.014]	[0.013]
Year 2003	-0.026	-0.017	-0.002	0.009
	[0.034]	[0.027]	[0.032]	[0.031]
Agriculture	0.145**	0.120**	0.131***	0.119***
	[0.047]	[0.043]	[0.034]	[0.031]
Agriculture*Year 1993	0.007	0.018	-0.004	-0.029
	[0.040]	[0.035]	[0.021]	[0.018]
Agriculture*Year 1998	-0.06	-0.044	-0.071	-0.087*
	[0.052]	[0.055]	[0.046]	[0.042]
Agriculture*Year 2003	-0.072	-0.062	-0.087*	-0.115**
	[0.057]	[0.056]	[0.042]	[0.033]
Child characteristics	N	Y	Y	Y
Mother's characteristics	N	N	Y	Y
Household characteristics	N	N	N	Y
Constant	0.389***	-0.037	0.269***	0.278***
	[0.020]	[0.043]	[0.053]	[0.077]
Observations	7043	7043	7043	7043
R-squared	0.01	0.09	0.10	0.11

Note: Child characteristics include sex, age and its square, whether a child is a first born, preceding birth interval and its square, and birth order and its square. Mother's characteristics include age at child birth, marital status, education, and whether she works for cash. Household characteristics include income (durable), health care index, sex of household head, age of household head, place of residence, and a set of dummies for region of residence.

Standard errors are in brackets and are corrected for heterokedasticity and clustering of observations within regions.

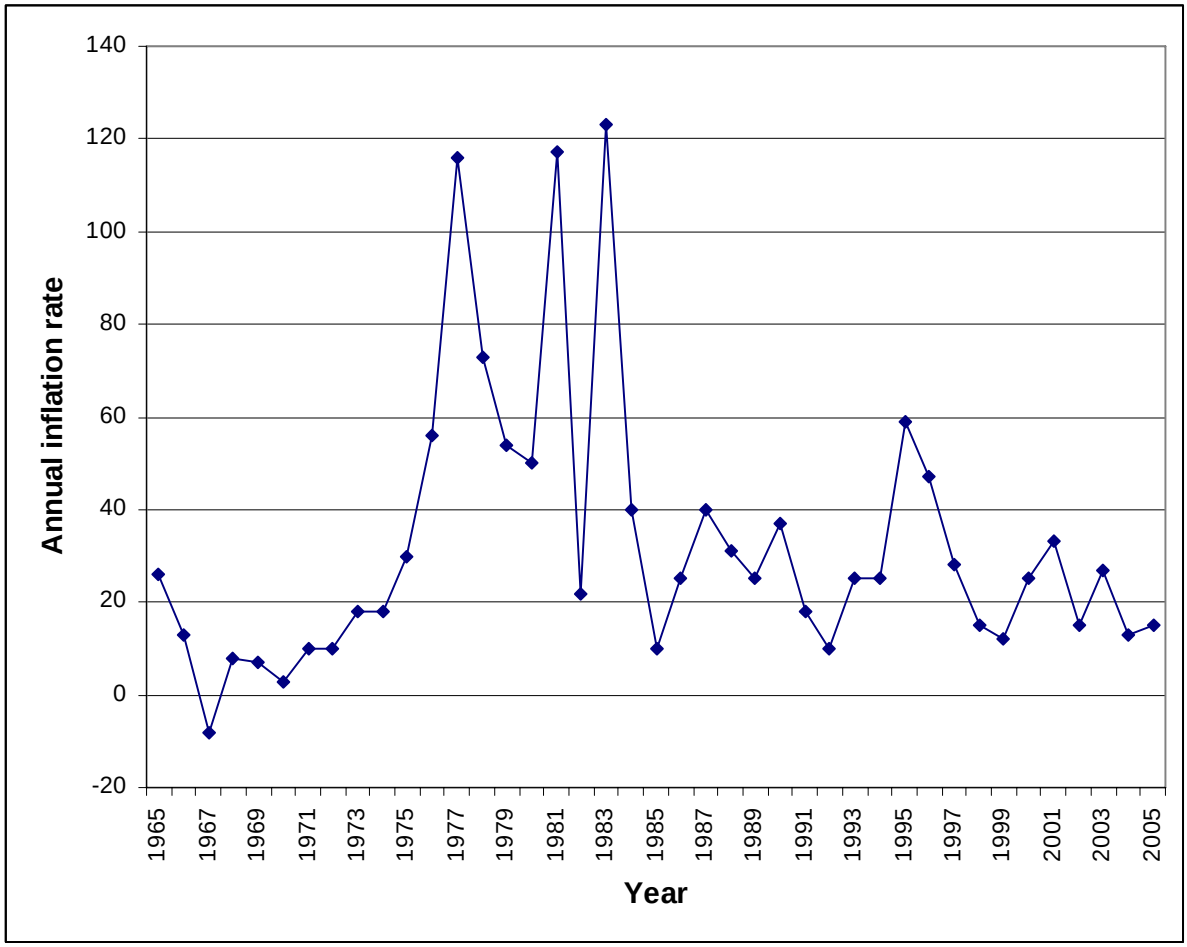
* significant at 10%; ** significant at 5%; *** significant at 1%

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



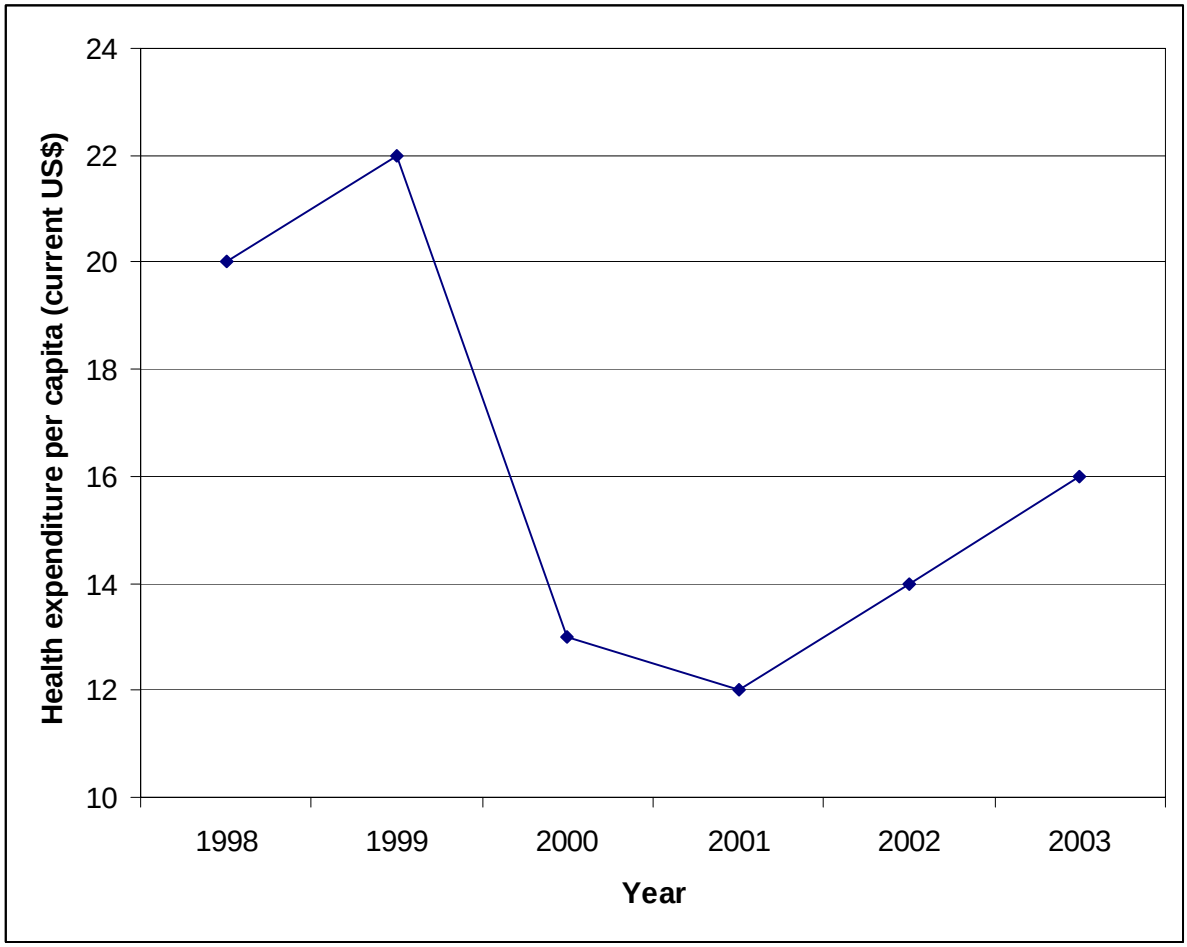
Source: World Bank databases.

Figure 2: Annual inflation rate (consumer prices) in Ghana, 1965-2005



Source: World Bank databases.

Figure 3: Health expenditure per capita (current US$)



Source: World Bank databases.

Figure 4: Trends in prevalence of stunting among agricultural and non-agricultural children in Ghana, 1988-2003

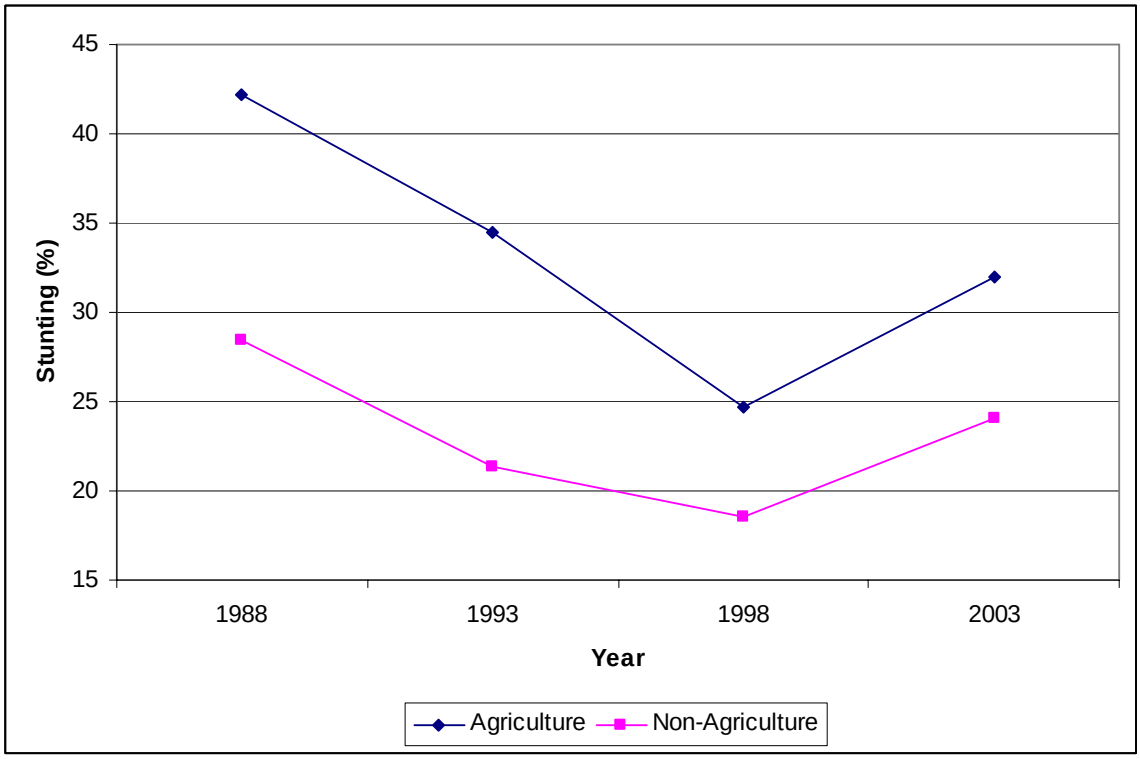


Figure 5: Trends in prevalence of wasting among agricultural and non-agricultural children in Ghana, 1988-2003

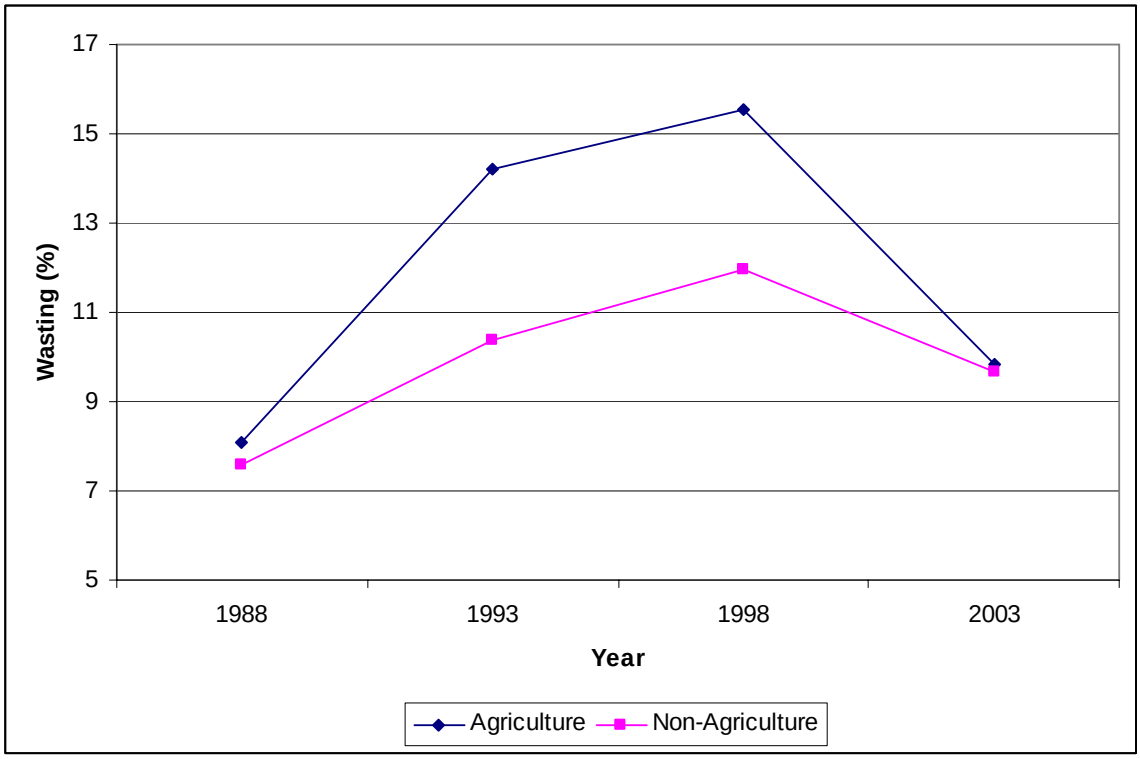


Figure 6: Trends in prevalence of underweight among agricultural and non-agricultural children in Ghana, 1988-2003

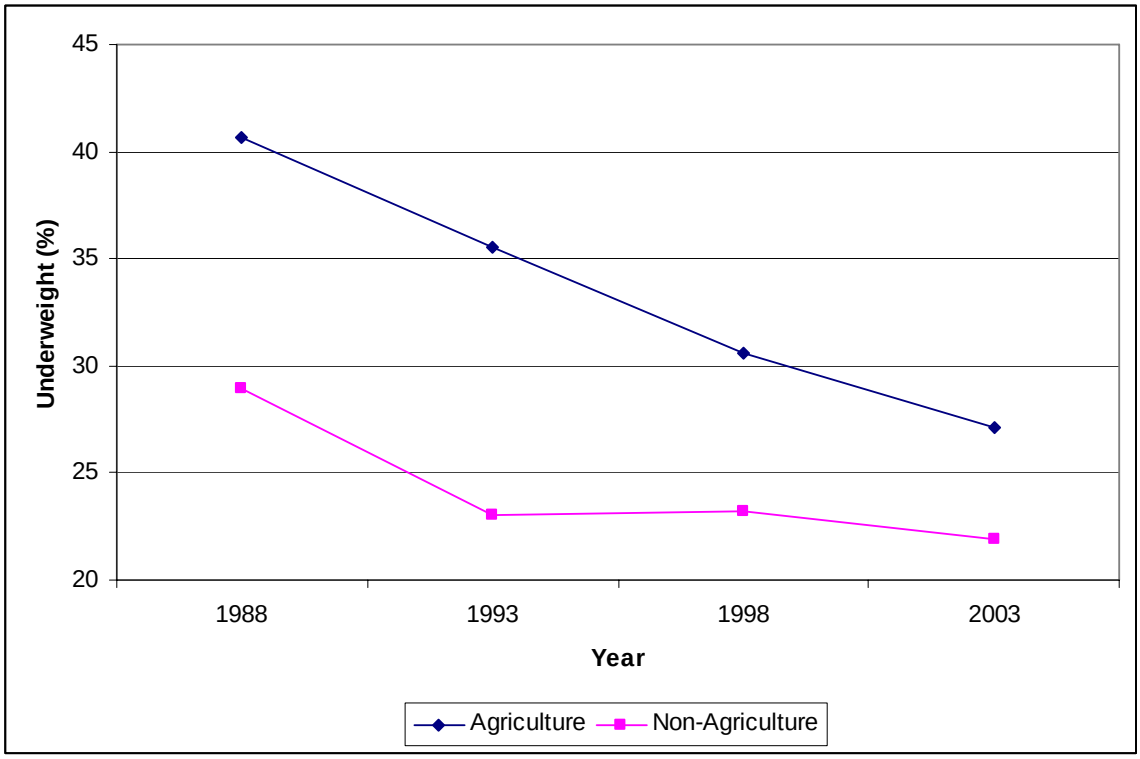


Figure 7: Trends in prevalence of malnutrition among agricultural and non-agricultural children in Ghana, 1988-2003