CHAPTER 4

Economic Development and Nutrition Transition in Ghana: Taking Stock of Food Consumption Patterns and Trends

Olivier Ecker and Peixun Fang

Since the launch of its economic recovery program and the adoption of a market-oriented approach in 1983, Ghana has experienced high economic growth. Ghana's gross domestic product (GDP) grew at an annual rate of 5.6 percent (2.9 percent on a per capita basis) between 1984 and 2014 (World Bank 2016). The value-added share of the agricultural sector in GDP dropped from 52 percent in 1984 to 22 percent in 2014, and the value-added share of the service sector increased from 37 percent to 50 percent (World Bank 2016).[4] As in several other countries south of the Sahara, labor is gradually flowing out of agriculture and into more productive sectors of the economy, contributing to Ghana's high economic growth (Hassen et al. 2016; McMillan, Rodrik, and Verduzco-Gallo 2014; McMillan and Harttgen 2014). Associated with structural transformation of the economy, the urban population increased from an estimated 33 percent in 1984 to an estimated 54 percent in 2014 (UN-DESA 2016). Besides migration of family members or entire families from rural to urban areas, rural households have been increasingly diversifying their livelihoods through participation in the rural nonfarm sector (Kolavalli et al. 2012; Lay and Schüler 2008). High economic growth and economic transformation contributed to Ghana's impressive progress on the Millennium Development Goals (MDGs), in particular, the first goal of eradicating extreme poverty and hunger. Ghana achieved the targets of halving extreme poverty and halving the prevalence of child underweight between 1990 and 2015 as one of the first countries in Africa and ahead of the 2015 deadline (NDPC and UNDP 2015).

Along with continuing, rapid economic development, Ghana—like several other developing countries—is likely to face a rapid "nutrition transition," too. This term describes the shifts in physical activity levels and dietary patterns that go along with improvements in people's living standards and changes in their livelihood activities and lifestyles (Popkin 1993, 1994). For example, motorized transportation replaces walking and carrying of goods, mechanization in agriculture reduces its heavy physical workload, a growing share of the population moves out of agriculture and engages in less physically demanding employment, and sedentary activities and leisure become part of the lives of more people. All of this reduces people's physical energy requirements. Food sourcing increasingly shifts from own production for home consumption to market purchases, and the share of processed foods in people's diet grows. Shifts in dietary patterns include large increases in the calorie density of people's diet and in the per capita intake of animal-source foods (Popkin and Du 2003; Speedy 2003). The proportion of the population that suffers from acute food insecurity drops, and the proportion of people consuming a high-fat diet increases rapidly. Further down the road, the diet of an increasing number of people becomes overly rich in fat—especially from animal-source foods—as well as cholesterol, sugar, and other refined carbohydrates, and low in polyunsaturated fatty acids and fiber.

These shifts in dietary patterns give rise to new nutritional challenges: overweight/obesity and related noncommunicable diseases (NCDs) such as type 2 diabetes, coronary heart disease, stroke, and hypertension become

4 The value-added share of the manufacturing sector in GDP declined from 12 percent in 1985 to 5 percent in 2014 (World Bank 2016).

increasingly prevalent and evolve to become major public health problems. As a consequence, private and public healthcare costs increase, and productivity losses to the individual and the society mount (Finkelstein, Fiebelkorn, and Wang 2003; Finkelstein, Ruhm, and Kosa 2005; Popkin et al. 2006; Trogdon et al. 2008). Globally, overweight and obesity are increasingly prevalent in developing countries. Deaths related to NCDs are projected to increase worldwide by 15 percent between 2010 and 2020, with the largest increases expected to exceed 20 percent in Africa south of the Sahara, Southeast Asia, and the Middle East and North Africa (WHO 2011). Evidence from cross-country comparisons suggests that the described shifts in dietary patterns and physical activity levels are occurring at greater speed and at earlier stages of countries' economic and social development today than in the past (Popkin 2003). A rapid nutrition transition has been observed in many middle-income countries that have experienced high economic growth and economic transformation (Popkin 1998, 1999, 2002). Ghana entered the group of lower-middle-income countries just recently, with implications for the country's continuation on a steady economic development path.

Overweight and obesity typically increase faster than declines in (chronic) undernutrition. This leads to a situation in which overnutrition and undernutrition coexist. This coexistence is often referred to as the "double burden of malnutrition." This double burden may occur not only at the population level (for example, overweight/obesity among the rich and chronic undernutrition among the poor) but also within the same family (for example, overweight/obese mothers with stunted children) and even within the same individual (for example, a stunted but overweight/obese child) (Ecker et al. forthcoming; Prentice 2006; Schmidhuber and Shetty 2005; Shrimpton and Rokx 2012). Where the double burden of malnutrition is common at the family and individual levels, it is possible that the same circumstances the household and the individual face are capable of contributing to both under- and overnutrition. Such circumstances may be partially the result of obsolete or poorly targeted public policies and programs. For example, food and agricultural subsidies as well as household cash transfers—designed to reduce household food insecurity—have been shown to contribute to rising overweight and obesity and to be ineffective in reducing chronic child undernutrition or micronutrient malnutrition (Ecker et al. forthcoming; Jensen and Miller 2011; Kochar 2005; Leroy et al. 2013; Tarozzi 2005).

Hence, countries that face a nutrition transition, like Ghana, are increasingly confronted with new nutritional challenges and may need to revisit established food policies for further advancing people's well-being and economic prosperity. Against this background, this chapter first provides an overview of trends and patterns in key development and food supply indicators in Ghana. Then the analysis turns to the household level and explores household consumption data from the fifth and sixth rounds of the Ghana Living Standards Survey, conducted in 2005–2006 and 2012–2013 (GLSS5 and GLSS6). The household-level analysis describes typical food consumption patterns and shows how the consumption of particular food groups changes with household income growth. The findings from this study may be useful in informing ongoing food policy reform processes and for designing and implementing food security and nutrition–related policies and programs more generally.

The analysis pays particular attention to the consumption of protein-rich foods and especially animal-source foods for several reasons. First, changes in the consumption of animal-source foods (such as meat, fish/seafood, eggs, and dairy products) are key indicators of shifting diets and thus of the nutrition transition described above. Consistent with the theory of consumer demand, households will diversify into higher-value foods such as animal-source foods and, to a lesser extent, vegetables and fruits only when they have satisfied their basic dietary energy needs. Hence, as poor people become richer, they gravitate away from relatively tasteless staple foods and toward more protein- and micronutrient-rich foods that also impart greater taste and therefore utility (Jensen and Miller 2010). In doing so, they tend to substitute vegetal sources of protein with animal sources of protein. Second, in undernourished populations, the consumption of protein-rich foods, and animal-source foods in particular, is associated with improved nutrition outcomes including reduced nutritional deficiencies (Black et al. 2008; Murphy and Allen 2003; Neumann et al. 2003; Sandstrom and Cederblad 1980), improved linear growth of children and reduced risk of child stunting (Allen 2003; Caulfield et al. 2006; Bwibo and Neumann 2003; Marquis et al. 1997; Neumann et al. 2003; Rivera et al. 2003), and improved cognitive functioning (Black 2003, Black et al. 2008; Dror and Allen 2011; Gewa et al. 2009). Animal-source foods, especially meat and fish/seafood, are rich sources of high-quality protein as well as the micronutrients whose deficiencies cause widespread illness in developing countries (including iron, zinc, vitamin A, and folate). Third, (over)consumption of animal-source foods has been linked to overweight/obesity and higher risks of nutrition-related NCDs (Larsen 2003; Popkin and Gordon-Larsen 2004; Popkin 2006, 2009). For example, excess intake of cholesterol is widely known to increase the risk of coronary disease and stroke (HPSCG 2004; LaRosa et al. 1990; Yusuf et al. 2001a, 2001b).

Trends and Patterns in Development and Food Supply Indicators

Economic Growth, Poverty, and Child Undernutrition

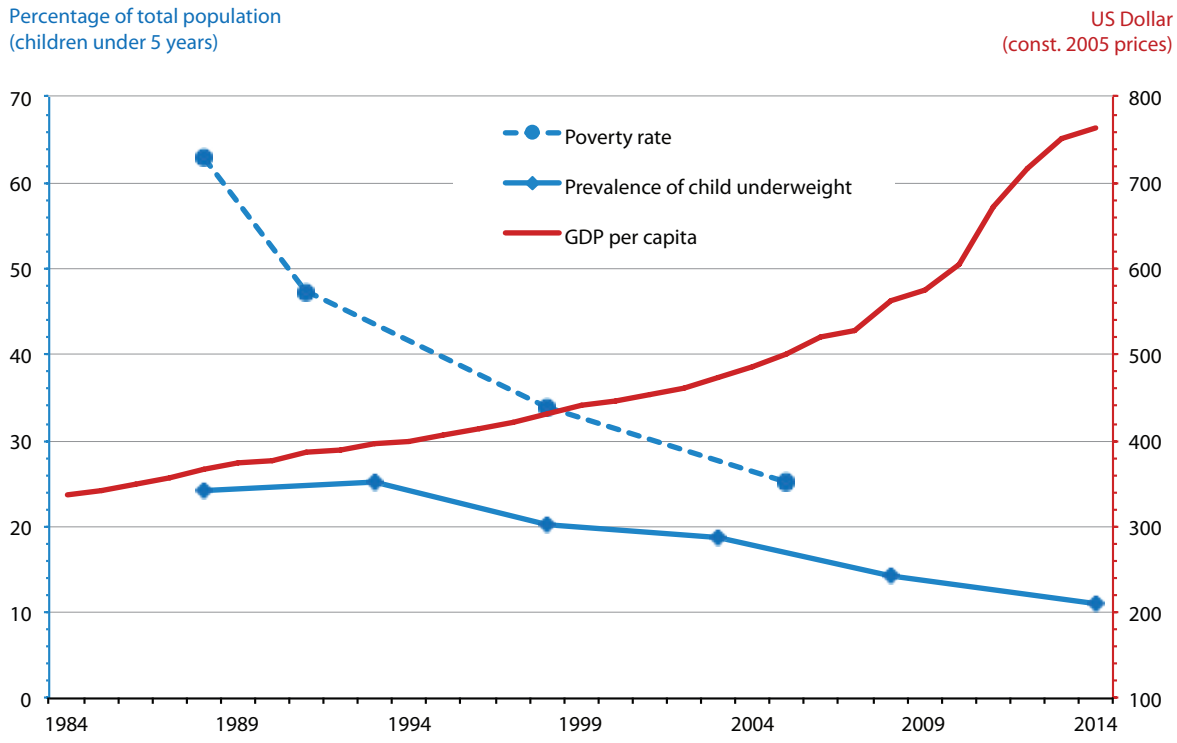
Ghana has been experiencing steady economic growth since 1984—after the launch of an economic recovery program and the adoption of a market-oriented approach. Ghana's GDP grew at an annual rate of 5.6 percent (2.9 percent on a per capita basis) between 1984 and 2014. Economic growth was particularly high during the last of the three decades (Figure 4.1), with average annual growth rates for total GDP of 7.3 percent and for per capita GDP of 4.7 percent. Even the lowest annual growth during this three-decade period—in 1990—was positive and moderate, with a total growth rate of 3.3 percent and a per capita growth rate of 0.5 percent (World Bank 2016). The GDP per capita grew by almost 2.3 times, from US$337 in 1984 to US$764 in 2014 (at constant 2005 prices). During just the last decade, it grew by almost 1.6 times, from US$468 in 2004, compared with 1.4 times during the first two decades.

Ghana's economic growth trickled down to the poor and contributed to a large reduction in poverty. Measured by the international line for extreme poverty, poverty dropped from 62.8 percent in 1988 to 25.2 percent in 2005

(Figure 4.1). This equals an annual average reduction of 2.2 percentage points, or 5.2 percent. Although somewhat less rapidly, poverty reduction has continued at high rates in more recent years. Measured by the national line for extreme poverty (which is higher than the international threshold), poverty dropped from 31.9 percent in 2005–2006 to 24.2 percent in 2012–2013 nationwide (Table 4.1). In absolute terms, the largest share of this reduction occurred in rural areas, where 52.0 percent of the total population lived in 2005 (World Bank 2016).[5] Rural poverty declined from 43.7 percent in 2005–2006 to 37.9 percent in 2012–2013—or by 0.8 percentage points per year (Table 4.1). Nevertheless, poverty remains predominantly a rural phenomenon. The poverty rate in rural areas in both 2005–2006 and 2012–2013 was more than 3.5 times the rate in urban areas. In relative terms, poverty declined slightly faster in urban areas than rural areas—at an annual average rate of 2.2 percent over this seven-year period, compared with 2.0 percent in rural areas.

Ghana also achieved major progress in reducing undernutrition among children younger than five. Between 1988 and 2006, the national prevalence of child stunting—indicating chronic child undernutrition—declined by an annual average rate of 0.4 percentage points or 1.2 percent. The national prevalence rate of child underweight—indicating overall (that is,

FIGURE 4.1—ECONOMIC GROWTH AND REDUCTION IN POVERTY AND CHILD UNDERNUTRITION, GHANA, 1984–2014



Source: Authors' representation based on data from World Bank (2016).

Note: Poverty rate is defined by the international US$1.90-a-day threshold (at 2011 purchasing power parity), marking extreme poverty. GDP = gross domestic product.

[5] Due to considerably higher population growth in urban areas than in rural areas in recent years, more people live in urban areas than in rural areas today. In 2014, the proportion of urban population accounted for an estimated 54.0 percent of the total population (World Bank 2016).

TABLE 4.1—POVERTY AND CHILD UNDERNUTRITION IN GHANA

Indicator	Total	Rural	Urban
Prevalence rates			
Poverty (percentage of total population)[a]			
2005–2006	31.9	43.7	12.4
2012–2013	24.2	37.9	10.6
Child stunting (percentage of children younger than five)[b]			
2008	28.0	32.3	21.1
2014	18.8	22.1	14.8
Child underweight (percentage of children younger than five)[b]			
2008	13.9	16.0	10.6
2014	11.0	13.1	8.6
Annual change (seven-year average)			
Poverty			
Percentage points	–1.1	–0.8	–0.3
Percentage	–3.9	–2.0	–2.2
Child stunting			
Percentage points	–1.3	–1.5	–0.9
Percentage	–5.5	–5.3	–4.9
Child underweight			
Percentage points	–0.4	–0.4	–0.3
Percentage	–3.3	–2.8	–2.9

Source: Authors' representation based on data from [a] World Bank (2016) and [b] ICF International (2016).

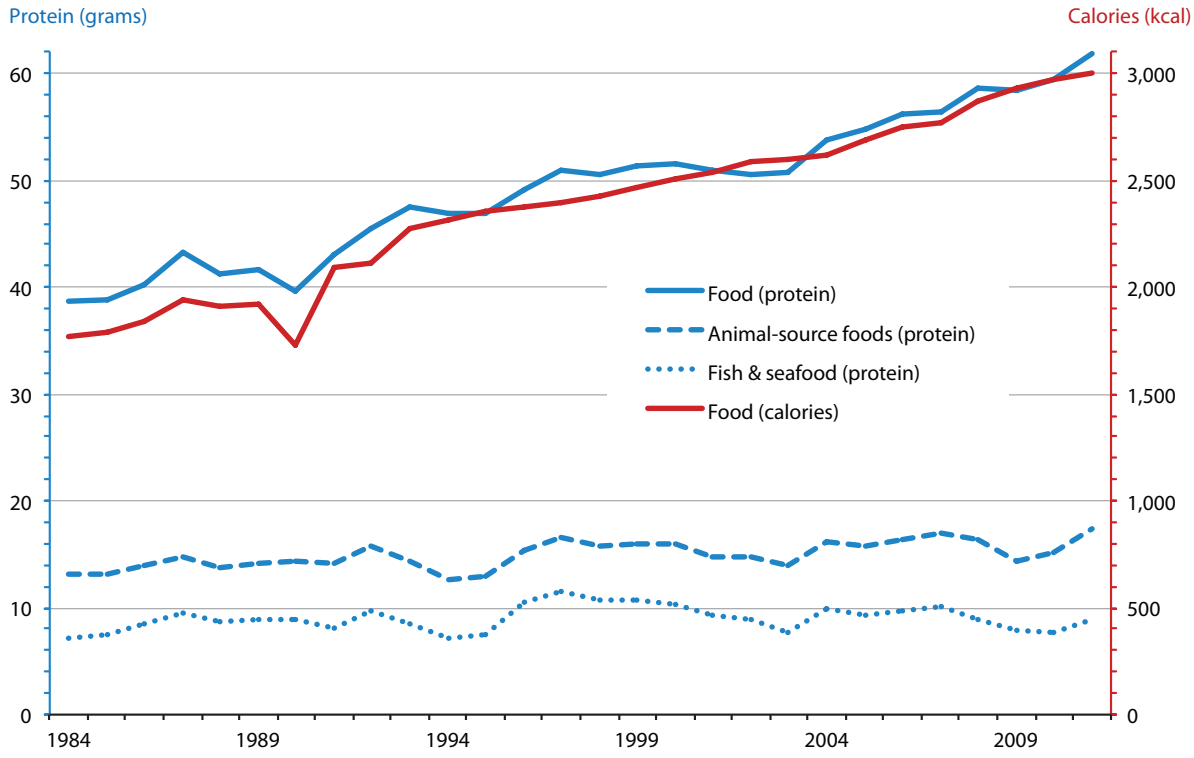
chronic and acute) undernutrition—declined by an annual average rate of 0.6 percentage points or 3.0 percent. Hence, the average annual reduction in the prevalence of both child undernutrition indicators between 1988 and 2005–2006 is lower than that of the poverty rate—in both absolute and relative terms. A slower relative (and absolute) reduction in child undernutrition than in poverty is consistent with international evidence. Nonetheless, Ghana's progress in reducing child undernutrition is clearly above average in the international comparison (World Bank 2016).

In more recent years, Ghana achieved a faster reduction in chronic child undernutrition than in poverty, and this in addition to rapid poverty reduction. The national prevalence of child stunting dropped from 28.0 percent in 2008 to 18.8 percent in 2014 (Table 4.1). This equals an average annual reduction of 1.3 percentage points, or 5.5 percent, over a seven-year period. Over a period of identical length and large time overlap, national poverty declined by 1.1 percentage points, or 3.9 percent, per year, and from a higher initial rate of 31.9 percent. Child stunting declined more rapidly in rural areas than in urban areas, and the rural-urban gap in child stunting prevalence was less pronounced than it was for poverty. Child stunting in rural areas was about 1.5 times more prevalent than in urban areas in 2008 and 2014. The progress achieved in reducing the prevalence of child stunting also reflects in the decline in the prevalence of child underweight. The reduction in chronic child undernutrition points to a significant improvement in the diets of young children and of their mothers during pregnancy and lactation (in addition to improvements in women's and children's health conditions).

Food and Nutrient Availability

The Food Balance Sheets (FBS) database of the Food and Agriculture Organization of the United Nations (FAO 2016) can provide a first glance at long-term trends and patterns of the per capita availability of food, food groups, main food items, and macronutrients at the national level.[6] Ghana's per capita availability of food—expressed on the basis of dietary energy in calories (for comparison across food groups)—has continuously improved between 1984 and 2011, with the exception of a drop in 1990 after a process of gradual devaluation of the Ghanaian cedi and the adoption of a free-floating system (Figure 4.2). The per capita availability of total protein (from food) has increased in great conformity with the per capita availability of total calories, with a correlation coefficient of 0.987 for the period 1984–2011. The fact that protein availability did not grow faster than calorie availability tentatively suggests that the average Ghanaian diet did not become denser in protein-rich foods during this period of almost three decades. Thus, these national data do not provide convincing evidence for a distinct nutrition transition in Ghana at the national level until 2011.

FIGURE 4.2—CALORIE AND PROTEIN AVAILABILITY (PER CAPITA PER DAY), GHANA, 1984–2011



Source: Authors' representation based on FAO (2016).

[6] In the FBS database (FAO 2016), the per capita food supply in a country available for human consumption—referred to as "food availability" in this chapter—is calculated as the residual of total quantity of foodstuffs produced plus the total quantity imported; minus the total quantity exported; adjusted for any change in stocks; and minus the total quantities used for livestock feed and seed, put to manufacture for food and nonfood uses, and lost during storage and transportation. Quantities of per capita food availability are converted into levels of calorie, protein, and fat availability by applying appropriate food composition factors for all primary and processed products (FAO 2016).

There is also no indication of a shift in the composition of total protein availability toward greater shares of protein from animal-source foods at the national level until 2011 (Figure 4.2). Rather, the opposite appears to have been the case. While the per capita availability of total protein steadily increased between 1984 and 2011, the per capita availability of animal protein stayed fairly constant. Accordingly, the increase in the per capita availability of total protein was driven by an increase in per capita availability of protein from vegetal sources. The share of animal protein in total protein declined from a five-year average of 34 percent at the beginning of the period 1984–2011 to a five-year average of 27 percent at the end of the period. The composition of the per capita availability of animal protein at the national level did not change markedly either. Around 93 percent of animal protein stemmed from meat and fish/seafood, a figure that has been quite stable over the time period under consideration. The largest share of total animal protein—around 60 percent—stemmed from fish/seafood. Visual comparison of the trends in animal protein availability and fish/seafood protein availability shows close co-movements (Figure 4.2), indicating limited substitution of fish/seafood with meat (during times of high fish/seafood prices).

Consistent with the trends in extreme poverty and child undernutrition, the trends and patterns in food and macronutrient availability suggest that, at least between 1984 and 2011, Ghana went through a phase of the nutrition transition that is characterized by a steady reduction in ubiquitous, severe food insecurity and hunger, described as a phase of "receding famine" by Popkin (1994).

Although this FBS data analysis can provide a useful first glance at Ghana's long-term trends and patterns of per capita food and macronutrient availability, the precise estimates should not be overinterpreted. The FBS database provides only averages at the country level. Thus, these estimates do not allow us to draw inferences on food and macronutrient availability trends and patterns at the subnational level. For example, they provide no information on whether the observed countrywide food and macronutrient availability trends are mainly driven by changes in urban areas or in rural areas, or on whether food and macronutrient availability trends in southern and northern Ghana conform to one another or vary from each other. Moreover, the FBS data cannot reveal any evidence on actual household food consumption, given the methodology underlying the data computation.[7] For that, detailed food consumption data from household surveys are needed, which, unfortunately, are usually unavailable for extended time series—unlike the FBS data.

Household Food Consumption Patterns and Trends in Southern and Northern Ghana

To complement and specify the first-glance findings of the FBS data–based analysis, the household-level analysis in this section makes use of food consumption data from the GLSS5 in 2005–2006 and GLSS6 in 2012–2013.[8] The analysis consists of two parts. The first part uses descriptive statistics and visualization techniques to examine the composition of average Ghanaian

7 Section A1 in the Technical Appendix (http://resakss.org/node/2190) discusses limitations of FBS data.

8 Section A2 in the Technical Appendix (http://resakss.org/node/2190) describes the GLSS data used and the methodology applied for calculating household food consumption values.

food consumption. The second part interprets estimated Engel curves and discusses elasticities derived from the Engel curve estimates. Engel curves show how food (group) consumption changes with increasing household income, and elasticities provide measures of the percentage changes in food (group) consumption due to a 1 percent change in household income. Given the focus of this study on the expected nutrition transition in Ghana, both parts serve to identify changes in food consumption patterns between 2005–2006 and 2012–2013. Hence, the analysis mainly compares the food consumption patterns captured by the fifth and sixth rounds of the GLSS.

The GLSSs provide household food consumption data for 116 food items.[9] These food items were grouped into six main food groups, considering their total protein content, protein source, and protein quality (FAO and FHI 360, 2016). Within each main group, food products of the same origin were grouped together. Less frequently consumed food items were pooled into "others" categories. The six main food groups are animal-source foods (fish and seafood, beef, chicken, other meats, milk and dairy products, eggs); pulses and nuts (beans, groundnuts, other pulses and nuts); cereals (maize, rice, wheat, other cereals); starchy roots and tubers (cassava, plantain, yams, other roots and tubers); vegetables and fruits (tomatoes, peppers, onions, other vegetables, fruits); and meal additives (palm oil, other oils and fats, sugar and sweets, beverages and miscellaneous).[10] Concerning a sufficient and well-balanced protein nutrition, the consumption of animal-source foods and of pulses and nuts is of particular relevance, because these two food groups are the main sources of high-quality protein, in addition to cereals, which typically provide the bulk of total protein in developing countries (Millward 1999; Pereira and Vincente 2013; Schönfeldt and Hall 2012; Young and Pellett 1994).

The analysis in both parts was conducted separately for rural and urban areas, because there are substantial urban-rural differences in people's living conditions, economic activities, food sourcing, and diets. Within urban and rural areas, the analysis was also conducted separately for southern Ghana and northern Ghana, where agricultural production conditions—and therefore possibly consumption patterns for (own-produced) foods—are quite different. Southern Ghana comprises the Coastal and Forest agroecological zones (AEZs), and northern Ghana consists of the Savannah AEZ. Southern Ghana has one long and one short rainy season and dry season per year, while there is only one rainy and one dry season in northern Ghana. Due to higher rainfall and tropical vegetation coverage, roots and tubers (and to some extent plantains) are traditional staple crops in southern Ghana, whereas cereals are the dominant staple crops in northern Ghana. Ruminant livestock production—especially cattle husbandry—is concentrated in northern Ghana.[11]

Characteristics of Household Food Consumption

Large shares of the foods consumed in Ghanaian households are own-produced on households' farms. Therefore, the availability of macronutrients (carbohydrates, protein, and fat) and micronutrients (vitamins and minerals) in many Ghanaian families is determined in large part by the amounts and

9 See Table A3.1 in the Technical Appendix (http://resakss.org/node/2190).

10 Section A3 in the Technical Appendix (http://resakss.org/node/2190) presents the food group classification in detail.

11 This study differentiates four "regions": (1) urban areas in southern Ghana—the urban south, (2) rural areas in southern Ghana—the rural south, (3) urban areas in northern Ghana—the urban north, and (4) rural areas in northern Ghana—the rural north.

diversity of the food produced by themselves. Tables 4.2 and 4.3 present the percentage shares of own-produced food consumption (measured in monetary value terms) in southern and northern Ghana for total food and for the main food groups at sample means. The tables also show the mean differences in own-produced food consumption shares between 2005–2006 and 2012–2013, and the significance levels of the performed t-tests on the equality of means (for unequal variance of the samples).

Comparisons of mean own-produced food consumption shares suggest that the share of own-produced food in total food consumption is much lower in southern Ghana than in northern Ghana (Tables 4.2 and 4.3), where markets are less developed and consumers' market access is often limited in rural areas (Kolavalli et al. 2012; Quaye 2008). This is consistent with evidence from the agricultural economics literature showing that the link between agricultural production and household food consumption is particularly strong in the presence of market imperfections (Barrett, Reardon, and Webb 2001; de Janvry, Fafchamps, and Sadoulet 1991; Dillon, McGee, and Oseni 2015; Hirvonen, Taffesse, and Hassen 2016). Between 2005–2006 and 2012–2013, the own-produced food consumption share of total food significantly declined in both rural and urban areas in southern Ghana, but it did not change significantly in rural and urban areas in northern Ghana. A possible interpretation is that, in the course of economic development, market integration considerably improved over this seven-year period in the south—and its rural areas in particular—but not so in the north.

TABLE 4.2—SHARES OF OWN-PRODUCED FOODS IN TOTAL FOOD AND FOOD GROUP CONSUMPTION (PERCENTAGES) IN SOUTHERN GHANA

	Urban						Rural					
	2005–2006		*2012–2013*		*Change*		*2005–2006*		*2012–2013*		*Change*	
Food group	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Sig. lev.**	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Sig. lev.**
Total food	4.5	12.3	3.6	11.0	–0.8	***	24.7	22.1	21.1	22.5	–3.7	***
Animal-source foods	1.1	7.7	0.8	6.7	–0.3	*	5.3	14.5	4.0	12.9	–1.2	***
Pulses and nuts	0.8	7.0	0.6	6.8	–0.2		8.2	24.4	6.4	22.4	–1.8	***
Cereals	2.5	10.0	3.5	12.4	1.0	***	15.6	23.7	15.9	25.8	0.2	
Roots and tubers	10.6	27.0	8.4	24.2	–2.2	***	55.7	40.7	48.4	43.1	–7.2	***
Vegetables and fruits	3.0	11.4	1.6	8.0	–1.4	***	20.8	26.5	14.1	24.0	–6.7	***

Source: Authors' calculation based on Ghana Living Standards Survey 5 and 6 data (2005–2006 and 2012–2013, respectively).
Note: Consumption is measured in monetary value terms. ***, **, * Mean difference is statistically significant at the 1 percent, 5 percent, and 10 percent level, respectively.

TABLE 4.3—SHARES OF OWN-PRODUCED FOODS IN TOTAL FOOD AND FOOD GROUP CONSUMPTION (PERCENTAGES) IN NORTHERN GHANA

	Urban						Rural					
	2005–2006		*2012–2013*		*Change*		*2005–2006*		*2012–2013*		*Change*	
Food group	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Sig. lev.**	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Sig. lev.**
Total food	11.8	19.2	12.6	20.3	0.8		39.3	27.0	38.2	25.7	–1.1	
Animal-source foods	1.3	7.1	4.5	13.7	3.2	***	9.5	23.2	11.9	23.6	2.4	***
Pulses and nuts	14.8	33.6	17.6	34.3	2.9		56.9	46.1	52.8	45.3	–4.1	***
Cereals	12.7	22.9	15.6	26.9	2.9	**	46.1	36.9	47.8	36.0	1.7	*
Roots and tubers	20.3	36.5	19.1	36.9	–1.2		51.1	47.4	46.8	47.0	–4.3	***
Vegetables and fruits	7.4	19.7	5.9	16.1	–1.4		27.8	33.2	22.3	29.7	–5.5	***

Source: Authors' calculation based on Ghana Living Standards Survey 5 and 6 data (2005–2006 and 2012–2013, respectively).
Note: Consumption is measured in monetary value terms. ***, **, * Mean difference is statistically significant at the 1 percent, 5 percent, and 10 percent level, respectively.

Mean shares of own-produced food consumption are highest for the food groups that contain the main local staple food and—in northern Ghana—for pulses and nuts; they are lowest for animal-source foods (Tables 4.2 and 4.3). In 2012–2013, the consumption of own-produced roots and tubers added up to 48 percent of the consumption of total roots and tubers among households living in rural areas of southern Ghana and to 47 percent among households living in rural areas of northern Ghana. Own-produced food consumption shares for cereals and for pulses and nuts amounted to 47 percent and 53 percent in the rural north, compared with 16 percent and 6 percent in the rural south, respectively. Thus, about half of the vegetal protein food sources came from own-production in rural households in northern Ghana. Even in urban areas in northern Ghana, the mean shares of own-produced food consumption were fairly high, at 19 percent for roots and tubers, 18 percent for pulses and nuts, and 16 percent for cereals in 2012–2013 (compared with 8 percent, 1 percent, and 4 percent, respectively, in urban areas in southern Ghana). The consumption share of own-produced animal-source foods in total animal-source foods has been much higher in northern Ghana than in southern Ghana, too. In 2012–2013, the mean share amounted to 12 percent in the rural north, compared with 4 percent in the rural south. However, even in the rural north, animal protein was largely obtained from foods purchased in the markets, unlike vegetal protein. The mean shares of animal-source foods and cereals in both rural and urban areas in northern Ghana (and cereals in urban areas in southern Ghana) significantly increased between 2005–2006

and 2012–2013, whereas the mean shares of all other food groups across all regions significantly declined or did not change significantly, as one would expect in a transforming economy.

Associated with differences in economic development and agricultural production conditions (Coulombe and Wodon 2012a; Kolavalli et al. 2012; Quaye 2008), the composition of household food consumption varies across Ghana's regions. Tables 4.4 and 4.5 show the total, food, and main food group consumption levels per adult equivalent per day in urban and rural areas of southern and northern Ghana at sample means. The tables also show the average shares of food group consumption in total food consumption and the average shares of food consumption in total consumption expenditure. In addition, the tables show the mean differences in consumption levels and consumption shares between 2005–2006 and 2012–2013, the significance levels of the performed t-tests on the equality of means (for unequal variance of the samples), and the percentage changes at sample means. For a better visualization of the composition of food consumption, Figures 4.3 and 4.4 present tree maps, where the sizes of the nested rectangles match the average consumption shares for the corresponding food groups and subgroups in total food consumption.

The average share of food consumption in total consumption expenditure varied considerably between urban and rural areas and between southern and northern Ghana (Tables 4.4 and 4.5). In 2012–2013, food consumption in urban areas added up to 39 percent of total consumption expenditure in the south and 46 percent in the north. Food consumption shares were much higher in rural areas, at 54 percent in the south and 60 percent in the north. This pattern is largely consistent with regional differences in the prevalence of poverty and household food insecurity found in previous studies (Coulombe and Wodon 2012a, 2012b; Quaye 2008).

The south-north gap in household wealth may also be reflected to a large extent in regional differences in the food consumption shares for animal-source foods (Tables 4.4 and 4.5). Compared with foods of vegetal origin, animal-source foods are typically more expensive sources of dietary energy and considered to have greater taste, both characteristics of superior goods (whose shares in total consumption tend to increase as people's income rises). In 2012–2013, animal-source foods accounted for 30 percent of total food consumption in both urban and rural areas in southern Ghana, compared with 24 percent in urban areas in northern Ghana and only 18 percent in rural areas in northern Ghana. Fish and seafood were the most important sources of high-quality protein across Ghana and especially in rural areas. The food consumption shares of fish and seafood were markedly larger than those of all meats in the urban and rural south and in the rural north. In the urban north, the food consumption share of fish and seafood and that of all meats were about equal.

Mainly because of different local staple foods, the food consumption shares of cereals were higher in northern Ghana than in southern Ghana, and the shares of roots and tubers were higher in southern Ghana than in northern Ghana, especially in rural areas (Tables 4.4 and 4.5). Nonetheless, cereals accounted for sizable food consumption shares in urban and rural areas in both northern and southern Ghana. In 2012–2013, cereals made up 25 percent of total food consumption in the urban north and 29 percent in the rural north. The food consumption shares of cereals in the urban and

rural south were 19 percent. Roots and tubers accounted for 12–13 percent of total food consumption in the urban south and in the urban and rural north; in the rural south the share was 21 percent.

Pulses and nuts accounted for considerable food consumption shares in northern Ghana, but much less so in southern Ghana (Tables 4.4 and 4.5). In 2012–2013, the food consumption share of pulses and nuts was 7 percent in the rural north and 5 percent in the urban north, compared with less than 2 percent in the rural and urban south. Hence, cereals and animal-source foods were the most important protein sources across all regions. However, although animal-source foods were the primary source of high-quality protein across Ghana, pulses and nuts were an important source of high-quality protein in the north—especially in rural areas and probably for smallholder subsistence farmers in particular. In southern and northern Ghana, vegetables and fruits made up 16–17 percent of total food consumption in urban areas and 14–15 percent in rural areas in 2012–2013. Thus, along with economic development, the nutrition transition—as identified by increasing total protein content in the diet and shifts in high-quality protein sources from foods of vegetal origin to foods of animal origin—has advanced most in southern Ghana and least in rural areas in northern Ghana.

Along with increased mean household income levels (as proxied by total consumption expenditure), the average shares of food consumption in total consumption expenditure significantly declined, by 4–8 percent, between 2005–2006 and 2012–2013, depending on the region (Tables 4.4 and 4.5). The largest decline occurred in the rural north, the poorest region, and the smallest decline occurred in the urban south, the richest region. The shares of animal protein–rich foods on total food consumption did not change significantly, except for rural areas in northern Ghana—the region where the nutrition transition has progressed the least. Over the observed period of seven years, the food consumption share of animal protein–rich foods increased by 11 percent in the rural north. At the same time, the share of pulses and nuts increased by 21 percent, and the shares of cereals and of roots and tubers declined by 9 percent and 7 percent, respectively. These changes mark a distinct shift from a food consumption pattern largely dominated by staple foods toward one with higher shares of high-quality protein sources of both vegetal and animal origin.

The changes in the food group consumption shares between 2005–2006 and 2012–2013 indicate two important shifts that were consistent across urban and rural areas in southern Ghana and urban areas in northern Ghana but different from the shifts observed for rural areas in northern Ghana: the food consumption shares of vegetables and fruits increased significantly, and (partial) substitution mainly occurred between the different vegetal food groups (considering that the consumption shares of animal-source foods did not change significantly) (Tables 4.4 and 4.5). As in the rural north, the food consumption shares of the food group containing the main local staple food significantly declined in the urban and rural south and the urban north. The largest increase in the food consumption share of vegetables and fruits occurred in the urban south, amounting to 12 percent between 2005–2006 and 2012–2013. In this region, both the food consumption share of cereals and that of roots and tubers declined at similar rates of 5–6 percent, while the food consumption share of pulses and nuts did not change significantly. In the rural south, the food consumption share of roots and tubers declined by 10 percent, whereas that of cereals increased by

6 percent, implying a partial substitution between different types of staple foods. The food consumption share of pulses and nuts declined by 5 percent, and that of vegetables and fruits increased by the same percentage. The largest (relative) shifts in the food group consumption patterns occurred for the urban north: the food consumption shares of pulses and nuts and of vegetables and fruits increased by 24 percent and 10 percent, respectively, and that of cereals declined by 10 percent. Hence, the food consumption shares for high-quality vegetal protein sources increased in both urban and rural areas in northern Ghana at high rates, but from low (absolute) consumption levels, compared with other food groups.

In summary, the observed changes in the average composition of household food consumption point to overall moderate shifts in dietary patterns at the subnational level between 2005–2006 and 2012–2013. The changes differ in direction and magnitude by region (which may partly explain why

TABLE 4.4—HOUSEHOLD FOOD CONSUMPTION (GHANAIAN CEDI) AND FOOD CONSUMPTION SHARES (PERCENTAGES) IN SOUTHERN GHANA

	Urban							Rural						
	2005–2006		*2012–2013*		*Change*			*2005–2006*		*2012–2013*		*Change*		
Food group	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Sig. lev.**	**Percentage**	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Sig. lev.**	**Percentage**
Total consumption	7.71	9.38	13.52	12.24	5.81	***	75	4.42	4.25	8.04	8.03	3.62	***	82
Food consumption	3.03	5.74	4.95	5.01	1.92	***	63	2.54	3.42	4.13	4.76	1.59	***	62
Share	41.0	16.4	39.2	16.0	–1.8	***	–4	56.6	15.6	53.7	16.6	–2.9	***	–5
Animal-source foods	0.97	4.45	1.55	1.92	0.58	***	60	0.72	0.83	1.18	1.04	0.45	***	63
Share	29.8	10.5	30.0	12.7	0.2		1	30.2	11.4	29.8	11.8	–0.4		–1
Pulses and nuts	0.04	0.07	0.08	0.13	0.03	***	75	0.04	0.06	0.06	0.12	0.02	***	68
Share	1.6	2.8	1.6	2.8	0.0		1	1.5	1.9	1.4	2.2	–0.1	*	–5
Cereals	0.56	0.68	0.92	1.90	0.36	***	64	0.44	0.85	0.74	0.79	0.30	***	69
Share	20.7	11.2	19.5	11.2	–1.2	***	–6	18.1	10.4	19.2	11.3	1.1	***	6
Roots and tubers	0.39	1.42	0.59	1.64	0.20	***	51	0.67	2.46	0.95	3.51	0.28	***	43
Share	13.0	10.5	12.3	10.6	–0.7	***	–5	23.0	14.7	20.7	15.4	–2.3	***	–10
Vegetables and fruits	0.47	1.73	0.85	1.16	0.38	***	82	0.33	0.63	0.59	1.23	0.26	***	77
Share	15.4	7.8	17.2	8.3	1.8	***	12	13.6	6.9	14.3	7.6	0.7	***	5

Source: Authors' calculation based on Ghana Living Standards Survey 5 and 6 data (2005–2006 and 2012–2013, respectively).

Note: Consumption is measured in monetary value terms, in Ghanaian cedi. Household consumption levels are expressed in units per adult equivalent per day. ***, **, * Mean difference is statistically significant at the 1 percent, 5 percent, and 10 percent level, respectively.

TABLE 4.5—HOUSEHOLD FOOD CONSUMPTION (GHANAIAN CEDI) AND FOOD CONSUMPTION SHARES (PERCENTAGES) IN NORTHERN GHANA

	Urban							Rural						
	2005–2006		*2012–2013*		*Change*			*2005–2006*		*2012–2013*		*Change*		
Food group	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Sig. lev.**	**Percentage**	**Mean**	**Std. dev.**	**Mean**	**Std. dev.**	**Mean**	**Sig. lev.**	**Percentage**
Total consumption	4.59	3.64	8.97	8.27	4.38	***	95	2.52	5.65	4.84	4.87	2.33	***	92
Food consumption	2.16	1.75	3.79	3.17	1.63	***	75	1.60	2.53	2.83	2.97	1.22	***	76
Share	49.0	17.5	46.2	16.0	–2.8	***	–6	64.8	15.5	59.7	16.2	–5.0	***	–8
Animal-source foods	0.54	0.56	0.92	1.00	0.38	***	71	0.27	0.78	0.53	0.82	0.26	***	96
Share	23.9	12.4	23.5	11.1	–0.4		–2	15.7	11.3	17.5	12.3	1.8	***	11
Pulses and nuts	0.08	0.32	0.13	0.29	0.05	***	70	0.09	0.34	0.21	0.64	0.11	***	120
Share	2.7	7.2	3.4	5.0	0.6	*	24	5.6	9.5	6.8	9.4	1.2	***	21
Cereals	0.54	0.53	0.93	1.04	0.39	***	72	0.42	0.96	0.73	0.99	0.31	***	74
Share	28.5	15.9	25.1	14.2	–3.3	***	–12	32.2	19.0	29.2	17.6	–3.1	***	–9
Roots and tubers	0.29	0.38	0.45	0.97	0.16	***	53	0.26	0.59	0.43	1.15	0.17	***	65
Share	12.5	13.1	11.6	13.4	–0.9		–7	13.6	17.6	12.7	17.0	–0.9	**	–7
Vegetables and fruits	0.34	0.61	0.59	0.56	0.25	***	74	0.35	1.72	0.45	0.92	0.10	**	29
Share	14.6	9.6	16.1	7.7	1.4	***	10	15.4	14.6	15.4	10.2	–0.1		0

Source: Authors' calculation based on Ghana Living Standards Survey 5 and 6 data (2005–2006 and 2012–2013, respectively).

Note: Consumption is measured in monetary value terms, in Ghanaian cedi. Household consumption levels are expressed in units per adult equivalent per day. ***, **, * Mean difference is statistically significant at the 1 percent, 5 percent, and 10 percent level, respectively.

there are no clear trends in the FBS data at the national level). This is consistent with the theory of nutrition transition, given that Ghana's regions are at different stages of the nutrition transition. Overall, the observed changes in the average composition of food consumption suggest that the quality of average Ghanaian diets in all regions improved between 2005–2006 and 2012–2013 and provide no evidence for a widespread increase in the risk for nutrition-related NCDs due to a diet overly rich in animal-source foods. However, it is important to note that the average food consumption patterns presented here provide no information on food consumption at different household income levels, such as among the rich and the poor, and on the likely trends in food consumption patterns beyond 2012–2013, when households' income continues to grow. The following section can provide some insights in these respects.

FIGURE 4.3—COMPOSITION OF HOUSEHOLD FOOD CONSUMPTION IN SOUTHERN GHANA

Source: Authors' presentation based on Ghana Living Standards Survey 5 and 6 data (2005–2006 and 2012–2013, respectively).
Note: Consumption is measured in monetary value terms. The tree maps show the average composition of household food consumption per adult equivalent.

FIGURE 4.4—COMPOSITION OF HOUSEHOLD FOOD CONSUMPTION IN NORTHERN GHANA

Source: Authors' presentation based on Ghana Living Standards Survey 5 and 6 data (2005–2006 and 2012–2013, respectively).
Note: Consumption is measured in monetary value terms. The tree maps show the average composition of household food consumption per adult equivalent.

Engel Curves and Food Consumption Elasticities

Figures 4.5 and 4.6 show estimated Engel curves for household food consumption of the main analyzed food groups in urban and rural areas in southern and northern Ghana in 2005–2006 and 2012–2013.[12] The Engel curves illustrate the associations between food group consumption levels and income levels across households, providing evidence on how food group consumption is likely to change when income rises. Table 4.6 presents point elasticities that were derived from the Engel curve estimates. The elasticity estimates are calculated at sample median income levels. The elasticities have large values and may overrate the true effect of household income growth on changes in food (group) consumption levels.[13] Therefore, the precise values of the elasticities should not be overinterpreted. Rather, the elasticities (which are all based on estimation models with identical properties) serve to complement the descriptive analysis of the estimated Engel curves and, in particular, to compare the consumption-income associations of the different food groups with each other. Overall, the results of the estimations based on the 2005–2006 data and the 2012–2013 data are highly consistent.

The shape of the estimated Engel curves suggests that the consumption of all analyzed food groups increases (almost) linearly with rising income across most households of the estimation sample populations (Figures 4.5 and 4.6). A linear curve implies that the marginal increase in food group consumption is constant across the considered income levels. Thus, the estimated Engel curves suggest that households with high incomes and households with low incomes will spend a similar (absolute) amount for the consumption of the considered food group when their incomes grow by the same (absolute) amount.[14]

The slopes of the estimated Engel curves suggest that income growth in southern Ghana is associated with the largest (absolute) increases in the consumption of animal-source foods in both urban and rural areas, followed by increases in the consumption of cereals and—in rural areas—roots and tubers (Figures 4.5 and 4.6). In urban and rural areas in northern Ghana, household income growth seems to come along with the largest (absolute) increases in the consumption of cereals in addition to animal-source foods. The finding that in the rural south and the urban and rural north, household income growth is associated with large (absolute) increases in the consumption of the food groups that contain the main local staple food indicates that household food insecurity is still widespread in these regions. The estimated Engel curves for the consumption of pulses and nuts are flat and show low consumption levels across all regions, suggesting that when income rises, the consumption of pulses and nuts is likely to remain at low (absolute) levels across Ghana, compared with other main food groups.

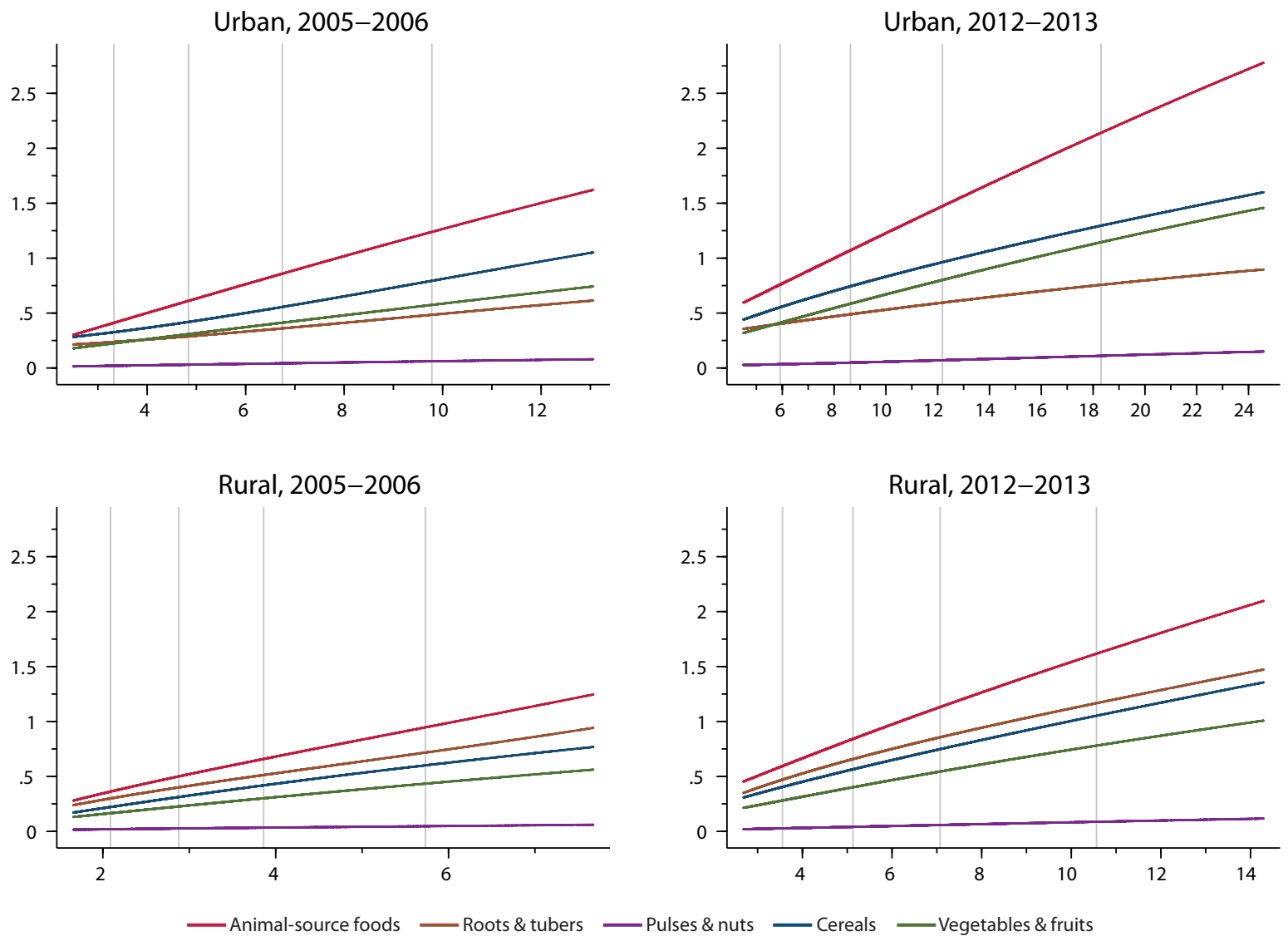
The elasticity estimates suggest that the consumption of animal-source foods increases at higher rates than total food consumption with increasing household incomes in urban areas in southern Ghana and in both urban and rural areas in northern Ghana and at similar rates in rural areas

12 Section A4 of the Technical Appendix (http://resakss.org/node/2190) presents the Engel curve estimations.

13 Large elasticity estimates may be partly due to the chosen reduced-form demand model underlying all estimations (which does not account for structural changes in consumption), omitting of variables from the estimation equations that possibly determine food consumption and are correlated with household income (such as household size, education, food preferences, local food prices, and so on), and using reported household consumption expenditure as proxy for household income (which ignores household saving and income transfers, which occur mostly in richer households).

14 Food consumption is measured in monetary value terms. Hence, differences in food quality and nonnutritive attributes, as well as local price differences, may influence the found relationship.

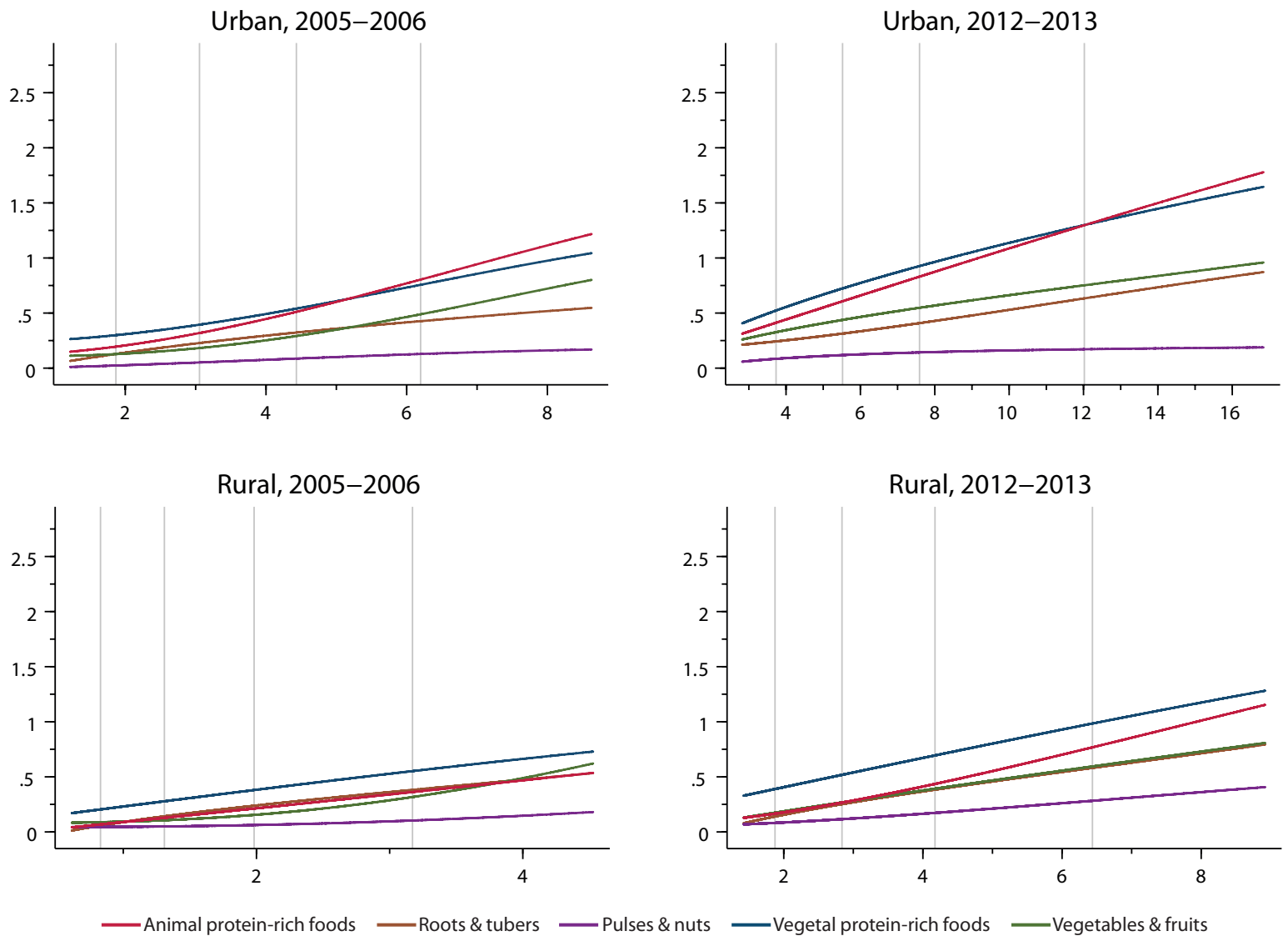
FIGURE 4.5—ENGEL CURVES FOR THE CONSUMPTION OF MAIN FOOD GROUPS IN SOUTHERN GHANA



Source: Authors' estimation based on Ghana Living Standards Survey 5 and 6 data (2005–2006 and 2012–2013, respectively).

Note: The y-axis identifies household food group consumption per adult equivalent per day; the x-axis identifies household income (as proxied by total household consumption expenditure) per adult equivalent per day. The vertical gray lines mark income quintiles in the sample populations. The presented graphs are excerpts of the estimated Engel curves, excluding households with income levels below the 10th percentile and above the 90th percentile of the estimation samples.

FIGURE 4.6—ENGEL CURVES FOR THE CONSUMPTION OF MAIN FOOD GROUPS IN NORTHERN GHANA



Source: Authors' estimation based on Ghana Living Standards Survey 5 and 6 data (2005–2006 and 2012–2013, respectively).

Note: The y-axis identifies household food group consumption per adult equivalent per day; the x-axis identifies household income (as proxied by total household consumption expenditure) per adult equivalent per day. The vertical gray lines mark income quintiles in the sample populations. The presented graphs are excerpts of the estimated Engel curves, excluding households with income levels below the 10th percentile and above the 90th percentile of the estimation samples.

in southern Ghana (Table 4.6). According to the estimates based on the 2012–2013 data, at median income levels, a 1 percent increase in household income is associated with an almost equivalent percentage increase in the consumption of animal-source foods in the urban and rural south and the urban north, and even an overproportional increase in the rural north. In both urban and rural areas of southern Ghana, the consumption of pulses and nuts tends to increase most with rising incomes (in relative terms), and that of vegetables and fruits tends to increase at similar rates to the consumption of animal-source foods (according to estimates based on the 2012–2013 data). The consumption of cereals and of roots and tubers tends to increase at lower rates than total food consumption and the consumption of all other food groups. Thus, the elasticity estimates together suggest that income growth in southern Ghana is associated with diversification of people's food consumption from a heavily staple-laden diet toward a diet richer in high-quality protein foods of both animal and vegetal origin and in vegetables and fruits.

The trends in northern Ghana's food consumption patterns implied by the elasticity estimates seem to differ from the trends observed for southern Ghana mainly regarding the consumption of roots and tubers and of vegetables and fruits (Table 4.6). According to the estimates based on the 2012–2013 data, the consumption of roots and tubers tends to increase at similar rates to total food consumption in urban areas and even at higher

TABLE 4.6—FOOD CONSUMPTION ELASTICITY ESTIMATES

	Southern Ghana				Northern Ghana			
	Median income (Ghanaian cedi)		Rural		Urban		Rural	
Variable	*2005–2006*	*2012–2013*	*2005–2006*	*2012–2013*	*2005–2006*	*2012–2013*	*2005–2006*	*2012–2013*
Median income (Ghanaian cedi)	***5.68***	***10.19***	***3.34***	***6.04***	***3.71***	***6.50***	***1.58***	***3.43***
Food consumption elasticity	0.95	0.86	0.93	0.93	1.13	0.85	1.01	1.01
Consumption elasticity for …								
Animal-source foods	1.02	0.92	0.93	0.92	1.28	0.98	1.22	1.28
Pulses and nuts	1.02	1.08	0.84	1.07	1.39a	0.57a	0.51b	1.04b
Cereals	0.85	0.75	0.99	0.87	0.86	0.77	0.75	0.76
Roots and tubers	0.68	0.57	0.84	0.82	0.93	0.84	1.25	1.08
Vegetables and fruits	0.87	0.91	0.96	0.94	1.28	0.70	0.88	0.99

Source: Authors' estimation based on Ghana Living Standards Survey (GLSS) 5 and 6 data (2005–2006 and 2012–2013, respectively).

Note: The elasticity estimates for food group consumption are derived from the estimated Engel curves shown in Figures 4.5 and 4.6. They are calculated for the reported median household income (as proxied by household total consumption expenditure) per adult equivalent per day. a Overall statistical fit of the estimated regression model is very low, with an R2 value of less than 0.03. The difference between the GLSS5- and GLSS6-based estimates is implausibly large. b Overall statistical fit of the estimated regression model is low, with an R2 value of around 0.09. The difference between the GLSS5- and GLSS6-based estimates is implausibly large.

rates in rural areas. In both urban and rural areas, the consumption of vegetables and fruits tends to increase at somewhat lower rates than total food consumption and the consumption of roots and tubers. As in southern Ghana, the consumption of the food group containing the main local staple food (which is cereals in northern Ghana) tends to increase at lower rates than total food consumption in both urban and rural areas. Thus, the elasticity estimates together suggest that income growth in northern Ghana is associated with diversification of people's food consumption from a cereal-dominated diet toward a diet richer in animal-source foods, denser in (calorie-rich and protein-poor) roots and tubers, and with constant or even declining shares of vegetables and fruits.

Summary and Conclusions

Along with high economic growth over a period of somewhat more than the past three decades, poverty, household food insecurity, and undernutrition have substantially declined in Ghana. Ghana was one of the first African countries that achieved the first MDG, that of eradicating extreme poverty and hunger. Recently, Ghana achieved (lower-) middle-income-country status. Economic growth has been accompanied by a structural transformation of the economy and progressing urbanization.

Household income growth improves people's ability to afford nutritious foods and diversified diets, and allows them to utilize superior healthcare and higher education, contributing to healthier and more productive lives for themselves and their children. However, improvements in people's living standards and changes in their livelihood activities and lifestyle usually also lead to a nutrition transition and give rise to new nutritional challenges, including increasing prevalence of overweight/obesity and related NCDs. To successfully address these new nutritional challenges, governments may need to launch new health and nutrition programs and revisit established food policies that have become inefficient in reducing food insecurity and malnutrition or even detrimental under the new circumstances.

Against this background, this study took stock of food consumption patterns and trends in Ghana. The analysis paid particular attention to the consumption of protein-rich foods and especially animal-source foods, because changes in their consumption patterns are key indicators of dietary shifts and the nutrition transition (Popkin and Du 2003; Speedy 2003); because insufficient consumption of animal-source foods is associated with widespread nutritional deficiencies, child growth failures, and poor cognitive functioning (Black et al. 2008; Dror and Allen 2011; Murphy and Allen 2003; Neumann et al. 2003); and because overconsumption of animal-source foods is associated with higher risks of overweight/obesity and related NCDs (Larsen 2003; Popkin and Gordon-Larsen 2004; Popkin 2006, 2009). To complement a first-glance analysis of long-term trends in food and macronutrient availability at the national level, a household-level analysis explored food consumption patterns and trends at the subnational level in great detail. The findings of the study may be useful in informing ongoing food policy reform processes and for designing and implementing food security and nutrition–related policies and programs more generally.

The national-level analysis suggests that in the 1980s, 1990s, and first decade of the 21st century, Ghana went through a phase of the nutrition transition that is characterized by a steady reduction in widespread, severe food insecurity, hunger, and undernutrition. Until the end of this three-decade period, there had been no indication of a transition into a phase in which overnutrition—especially overconsumption of animal-source foods—and associated adverse health consequences become major public

health problems. The household-level analysis suggests, however, that there are considerable regional differences within Ghana and that some regions are about to transition into this next phase. Urban areas—primarily in the south—are at a later stage of the nutrition transition than rural areas, with the rural north being least progressed. Household food insecurity is still widespread in the rural north, and meeting dietary energy requirements seems to still dominate food choices in many households.

The analysis also provides indications that Ghana as a whole, as well as its single regions appear to closely follow the nutrition transition path that has been observed in other developing countries. The results from the Engel curve estimations suggest that, along with continuing household income growth (and urbanization), the consumption of animal-source foods is likely to rapidly increase primarily—but not exclusively—among Ghana's growing urban middle class. The derived elasticity estimates indicate that with rising incomes, diets in Ghana's urban areas and even in the rural north become denser in protein-rich foods of animal origin. The estimated elasticities also suggest that when incomes grow, the consumption of pulses and nuts tends to increase faster than total food consumption in southern Ghana, where (absolute) consumption levels of pulses and nuts are very low, considerably lower than in northern Ghana. Hence, with rising incomes, the diet in southern Ghana is likely to become somewhat richer in high-quality protein of vegetal origin, too. The consumption of vegetables and fruits tends to increase, at best, at similar rates to that of animal-source foods in all regions, while the consumption of the main local staple food tends to further increase in absolute amounts but at lower rates than that of nonstaple foods.

In conclusion, it is now a good time to review existing food policies (including agricultural subsidies) with respect to their potential nutritional impact and to start reforming those policies that are likely to have adverse effects on people's dietary quality and body weight. Increasing risks of overweight/obesity and related NCDs are normal symptoms of a progressing nutrition transition, but public policy can do a great deal in setting the right (economic) incentives to reduce the potential adverse impact. In contrast, unfavorable food policies can further aggravate the nutritional challenges, as examples from Egypt (Ecker et al. forthcoming), Mexico (Leroy et al. 2013), and other developing countries show. Inaction may come at high costs for private and public healthcare budgets and long-term economic development.