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Evolving food systems in Ethiopia: Past, present and future

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ABSTRACT

Ethiopia's food systems are rapidly evolving, being driven by major contextual changes including high population growth, rapid urbanization, infrastructure investments, and income growth. These changes are illustrated by dietary, agricultural, and supply chain transformations.

First, important changes in diets are noted with overall higher calorie consumption, a declining share of starchy staples and an increasing share of high-value products, such as animal-source foods and fruits and vegetables, in the food basket, and the emergence of processed convenience foods and greater out-of-home food consumption.

Second, at the agricultural production level, we note processes of intensification and modernization. There is an increasing emphasis on commercial farms, mostly established in the hope to tap into agricultural export markets. Meanwhile, smallholders, who have an average agricultural area of 1.0 hectare per holder and who cultivate 93 percent of the agricultural land in Ethiopia, are facing increasing land constraints. This is seen in declining farm sizes over time and younger farmers being more reliant on land rental markets to access the land that they farm.

Third, agricultural supply chains are expanding and are an increasing source of employment. Agricultural commercial surpluses are rapidly growing. Consequently, there is more reliance on markets by both producers and consumers. We also see the start of the use of modern food marketing methods and technologies, including mobile phones, a commodity exchange, and an incipient modern retail sector and food service sector. Markets are found to be better integrated with spatial and seasonal price margins becoming smaller. However, we also see an increase of the prices of nutritious foods. Despite significant impediments to international trade, Ethiopia's reliance on it has however grown significantly over the last 15 years. While food imports and the number of food aid beneficiaries have not come down over time, Ethiopia, however, has been a net agricultural exporter in value terms for all but one year over the last decade.

These transformations in Ethiopia's food systems are expected to continue at a rapid pace given similar even more pronounced changes going forward. We expect to see especially rapid growth in commercial food markets. This will have enormous implications on farming and on the required development of efficient private-led agricultural input supply, logistics, trading, and distribution sectors.

1. INTRODUCTION

When food systems and agricultural markets transform, they tend to go through fairly typical stages (Reardon et al. 2018; Reardon and Timmer 2014). In the *traditional* system, farmers are mostly focused on production for own consumption. The urban share of the population is low and supply chains are mainly short and local, serving own consumption, local villages, and nearby towns. In the *transitional* system, markets become more important. Value chains extend spatially because of growing demand from cities and an expansion in the catchment areas for merchants (Braudel 1982). There are emerging public standards of quality, but spot market relations are still dominant. In the *modern* system, value chains are spatially extensive, but there is disintermediation and consolidation in various segments – such as in retail markets that are characterized by the dominance of supermarkets. Private and safety standards, contracts, and capital intensification are widespread in this stage.

In this paper, we look at the evolving food systems in Ethiopia. Driven by population growth, improved connectivity, higher incomes, urbanization and consequent diet change, we see a food and agricultural system that is rapidly transforming. Guided by the framework of Timmer (2014), we assess

recent evidence regarding dietary, agricultural, and supply chain transformation. For this assessment, we rely on a literature review as well as on an analysis of secondary data. We also speculate on expected future developments based on simple assumptions of income growth, urbanization, and population growth and by benchmarking Ethiopia with other countries with lower and higher GDP levels – economic growth has been shown to be an important associate of change in food systems.

Following the distinction of Reardon et al. (2018), we are seeing in Ethiopia the start of a change from the traditional to a transitional system. First, we see dietary transformation with higher consumption levels and better food security, the relative share of cereals in food baskets declining and those of high-value products, such as animal-source foods and fruits and vegetables, rising, an emergence of processed and convenience foods in markets, and greater out-of-home consumption. Second, we note changes in supply chains with more reliance on markets by consumers, better integrated markets, smaller spatial and seasonal price margins, and an increase in prices of non-cereals. While food imports and the number of food aid beneficiaries annually in Ethiopia are not coming down, we find, however, that Ethiopia was a net importer of agricultural products in value terms only in one of the last ten years. At the agricultural production level, we note processes of intensification and modernization. We see changes in the characteristics of smallholder farms and farmers – declining farm sizes, increasing average age of farmers, and younger farmers being more reliant on rental markets to access the land they require. We further see an increasing emphasis on bigger commercial farmers with at least 1.3 million hectares leased out to them. Although only 1 million hectares was effectively cultivated in 2013 (Ali et al. 2017), representing 7 percent of all cultivated land in Ethiopia. While structural transformation of Ethiopia's economy is still at an early stage as seen by the continuing high share of employment in agriculture, food systems are expected to continue to transform rapidly – especially so in commercial food markets – given similar dynamics going forward. This will have enormous implications for the required growth, functions, and efficiency of private-led agricultural input supply, logistics, and trading sectors.

The structure of the paper is as follows. We first describe the data that is used in this analysis. We then look at contextual changes in Ethiopia. In section 4, we assess dietary transformation. Agricultural and supply chain transformations are looked at in Sections 5 and 6, respectively. We then discuss the current state of structural transformation of Ethiopia's economy and speculate on likely upcoming changes in Ethiopia's food systems, focusing on agriculture, dietary, and supply chains, in Section 7. We finish with conclusions in the last section.

2. DATA

Diverse datasets are used in this analysis. First, for the consumption analysis we use nationally representative household income, consumption, and expenditure surveys (HICES) conducted by the Central Statistics Agency (CSA). These surveys were administered in 1995/96, 1999/00, 2004/05, and 2010/11. The HICES are repeated cross-sectional surveys that serve as the official source for poverty statistics in Ethiopia (MoFED 2012). The sampling was done by stratifying the country into rural and urban areas. After that, enumeration areas were selected using a probability proportional to size approach where more populated units had a higher probability of being selected into the final sample. Sampling weights provided by the CSA, which are based on selection probabilities, are used to compute representative estimates for rural and urban areas of the country.

Second, we use data collected by the CSA in its annual Agricultural Sample Survey (AgSS) of agricultural households. The data covers the main agricultural season (*meher*) for the period 2004/05 to 2015/16 and pertain to smallholder farmers – those farming less than 25 hectares – that dominate agricultural land use in Ethiopia. During the period covered in this study, the sampling frame of the AgSS included the entire rural parts of the country except for the non-sedentary population of three zones in

Afar and six zones in Somali regions (CSA 2016a). We use these data to conduct descriptive analyses of trends in smallholder landholdings in Ethiopia.

Third, the Ethiopian Grain Trading Enterprise (EGTE), a grain procurement arm of the government, gathers prices of cereals in a number of major wholesale markets in the country. Prices are collected during the early morning, late morning, and afternoon on major market days, with simple averages of these prices over the course of a month being reported as monthly prices. The prices are collected by noting prices from observed transactions. Wholesale prices at 12 selected markets are made available publicly. These price data are used in the analysis. We rely on the national CPI as constructed by the CSA to deflate prices.

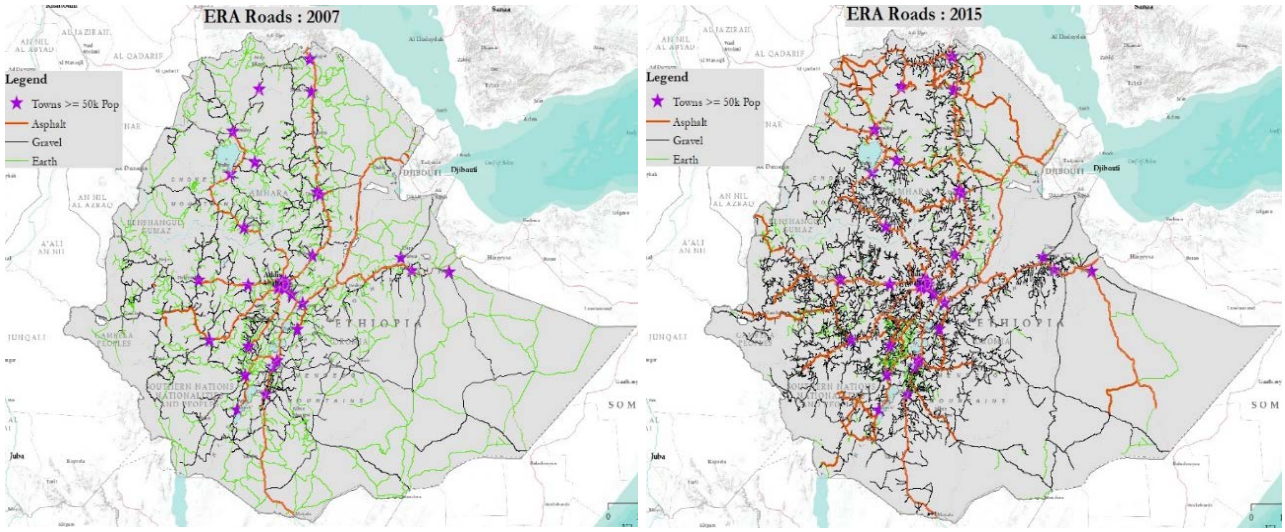
Fourth, import data were obtained from the Ethiopian Revenues and Customs Authority or downloaded from the United Nations' Comtrade webpage.[1] We also rely for some data on the National Bank of Ethiopia (NBE 2018), the Ethiopian Road Authority, World Bank, FAOSTAT, the Ethiopian Meat and Dairy Institute, and the Ministry of Trade.

3. CONTEXTUAL CHANGES

A number of changes in Ethiopia's economy are resulting in significant dynamism in its agricultural and food markets. We discuss three major factors – infrastructure development, population growth and urbanization, and income growth.

Ethiopia has invested heavily in road network development over the last two decades. It is estimated that the length of asphalted roads expanded four-fold over the last 15 years from 3,900 km in 2000/01 to 15,900 km in 2016/17 (NBE 2018). However, investments in rural roads were important as well. Figure 3.1 maps the evolution of investments in both asphalt and gravel roads at national level between 2007 and 2015 based on data from the Ethiopian Road Authority. The length of gravel roads expanded from 22,900 km in 2007 to 62,100 km in 2015, while the length of asphalted roads increased from 4,800 km to 15,400 km over the same period.

Figure 3.1. Changes in road infrastructure in Ethiopia, 2007 to 2015



Source: Ethiopian Road Authority

Table 3.1 illustrates to what extent these investments in roads have led to better connectivity for Ethiopia's population. In 1994 an estimated 29 percent of the Ethiopian population was located 10 hours or more in travel time from a city of at least 50,000 people. This figure had declined by 2015 to only 5 percent

[1] http://comtrade.un.org/

of the population. Similarly, 23 percent of the population was within three hours of such a city in 1994, but by 2015 this had improved to 59 percent of the population. Ethiopia has also benefited from increasing access to mobile phone infrastructure allowing for overall better communication in the country. It was estimated that teledensity, the number of phone subscribers per 100 inhabitants, increased from 7 percent in 2008/09 to 63 percent in 2016/17 (NBE 2018).

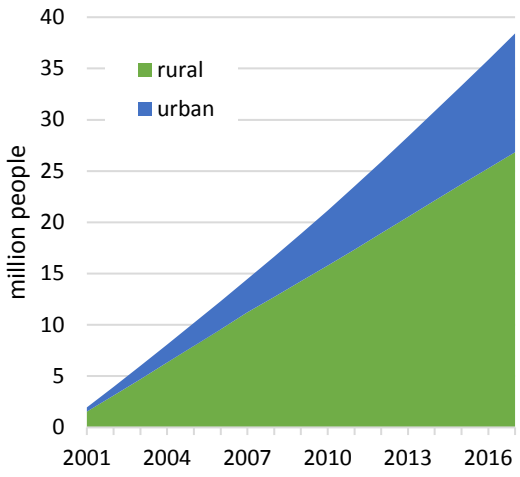
Table 3.1. Travel time to a city of at least 50,000 people, 1994, 2007, and 2015, percent of total Ethiopian population

	1994	2007	2015
Less than 1 hour	8.7	16.2	24.5
1 to 3 hours	14.0	28.3	34.1
3 to 5 hours	16.1	20.8	19.8
5 to 10 hours	31.9	23.9	16.2
More than 10 hours	29.3	10.8	5.4
Total	100.0	100.0	100.0

Source: Schmidt et al., 2018

The population of Ethiopia is rapidly growing. Since 2000, a population equivalent to that of Canada has been added to the country. Figure 3.2 shows that the rural population grew by 25 million people between 2000 and 2016. Over the same period, the urban population increased by 10 million. While the rural areas are rapidly growing, cities are growing even more rapidly. In 2017 22 percent of the Ethiopian population was living in cities (World Bank 2017).

Figure 3.2. Population growth in Ethiopia from 2000 to 2016, by urban and rural in millions of persons added



Source: Authors' calculations based on data from World Bank

Ethiopia has been one of the fastest growing economies in the world over the last decade – an impressive feat for a low-income African country that exports relatively few natural resources. Average annual GDP growth over the decade 2007/08 to 2016/17 was estimated at 10 percent (NBE 2018). Agriculture was a main contributor to that growth. While national official data show that real agricultural output growth was lower than overall GDP growth, it still grew on average by 6.3 percent per year over the same decade. This growth in agriculture, and especially in cereal production, has been a major contributor to the important reductions in poverty observed in the last decade (World Bank 2014).

4. DIETARY TRANSFORMATION

We study consumption patterns and their changes over time using four rounds of the HICES dataset, covering the period from 1996 through 2011. To ensure comparability over time, expenditures are deflated using the national Consumer Price Index (CPI) and values are expressed in constant 1996 birr. Quantities consumed per capita were calculated as well. The results of this exercise, presented in Table 4.1, illustrate a number of interesting findings (see Worku et al. (2017) for more details).

The share of nonfood items in the total consumption basket increased substantially over time, especially since 2000. In 2000, the share of nonfood consumption expenditures accounted for 36 percent of the total. Over the following decade, this type of expenditure grew to 52 percent by 2011. Such rapid increases of nonfood expenditures, outstripping increases in food expenditures, are typical of transforming economies and indicate significant improvements in welfare in the country (World Bank 2014; MoFED 2012).

An important increase in the total quantity of food consumed per capita equivalent is seen at the bottom of Table 4.1. HICES data show that consumption increased from 288 kilograms per capita equivalent per year in 1996 to 447 kilograms in 2011, an increase of 55 percent. The quantities of cereals consumed have shown much less growth, especially in the last 10 years. Here, consumption of cereals grew from 180 kilograms per capita equivalent in 2000 to 192 kilograms per capita equivalent in 2011, an increase of 7 percent. Moreover, expenditures on food have grown in real terms in the last two surveys conducted compared to 2000. Per capita equivalent food expenditures in 2011 were 22 percent higher than in 2000.

Some notable shifts are seen within the food basket. Overall, the share of cereals in total food expenditures is declining. While the share made up 47 percent of expenditures in 2000, this declined to 36 percent 10 years later. Most growth in the non-cereal food categories was recorded in the “other food” category that grew from 3.0 percent in 2000 to 6.2 percent in 2011. There also is seen a growing importance of animal-source foods in the food basket over time. Although the share is still relatively low (see Humphries et al. (2014) for a comparison with Peru), it has grown from about 7.5 percent in 1996 to 10.8 percent in 2010. These patterns are a reflection of Bennett’s law that describes a relative decline in starchy staples and an increase in animal proteins with income (Bennett 1941). While Ethiopia is generally characterized by a lack of diverse diets, which are associated with poor nutritional outcomes (Headey 2014), this seems to be changing over time, albeit slowly.

Cereal expenditures make up 36 percent of the total consumption basket, but they make up 43 percent of the quantity consumed in 2011. This indicates that the relative cost of cereals is declining. In contrast, animal products constitute 10.8 percent of expenditures and 4.6 percent of the quantities consumed. These animal products are the most expensive items in the consumption basket. On the opposite side of the price spectrum, root crops are a relative cheap food category in the consumption basket.

Table 4.2 illustrates differences in consumption patterns between rural and urban areas using the 2011 HICES dataset. Average per capita equivalent expenditures are significantly higher in urban areas than in rural ones and the share of nonfood expenditures is also significantly higher in urban areas (61.8 percent) than in rural areas (48.1 percent). Compared to rural areas, urban food expenditures are relatively higher: rural food consumption expenditures are only two-thirds of the urban food expenditures at 863 birr versus 1,219 birr, respectively. Although food expenditures are significantly higher in urban areas, the actual quantities consumed are lower – 462 kilograms in rural areas versus 376 kilograms in urban areas. This is due to the higher prices paid in urban areas for food, but also possibly because of lower calorie requirements in these urban settings (Deaton and Drèze 2009).

Table 4.1. Food consumption and real per adult equivalent expenditure, by category, 1996 to 2011

	1996		2000		2005		2011	
	Birr	Share (%)	Birr	Share (%)	Birr	Share (%)	Birr	Share (%)
Real expenditures (birr/per adult equivalent/year)								
Food								
Teff	85	11.6	96	12.6	72	8.9	69	7.5
Wheat	53	7.2	66	8.7	71	8.9	68	7.4
Barley	34	4.7	29	3.8	35	4.4	22	2.4
Maize	74	10.1	82	10.8	69	8.6	71	7.7
Sorghum	52	7.1	46	6.1	65	8.1	46	5.0
Other cereals	22	3.0	24	3.2	13	1.7	13	1.4
Processed cereals	15	2.1	15	2.0	26	3.2	42	4.6
All cereals	337	45.7	357	47.1	351	43.8	333	36.0
Pulses	56	7.6	75	9.9	62	7.7	88	9.5
Oilseeds	2	0.3	2	0.3	2	0.2	1	0.2
Animal products	56	7.5	60	7.9	70	8.7	100	10.8
Oil & fat	34	4.6	27	3.6	31	3.9	61	6.6
Vegetables & fruits	28	3.7	34	4.5	37	4.6	59	6.4
Pepper	36	4.9	30	4.0	21	2.6	61	6.6
Enset/kocho	38	5.1	57	7.5	36	4.4	39	4.2
Coffee/tea/chat	72	9.8	52	6.9	62	7.7	84	9.1
Root crops	19	2.6	26	3.4	25	3.1	16	1.8
Sugar & salt	18	2.5	15	2.0	15	1.9	25	2.7
Other foods	42	5.7	23	3.0	90	11.3	57	6.2
Total food	*739*	*100.0*	*759*	*100.0*	*802*	*100.0*	*925*	*100.0*
Food/non-food								
Food	739	59.6	759	63.6	802	54.1	925	47.9
Non-food	502	40.4	434	36.4	681	45.9	1,005	52.1
Total	*1,240*	*100.0*	*1,193*	*100.0*	*1,483*	*100.0*	*1,930*	*100.0*
Consumption (kg/adult equivalent/year)	**kg**	**Share (%)**	**kg**	**Share (%)**	**kg**	**Share (%)**	**kg**	**Share (%)**
Teff	31	10.6	38	10.0	32	8.0	33	7.3
Wheat	25	8.7	32	8.4	37	9.1	31	6.9
Barley	17	5.9	12	3.3	16	3.9	12	2.7
Maize	41	14.0	47	12.5	47	11.6	63	14.2
Sorghum	20	7.1	28	7.5	40	9.9	35	7.8
Other cereals	10	3.4	17	4.5	7	1.6	9	2.0
Processed cereals	5	1.9	6	1.6	8	2.0	9	2.0
All cereals	149	51.7	180	47.8	187	46.2	192	43.0
Pulses	23	8.1	21	5.6	21	5.1	22	5.0
Oilseeds	1	0.3	1	0.1	0	0.1	0	0.1
Animal products	17	6.0	16	4.2	18	4.6	21	4.6
Oil & fat	2	0.8	2	0.5	3	0.7	5	1.2
Vegetables & fruits	31	10.9	37	9.7	42	10.5	45	10.0
Pepper	3	1.2	2	0.6	2	0.6	5	1.2
Enset/kocho	13	4.6	71	18.8	52	12.8	58	13.0
Coffee/tea/chat	10	3.6	10	2.6	10	2.5	15	3.4
Root crops	15	5.3	28	7.4	34	8.3	30	6.7
Sugar & salt	8	2.7	6	1.7	7	1.7	10	2.1
Other foods	14	4.8	4	1.0	28	7.0	43	9.7
Total food	*288*	*100.0*	*376*	*100.0*	*404*	*100.0*	*447*	*100.0*

Source: Worku et al., 2017

Table 4.2. Per adult equivalent expenditures and food consumption in 2011, urban versus rural

	Rural		Urban		Rural		Urban	
	Birr	Share (%)	Birr	Share (%)	kg	Share (%)	kg	Share (%)
	Real expenditures by food group (birr/adult equivalent/year)				Consumption by food group (kg/adult equivalent/year)			
Food								
Teff	51	6.0	153	12.6	25	5.4	69	18.4
Wheat	59	6.8	113	9.3	29	6.2	41	10.9
Barley	25	2.9	10	0.8	14	3.0	4	1.1
Maize	80	9.3	30	2.4	72	15.7	22	5.8
Sorghum	52	6.0	18	1.5	40	8.6	14	3.6
Other cereals	14	1.6	11	0.9	10	2.2	4	1.0
Processed cereals	28	3.3	109	8.9	5	1.1	26	7.0
All cereals	309	35.8	445	36.5	195	42.2	180	47.9
Pulses	84	9.8	105	8.6	23	4.9	21	5.6
Oilseeds	2	0.2	1	0.1	0	0.1	0	0.1
Animal products	84	9.8	175	14.3	20	4.4	23	6.1
Oil & fat	51	5.9	110	9.0	4	0.8	11	2.9
Vegetables & fruits	51	5.9	99	8.1	42	9.2	56	14.8
Pepper	59	6.8	73	6.0	5	1.1	6	1.6
Enset/kocho	45	5.3	7	0.6	69	14.9	8	2.0
Coffee/tea/chat	85	9.9	78	6.4	16	3.6	10	2.5
Root crops	16	1.9	17	1.4	32	7.0	19	5.1
Sugar & salt	21	2.4	44	3.6	9	1.9	13	3.5
Other foods	55	6.4	67	5.5	46	10.0	30	7.9
Total food	*863*	*100.0*	*1,219*	*100.0*	*462*	*100.0*	*376*	*100.0*
Food/non-food								
Food	863	51.9	1,219	38.2	*na*	*na*	*na*	*na*
Non-food	799	48.1	1,975	61.8	*na*	*na*	*na*	*na*
Total	*1,662*	*100.0*	*3,194*	*100.0*	*na*	*na*	*na*	*na*

Source: Worku et al., 2017. Note: na = not applicable.

Interestingly, there are almost no differences in the share of cereals in total food expenditures between urban and rural areas, and the quantities consumed of cereals are also at similar levels. However, consumption of animal products is substantially higher in urban areas. Within the cereal category, however, consumption patterns differ significantly. Rural households consume significantly more sorghum (40 kilograms versus 14 kilograms in urban households) and maize (72 kilograms versus 22 kilograms). In contrast, the share of teff in the urban food consumption basket is significantly higher than in rural areas—more than three times as high. Urban residents consume relatively more expensive cereals, such as teff, than do rural ones (Worku et al. 2017). Overall, we see a substantially different diet in urban households than in rural ones. This implies that national food systems will likely change in important ways in the future with an increase in the share of Ethiopia's population residing in urban areas and the changing food preferences accompanying that demographic shift.

5. AGRICULTURAL TRANSFORMATION

CSA official statistics show that grain production doubled from 13.4 million metric tons (mt) in 2005/6 to 27.0 million mt in 2014/15. Bachewe et al. (2018) triangulate these numbers and assess some of the drivers for that change. They find that there has indeed been substantial growth in agricultural production in Ethiopia, driven by increasing land expansion but even more so by increasing yields. These increasing yields have been achieved through improved total factor productivity but also by increasing use of modern inputs.

They argue that this modernization and intensification process in agriculture was driven by expanded availability of agricultural extension agents, improved market access, better price incentives, and higher education levels of farmers.

This process of intensification and modernization of agricultural production has continued in more recent years. Figure 5.1 illustrates to what extent imports of chemical fertilizers and agro-chemicals have changed over the last decade. The figure shows that imports of such modern inputs more than quadrupled in the last decade. While part of these agro-chemicals is used in large commercial farms (especially the commercial large-scale flower farms that have quickly taken off in the last decade), there is also increasing uptake by smallholder farmers. For example, Tamru et al. (2017) show herbicides being used on a quarter of the cereal area in the country in most recent years, mostly by smallholders.

Figure 5.1. Imports of chemical fertilizer and agro-chemicals

Source: UN, Comtrade, https://comtrade.un.org/data/. Note that dotted line is linear trend over the period examined.

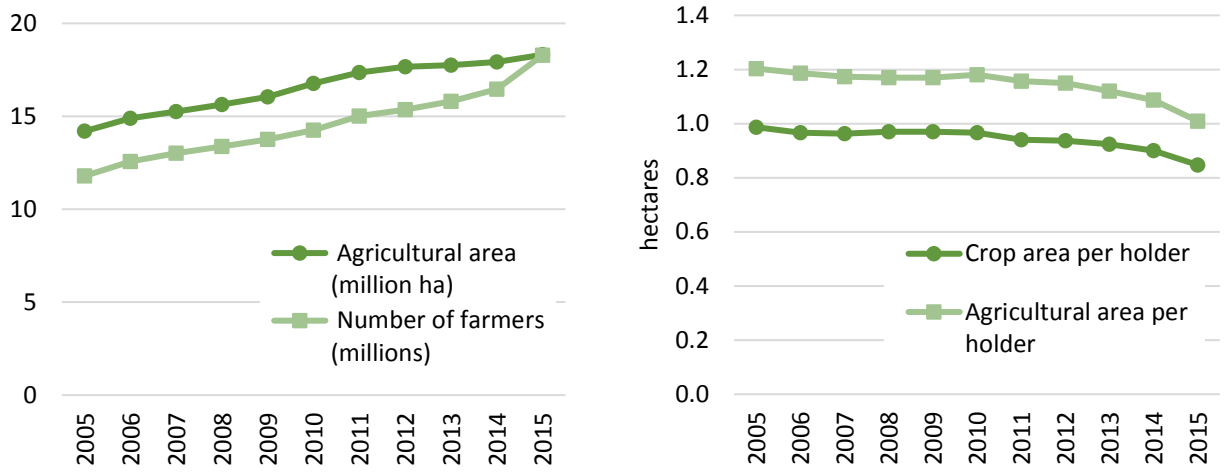
We note also some important structural changes in agricultural production. Ethiopia has recently pursued a policy aiming to increase the role of commercial farms. There are different estimates on the land area allocated to them. Ali et al. (2017) estimated that 1.3 million hectares were allocated to 6,612 commercial farmers in 2013/14. This compares to 1.4 million hectares estimated by Rulli et al. (2013) and 2 million hectares by Bekele (2016). However, their role in national agricultural production is still relatively small and, despite the fiscal advantages that were given to these farms, their performance has been lower than anticipated. It has been observed that a substantial part of the allocated land to them is not under cultivation (Ali et al. 2017). Based on a commercial farm survey in 2013/14, it was estimated that about 1 million hectares were cultivated by large commercial farms in 2013, which made up 7 percent of all the cultivated area in Ethiopia (Ali et al. 2017). Commercial farms have higher yields - about double - than smallholders (Ali et al. 2017), but they also tend to specialize in export crops. For example, cereals made up 28 percent of the area cultivated by commercial farms, but 76 percent of that cultivated by smallholders in 2013/14 (Bachewe et al. 2018). The most important crops cultivated by commercial farms are sesame (27 percent of their total area), cotton (17 percent), and coffee (12 percent).

In further analysis, we rely on data from the Annual Agricultural Sample Surveys conducted by CSA to understand the dynamics in land allocation for smallholder farmers in particular.

Farm sizes of smallholders are declining. The left chart in Figure 5.2 shows that both total agricultural land area and the number of farmers increased considerably during the period 2004/05 to 2016/17. Total agricultural land in 2016/17 was 40 percent higher than in 2004/05 – a growth of 2.9 percent annually – but the number of farmers increased even faster during the same period. It is especially

in the last five years that we see significantly slower growth in the expansion of agricultural land.[2] Since population growth patterns change slowly and growth in agricultural land is constrained by the limited availability of arable land, the observed decline in the availability of land per farmer is likely to be an increasingly binding constraint for agriculture in the future (Schmidt et al. 2018). Further building on these numbers, the right chart in Figure 5.2 shows trends in the average farm size of smallholders in Ethiopia over the last decade. Average crop area declined from about 1.0 hectare per farmer in 2004/05 to 0.85 ha in 2015/16. Although the size of agricultural landholdings declined at an average annual rate of 2.3 percent, they stayed about the same in the first half of the decade (2004 to 2010), with almost all of the decline occurring more recently in the period from 2010 to 2016.[3]

Figure 5.2. Agricultural area, number and farm size of smallholder farmers, 2004/05 to 2016/17 (three-year moving average)



Source: Authors' calculations based on AgSS 2004/05 – 2016/17, CSA

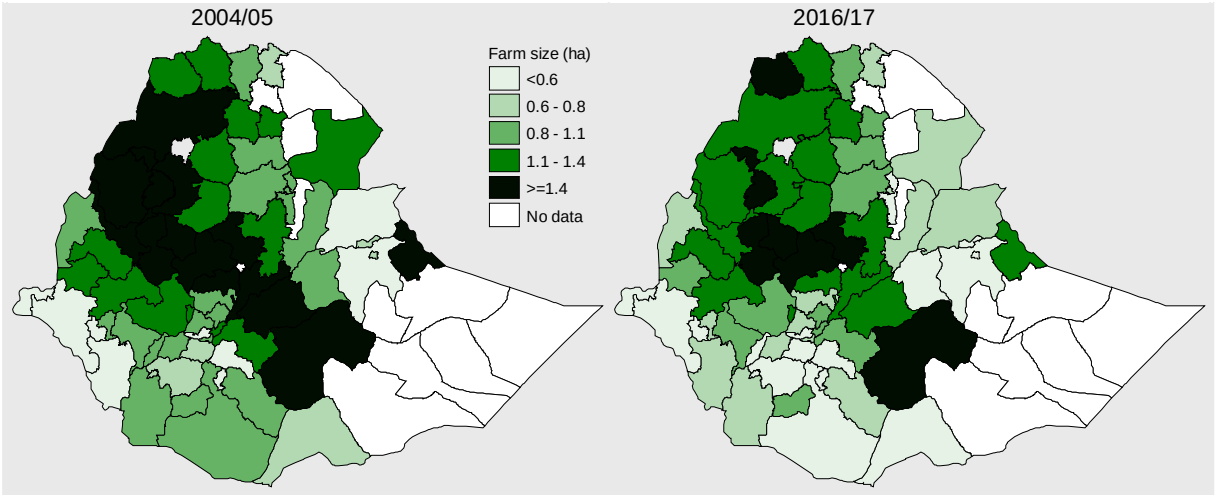
The decline in agricultural landholding per farmer is a widespread phenomenon rather than a localized occurrence. Figure 5.3 shows zonal average agricultural landholding sizes in the 64 administrative zones covered in CSA's AgSS.[4] Darker colors reflect relatively larger farms. The map shows that farms are relatively smaller in the south and in the central north of the country, illustrating the higher population density in those areas, and are larger in the west and northwest. The maps also illustrate that agricultural landholding per farmer declined in almost all zones of the country, i.e., in 57 of the 64 administrative zones covered in CSA's AgSS.

[2] Indeed, the difference between average annual growth rates in the number of farmers and agricultural land (-1.4 percent) is about the same as the observed average annual decline in agricultural landholdings.

[3] The distance between the two graphs in Figure 5.2 (right panel) is about the same over the years, which indicates that non-crop area remained about the same during the period (at about 0.2 ha). However, the data also show that the area of fallow land declined considerably and that the land area under grazing, woodland, and other uses increased, which reflects existing land constraints and that increasingly little land is left to bring into production.

[4] 2004/05 and 2005/06 data are unavailable for ten zones (four, three, two, and one zone in Gambella, Oromiya, Benishangul-Gumuz, and Amhara regions, respectively). We use the data in the earliest year (2006/07) for these zones.

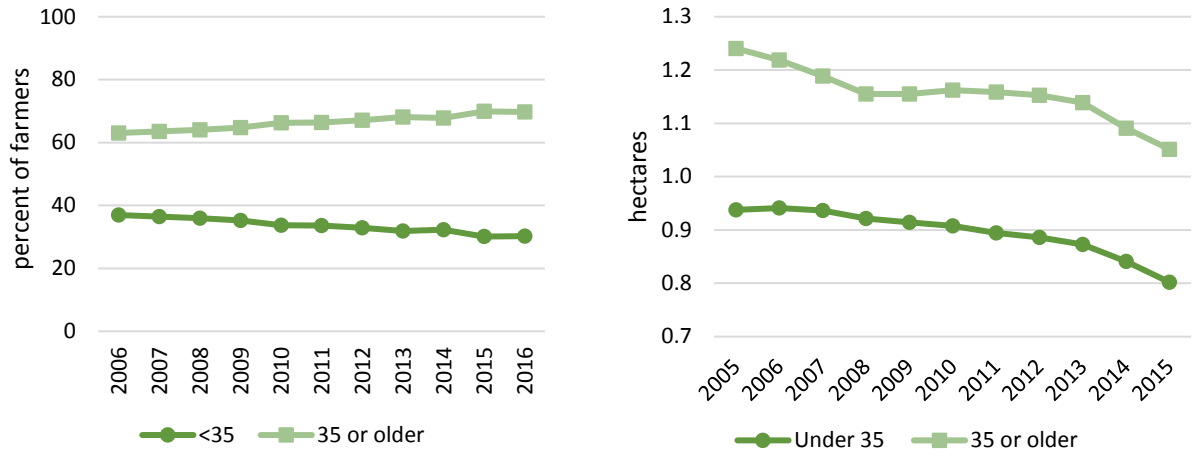
Figure 5.3. Average agricultural land size (ha) of smallholders, 2004/05 and 2016/17



Source: Authors' calculations based on AgSS 2004/05 – 2016/17, CSA

We also find that farmers on average are becoming older. The left chart in Figure 5.4 indicates that the share of farmers under age 35 years has declined from 36 percent in 2004 to 30 percent in 2015, driven by the expanding life experience of more mature farmers as well as lower entry into farming by younger farmers. The CSA data also show that young farmers have smaller and declining farm sizes. We depict average land sizes cultivated by young and by mature farmers in the right chart of Figure 5.4. The decline in agricultural area has occurred in both age groups, but it is relatively more important for young farmers given their smaller farm sizes to start with. The absolute differences in farm sizes between the different age groups remained rather similar across years.

Figure 5.4. Share of farmers in age categories and farm size (three-year moving average), by age category, 2004/05 to 2016/17

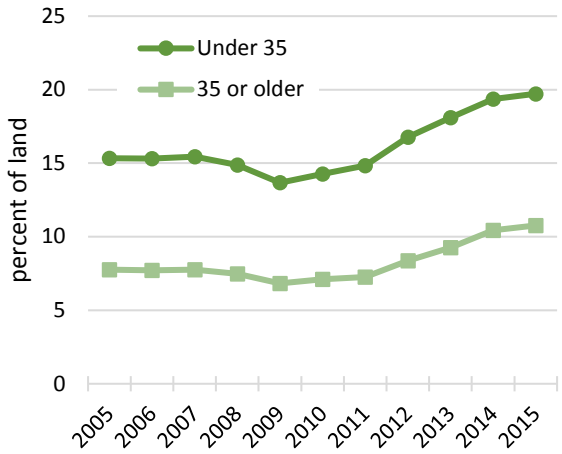


Source: Authors' calculations based on AgSS 2004/05 – 2016/17, CSA

As most rural residents depend on agriculture as their main source of livelihood (Schmidt and Bekele 2016; Bachewe et al. 2017), access to land is crucial for agricultural activities. This is especially an issue for the younger population given that they have less access to agricultural land. In response to more binding land constraints, rental markets are seemingly becoming more widespread, with the youth increasingly relying on these rental markets to access land. In Figure 5.5 we show the share of rented-in land out of the total land that is operated by youth and mature farmers, respectively. The share of rented-in land operated by youth farmers was nearly twice that operated by mature farmers in an average year

during the period 2004/05 to 2015/16, with the share of rented-in land especially increasing in the last 5 years. Vandercasteelen et al. (2018) illustrate that these formal rental markets are especially taking off in areas with better market access.

Figure 5.5. Share of total land operated by farmer that is rented-in, by age category, 2004/05 to 2016/17



Source: Authors' calculations based on AgSS 2004/05 – 2016/17, CSA

6. SUPPLY CHAIN TRANSFORMATION

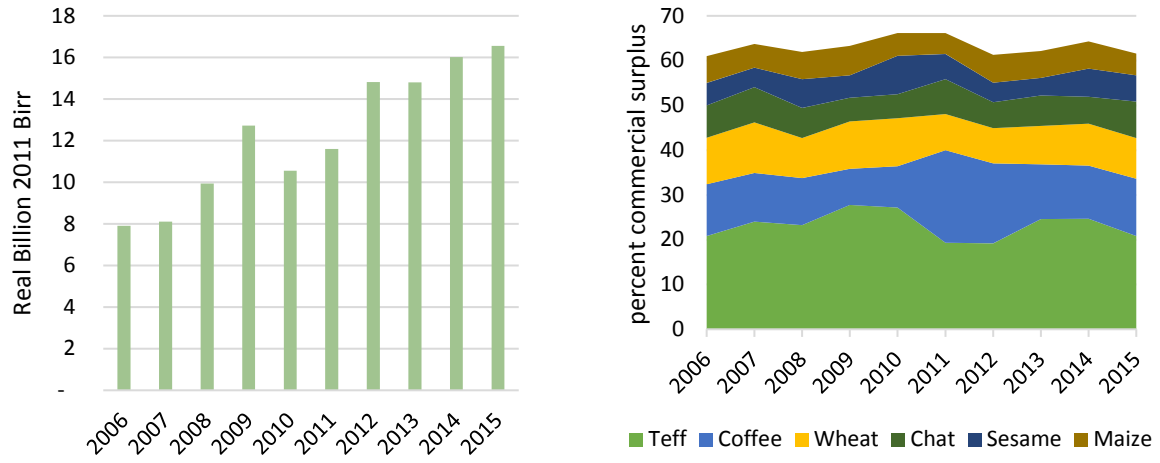
6.1. Local markets

Expansion

The quantities traded and the total value of agricultural commercial surpluses are rapidly increasing. To illustrate these changes, we use commercial surplus data from the AgSS of CSA and value those at real yearly prices by crop. We see in the left chart of Figure 6.1 how the overall real value of the commercial surplus in agriculture in Ethiopia has doubled over the last decade, from 8 billion to 16 billion Birr. We also note relatively small changes in the composition of this commercial surplus (Figure 6.1, right side). Teff is by far the most important crop, making up about 23 percent of commercial surplus in the country. The other important crops are coffee (13 percent), wheat (9 percent), chat (7 percent), and sesame (6 percent). Maize – despite being on top in quantities produced in the country – is relatively less important as a component of the commercial surplus (at 6 percent), consistent with consumption patterns in rural areas noted above.

The increased agricultural commercialization patterns also show up in the purchase behavior of households. Respondents during the National Consumption Survey of 2011 were asked how they paid for specific food purchases. As expected, there are large differences between rural and urban areas. Consumption of households' own agricultural products accounts for 42 percent of total food expenditures in rural areas (Worku et al. 2017), but that share is much higher in calorie terms – two-thirds for crop producers – indicating that relatively more expensive foods are acquired through purchase (WFP/CSA 2014). These numbers reflect the high level overall of auto-subsistence of the rural Ethiopian economy (Worku et al. 2017).

Figure 6.1. Real value of commercial agricultural surplus in Ethiopia and composition by commodity, 2006 to 2015



Source: Authors' calculations based on CSA data

However, it is to be noted that the value and share of auto-consumption is considerably lower than is often assumed. Even rural households depend in important ways on commercial food markets. This is a consistent finding with other countries in Eastern and Southern Africa. For example, Dolislager et al. (2015) show rural households bought 44 percent (in value terms) of the food they consume. However, as might be expected, in urban areas only 3 percent of food expenditures comes from own production. Towns and cities therefore are important commercial food markets. Despite the low urbanization share in the total population of Ethiopia, urban markets made up about one-third of the total commercial food market in 2011.

Change in the structure of supply chains

We note important growth and transformation in the trading and transport, processing, and food service sectors, and in retailing and distribution. They are discussed below consecutively. It is estimated that 4 percent of the population was employed in agricultural trade or transport in 2011 per Ethiopia's Social Accounting Matrix (SAM), and is one of the most important areas of employment in the service sector. This sector has shown rapid change. Minten et al. (2014) reported that the number of trucks in urban wholesale markets rose by about 75 percent over a decade. They also illustrate a shift to larger trucks being used for the transportation of agricultural products. Trader focus groups indicated considerable growth over time in the number of traders in these markets as well (Minten et al. 2014). With the number of traders perceived to be growing by almost 150 percent over the past decade, and the number of brokers growing by more than 250 percent, competition in these markets appears to have become keener and turnover per trader and broker lower. Bachewe et al. (2016) also show that agricultural trade is one of the main non-farm activities in rural areas in Ethiopia, especially so for the relatively rich.

A pattern that is seen globally with increases in income is the increased consumption of processed food. Benfica and Thurlow (2017) estimated the share of the food budget in 2011 in Ethiopia made up by processed food at 17 percent. We rely on the most updated data from two manufacturing enterprises surveys conducted by CSA to assess the food processing sector. In 2010/11, CSA surveyed large and medium-scale manufacturing firms, defined as those that employ 10 or more people and use electricity-driven machinery. Based on this survey, 686 firms were identified as being involved in the manufacturing of food products and beverages, employing more than 67,000 people (Table 6.1). Of these employees, two-thirds are men and one-third are women. By sub-sector, the most important sub-sectors in terms of

employment in the food processing sector are firms involved in grain milling, baking, and the production of sugar and sugar confectionery.

Table 6.1. Food processing sector in Ethiopia, by scale

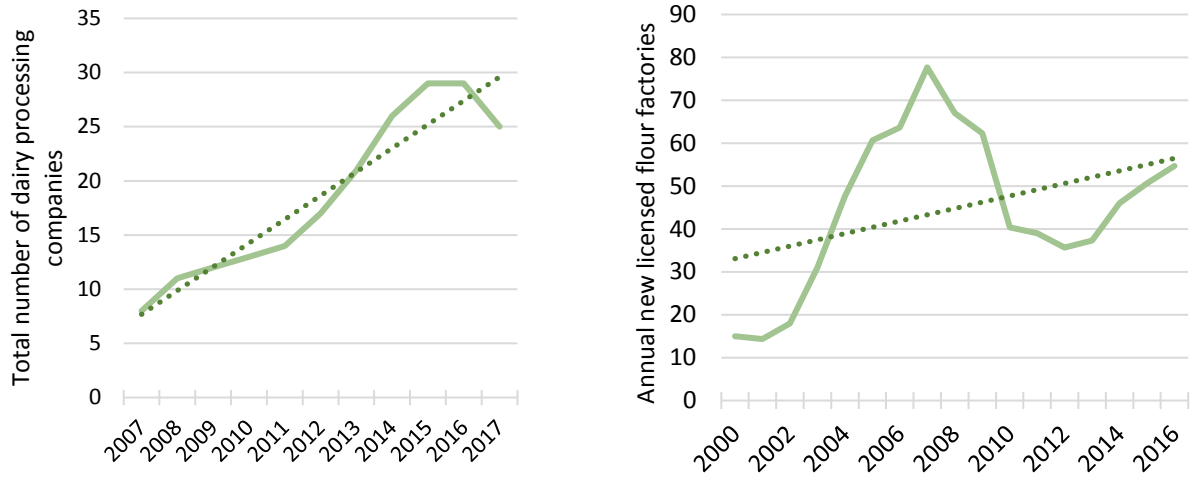
	Number of establish-ments	Number of persons engaged	Of which permanent	
			Male	Female
Large and medium scale manufacturing (2010/11)				
Total	2,170	175,698	95,211	52,037
Manufacturing of food products and beverages	686	67,471	38,134	18,612
Share (%)	*32*	*38*	*40*	*36*
Production, processing and preserving of meat, fruits, and vegetables	10	2,716	1,890	579
Manufacture of…				
… vegetable and animal oils and fats	34	1,198	743	198
… dairy products	24	1,867	1,165	509
… grain mill products	197	10,077	5,590	2,419
… prepared animal feeds	11	601	375	136
… bakery products	247	14,917	6,619	7,696
… sugar and sugar confectionery	31	15,273	8,897	1,303
… macaroni and spaghetti	20	1,855	1,230	569
… other food products	29	2,522	973	624
… distilling, rectifying and blending of spirits	18	1,886	1,079	739
… wines	2	524	353	171
… malt liquors and malt	10	6,049	4,398	1,021
… soft drinks and production of mineral water	53	7,986	4,822	2,648
Small scale manufacturing industry (2013/14)				
Total	116,604	1,744,544	532,859	445,209
Manufacturing of food products, except milling services	25,430	373,259	116,458	110,102
Share (%)	*22*	*21*	*22*	*25*
Production, processing and preserving of meat, fruits, and vegetables	269	3,271	1,162	1,238
Manufacture of…				
… vegetable and animal oils and fats	720	7,487	3,082	2,640
… bakery products	14,218	221,301	69,754	65,760
… cocoa, chocolate and sugar confectionery	29	320	134	115
… other food products	10,195	140,881	42,326	40,349
Grain mill services	35,430	540,539	152,896	129,843
Share (%)	*30*	*31*	*29*	*29*
Total food processing sector	61,546	981,269	307,488	258,557

Source: Authors' calculations based on CSA (2012; 2015)

In 2013/14, CSA surveyed small-scale manufacturing firms, defined as those that employ less than 10 people. Such firms are significantly more important in terms of employment than the larger firms – they employ 1.7 million people nationally, out of which 52 percent is involved in food processing (Table 6.1). Twenty-one percent of these firms manufacture beverage or food products, with the production of bakery products being particularly important, employing more than 220,000 people. Grain milling accounts for 31 percent of people employed in small-scale manufacturing industries with more than 540,000 people engaged. In contrast to larger firms, more females are employed in these smaller firms, making up almost half of permanent employees. Overall, it is estimated that almost one million people are engaged in food processing in Ethiopia (bottom Table 6.1), or around 2 percent of the economically active population of the country defined as those aged 15 to 64 years.

Unfortunately, good and consistent time series data for the processing sector as a whole are lacking. However important changes are happening in the sector as illustrated by two examples. First, in the case of dairy processing plants, there were eight companies active in the country in 2007. By 2017, this had more than tripled to 25 (Figure 6.2, left side).[5] While there now is significant overcapacity in dairy processing, this example illustrates significant change in the sub-sector. Second, data were obtained from the Ministry of Trade on the number of licenses given out to flour factories in Ethiopia. While in the beginning of the 2000s, about 15 licenses were given out annually, this annual rate had tripled to more than 50 in 2016 (Figure 6.2, right side). Further illustrating large changes in the milling sector, Comtrade data indicate that the three-year moving average of the value of imports of machinery for mills (HS code 8437) quadrupled from 7 million USD in 2006 to 28 million USD in 2015. Minten et al. (2014) further provide evidence of the much greater presence of mills in urban areas, their evolving roles in moving towards one-stop retail shops, increasing competition, and lower milling margins over time.

Figure 6.2. Change in number of agro-processing firms



Source: Ethiopian Meat and Dairy Industry Development Institute (left) and Ministry of Trade (right). Note that dotted lines are linear trends in number of agro-processing firms over this period

The share of food eaten away from home is increasing – a development that is seen globally as incomes rise.[6] In Ethiopia in 2011, this share made up by food eaten away from home in the urban food budget was estimated to be 16 percent, i.e., twice as high as expenditures on vegetables and fruits. Moreover, a strong gradient over income is seen. The poorest quintile spends 6 percent of its food budget on food eaten away from home, compared to 25 percent for the richest quintile. Associated with this, we see the increasing emergence of a rapidly growing food service sector. For example, in the case of commercial *enjera* markets, Minten et al. (2017) show how these markets are quickly transforming with a large number of people, especially in urban areas, now buying enjera instead of preparing it themselves. They estimate that more than 100,000 people in urban centers in Ethiopia make their living in enjera-making enterprises or through the retailing of the enjera produced. This sector therefore provides a high level of employment in Ethiopia, comparable to the much-publicized flower export sector (e.g., Oqubay 2015; Schaefer and Abebe 2015).

Modern retail and different food distribution and retail systems are emerging. Assefa et al. (2016) analyze the urban food retail market in Ethiopia and find increasing differentiation in food retail markets in

[5] Data from the Ethiopian Meat and Dairy Industry Development Institute.

[6] For example, Smith et al. (2014) note that food eaten away from home increased from 10 to 49 percent of total food expenditures in the US between 1900 and 2010 and that similar fast changes are seen in this area in a number of quickly transforming economies such as India, China, and Mauritius.

recent years. Despite the prohibition of foreign direct investment in food retail, a domestic modern private retail sector is quickly appearing. However, its share of the total urban food retail market is still very small and, in contrast to roll-outs of modern retail in other countries (e.g., Reardon et al. 2003), it has not yet entered the cereal sector in a big way. The cereal sector remains overwhelmingly in the hands of local flour mills, cereal shops, and cooperative retail outlets. Another example of changes in distribution systems – in input markets – is the model of Ethio-chicken where a private firm has engaged 2,500 agents in the country to distribute their chickens.

Innovations in supply chains

Three major innovations in agricultural markets in the last decade can be highlighted. First, a modern commodity exchange, the Ethiopian Commodity Exchange (ECX), was started in 2008. From December 2008 onwards, it became mandatory to sell coffee – followed by other exports crops, such as sesame and other oilseeds – through the Ethiopian Commodity Exchange (ECX). ECX trades standard contracts, based on a warehouse receipt system, with standard parameters for grades, transaction size, payment, and delivery. Before the establishment of ECX, there was no third-party quality control except when exported. All trade was centralized and sold through an auction system in Addis Ababa. While ECX has had important impacts on the structure of value chains, it, however, appears not to have led to important improvements in performance (Hernandez et al. 2017). The ECX is only involved in trade in export crops.

Second, mobile phones are now used ubiquitously by all agricultural traders. Minten et al. (2014) show that cell phone usage rates increased to 100 percent for traders and brokers of all the cereal crops in the various markets within an average of only 4 to 5 years after the introduction of cell phone coverage. This has contributed to behavioral changes such as the bypassing of the Addis wholesale markets as the clearing house for agricultural trade and the increasing use of mobile phones by traders to coordinate logistics and trade. However, surprisingly, no major effect of these improvements in communication on trade margins were found (Riera and Minten 2016). Also farmers and pastoralists have increasingly adopted these mobile phones. They have, for example, been useful for pastoralists to find buyers as well as pastures to migrate to (Debsu et al. 2016). Despite these better communication possibilities, Tadesse and Bahiigwa (2015), however, did not find an effect of mobile phone ownership on the prices obtained by crop farmers.

Third, contract farming has been promoted by a number of institutions and firms in recent years. As argued by Reardon et al. (2018), contract farming might take off in transitional marketing systems, but are more widespread in modern markets. They have the potential to solve a number of constraints that might exist in these markets such as access to improved inputs, credit, extension, and lack of market access, which could lead to important spillover effects (Negash and Swinnen 2013). Holtland (2017) reviewed a number of implemented contracting schemes in recent years in Ethiopia. He showed that none of them was long-lived and that the only large-scale contracting scheme with smallholders that existed for a number of years, that with the Heineken brewery, was subsidized by the company. He identified a number of issues with these contract farming schemes, including firms not following up on their promises or farmers failing to deliver because of production problems or side-selling. Such issues have also been found to be major constraints to contract farming in other developing countries (Otsuka et al. 2016).

Market performance

We further look at some measures of agricultural market performance over time. First, the degree to which cereal prices move together across markets throughout Ethiopia, i.e., how well they are integrated, provides a measure of how well these markets function. Several authors have shown that markets have become better integrated over time and are more resilient to drought (Minten et al. 2015; Dercon 1995; Hill and Fuje 2017). We update that analysis and assess here the integration of cereal wholesale markets over the period 1999 to 2016 by studying market integration between various market pairs for each of the major cereals using the methodology developed by Van Campenhout (2007). In particular, we pair Addis

Ababa with the most important regional wholesale markets for each of the cereals, thus our analysis reflects the major cereal flows in the country (Table 6.2).

Table 6.2. Degree of market integration of Addis Ababa with other cereal wholesale markets between 1999 and 2016

	Year	White teff	Mixed teff	Maize	White wheat	White sorghum
Total market pairs	1999	11	11	8	10	5
	2004	11	11	8	10	5
	2010	11	11	8	10	4
	2016	11	11	8	10	4
Percent integrated markets	1999	36	27	25	70	60
	2004	38	27	25	80	60
	2010	36	45	50	80	75
	2016	50	45	50	80	50
Half-life of adjustment to price changes, in months	1999	1.2	4.0	2.0	4.3	0.7
	2004	1.0	3.7	1.6	4.0	0.6
	2010	1.0	3.7	0.8	3.6	0.5
	2016	0.8	3.2	0.8	2.2	3.0
Transaction costs, measured as percent of average cereal prices in that period	1999	16	8	13	10	11
	2004	10	7	13	10	10
	2010	7	6	12	9	5
	2016	6	6	10	8	10

Source: Authors' calculation based on data from Ethiopian Grain Trading Enterprise (EGTE).

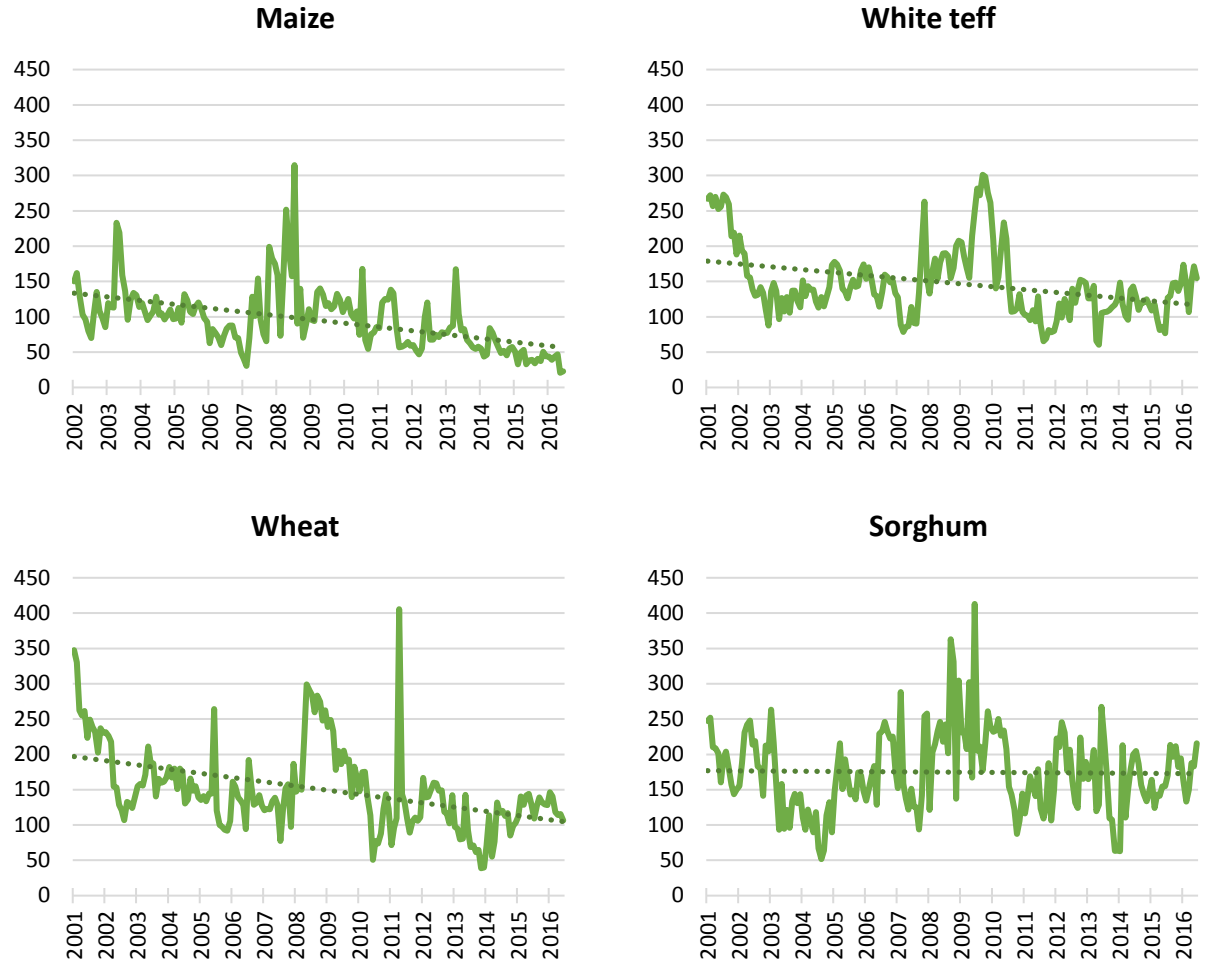
Three important results can be highlighted from this market integration analysis. First, there has been an overall improvement in market integration over the two last decades. While the majority of wholesale markets for white teff, mixed teff, maize, and white wheat were well integrated at the end of 2016, only about half of those markets were integrated in 1999. Fifty percent of the regional white teff, maize, and white wheat markets were integrated with respect to the Addis Ababa market in 2016, compared to 36, 25, and 60 percent, respectively, in 1999. In contrast, there seems to be no improvement in sorghum market integration over time. Second, the speed of price adjustments has improved. This is illustrated in the average half-life of adjustment to price changes declining from an average of 3 months in 1999 to a month and a half in 2016. Compared to the case in 1999, it now takes about half the time for prices between wholesale markets to return back to half of the long-run equilibrium after a given price shock. Third, estimated transaction costs between the wholesale markets considered have come down substantially over time (bottom row, Table 6.2). Transaction costs fell by about 50 percent for all of the cereals examined, except for white sorghum.[7]

Second, the analysis shows that marketing margins between agricultural markets are seemingly decreasing over time. Relying on EGTE price data from a number of wholesale markets in the country, Figure 6.3 shows that the standard deviation between wholesale market prices for cereals have all come down over time, expect for sorghum. Using the trend line for maize, wheat, and teff, standard deviations fell by 100 Birr/quintal over the 15-year period, indicating that price differences between maize and wheat wholesale markets fell to one-third and half the differences at the beginning of the period. This decrease is likely a reflection of investments in road and communication infrastructure and the more competitive markets that have developed over time (Minten et al. 2014). However, it is to be noted that there is still

[7] It is to be noted in the latter case that sorghum is not widely consumed in major markets such as in Addis Ababa. As such, the thin sorghum markets with limited flows among them appear to be reflected in these estimation results.

substantial volatility around this trend. This deviation was especially high in 2008 and 2009 when inflation rates were high in the country.

Figure 6.3. Standard deviation of cereal market prices between wholesale markets in Ethiopia, 2001 to 2016, birr/quintal



Source: Authors' calculations based on Ethiopian Grain Trading Enterprise (EGTE) price data. Note that dotted lines are linear trends in prices over the period considered.

Third, seasonality is a major characteristic of agricultural markets. We assess with the EGTE wholesale market price data to what extent seasonal behavior is present in market prices and how this seasonal behavior is changing. To do this, we run a simple regression on the logarithm of the wholesale prices with market, year, and monthly dummies on the right-hand side. We then interpret the coefficients for the monthly dummies (Table 6.3). We note that there is significant price seasonality, with prices low immediately after the main harvest and highest at the end of the rainy period before the new harvest starts coming in. Over the period considered, price seasonality was the highest for maize with a price amplitude of 16 percent, while it was lowest for teff with a price amplitude of 7 percent. This difference between crops might reflect aptitude for storage as maize is less suited for long storage periods compared to teff.

Interestingly, we see a significant decline in price seasonality over time, comparing seasonal amplitudes for the period 2002 to 2008 and the period 2009 to 2016. Seasonal price amplitudes were reduced over these two periods by between 8 percentage points for teff and 10 percentage points for wheat. For example, while the price difference for wheat between the highest and the lowest-priced month in the first period was 17 percent, this had declined to 7 percent in the second period. Several explanations could account for this reduced-price seasonality. First, as shown above, agricultural production during the

main *meher* season has increased rapidly. Thus, there might be more food available for storage and sale later in the year. Second, markets are better integrated and different supply regions can be used to smoothen the lack of seasonal supplies in some areas. Third, farm households are relatively richer now than before and are less cash constrained in the immediate period after the harvest. Consequently, they are not quite so obliged as previously to sell all of their harvest immediately. Fourth, storage conditions have improved due to better access to financial markets, infrastructural improvements, and due to easier access to agro-chemicals used to reduce storage losses. However, quantifying the impacts of each of these factors is left for future research.

Table 6.3. Price seasonality in cereals in Ethiopia

	Amplitude				2002 to 2008		2009 to 2016	
	All 2002-1016	Period 1 2002-2008	Period 2 2009-2016	Reduction p1-p2	Lowest price	Highest price	Lowest price	Highest price
All wholesale markets								
Teff	7.34	13.05	5.48	7.57	February	August	December	September
Wheat	8.45	16.81	6.53	10.28	January	August	December	September
Barley	10.84	16.96	8.04	8.92	March	October	December	August
Sorghum	12.89	19.41	11.06	8.35	February	November	April	January
Maize	15.99	25.18	16.58	8.60	January	August	December	August
Addis Ababa								
Teff	9.22	17.17	6.33	10.84	March	August	December	September
Wheat	8.83	17.43	6.84	10.59	January	August	December	June
Barley	12.78	23.04	5.49	17.55	February	August	February	June
Sorghum	12.22	19.52	11.24	8.28	February	November	April	September
Maize	19.33	29.39	19.25	10.14	January	August	December	August

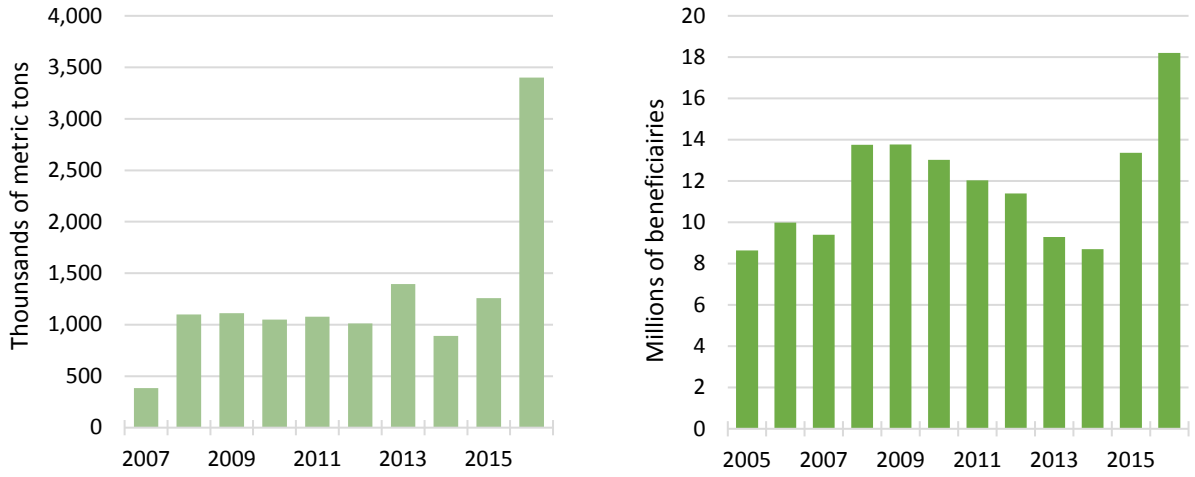
* Seasonality calculated as dummies in regression of the form log(real price) = f(city, year, month)
Source: Authors' calculations based on Ethiopian Grain Trading Enterprise (EGTE) data

Finally, different food groups have shown different price developments over time. Using a large-scale price dataset collected monthly in 116 urban and rural markets across the country, Bachewe et al. (2017) show that real prices of all nutritionally-rich food groups increased between 19 and 62 percent over the last ten years. This contrasts with staple crops (grains, roots, and tubers), which did not show any real price increase, and with oils, fats, and sugar, the prices of which decreased substantially. Given the large influence of prices on consumer choices in countries like Ethiopia, these findings suggest that more investments and attention to the production of nutritious foods – combined with behavioral change messaging – is needed to improve their affordability for consumers.

6.2. Changes in international trade

An important policy consideration in Ethiopia is dependence on international food markets. Ethiopia is a consistent importer of wheat, mostly by the government or international agencies such as the World Food Program (WFP) to be used for distribution in humanitarian activities or in its large social safety net, the Productive Safety Net Program (PSNP). The left chart in Figure 6.4 illustrates the quantities of wheat imported into the country over the last decade. Wheat imports were typically about 1 million tons per year (They were much higher in 2016 because of a large El Nino induced drought in the country). The chart on the right shows how the overall number of beneficiaries in safety net and aid programs has changed over the years. It is noteworthy that imported quantities of wheat and the number of aid beneficiaries are, on average, not declining over time.

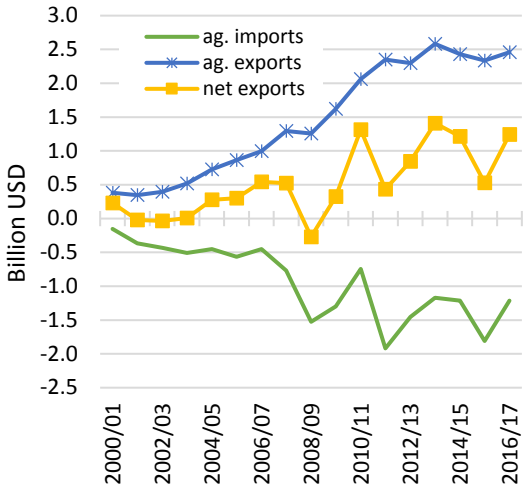
Figure 6.4. Wheat imports, 2007 to 2016, and number of aid beneficiaries (from PSNP and Humanitarian Requirements Document), 2005 to 2016



Source: Comtrade webpage, AKLDP (2017), and World Bank (2017)

On the other hand, Ethiopia is also an exporter of a number of agricultural products, particularly coffee, but also oilseeds, chat, flowers, and meat. Figure 6.5 shows to what extent agricultural exports have changed over the last 15 years. We see an important increase, partly driven by increasing commodity prices in international markets over the last decade for crops such as coffee and sesame, but also by rapidly increasing exported quantities. The value of agricultural exports overall rose six-fold, from 0.4 billion USD in 2000/01 to 2.5 billion USD in 2016/17. When we compare the value of these exports with agricultural imports, including those products that are major inputs in the agricultural production process such as chemical fertilizer, we find that both agricultural imports and exports have increased significantly over the last decade.[8] However, Ethiopia in the last decade was a net agricultural exporter in all years except one. The annual value of net agricultural exports hovered around 1 billion USD over the last five years. This increasing reliance on international trade is noteworthy, especially given complicated trade regimes in Ethiopia (World Bank 2015).

Figure 6.5. Ethiopia's agricultural imports and exports, 2000 to 2016



Source: Authors' calculations based on data from the National Bank of Ethiopia

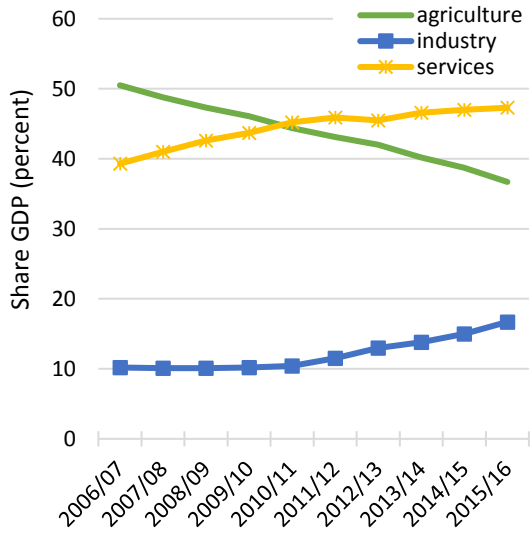
[8] Relying on the National Bank of Ethiopia classification system, food and live animals; tobacco; fertilizer; and grains are included in agricultural imports. It is to be noted that only data on official imports and exports are included in this analysis. Given lack of data on informal trade, such as that of exports of livestock or imports of rice and pasta, these could not be included.

7. STRUCTURAL TRANSFORMATION AND FUTURE FOOD SYSTEMS

7.1. Structural transformation

Structural transformation of economies is an essential process for poverty reduction and welfare improvements (Timmer 2014). In this process, the share of agriculture in the overall economy declines while the services and, most importantly, the manufacturing sectors grow. As these sectors grow, lower labor productivity that is usually seen in the agricultural sector then catches up with productivity levels in the other economic sectors. Ethiopia is still a relatively poor developing country where agriculture is important for the economy and for overall employment. However, the situation of Ethiopia's economy is rapidly changing. Figure 7.1 illustrates sectoral GDP changes over the last decade. While agriculture made up 50 percent of Ethiopia's GDP in 2006/07, this share came down to 37 percent in 2015/16. Based on share of GDP, agriculture is no longer the largest sector of the economy – since 2010/11 it has been overtaken by the services sector.

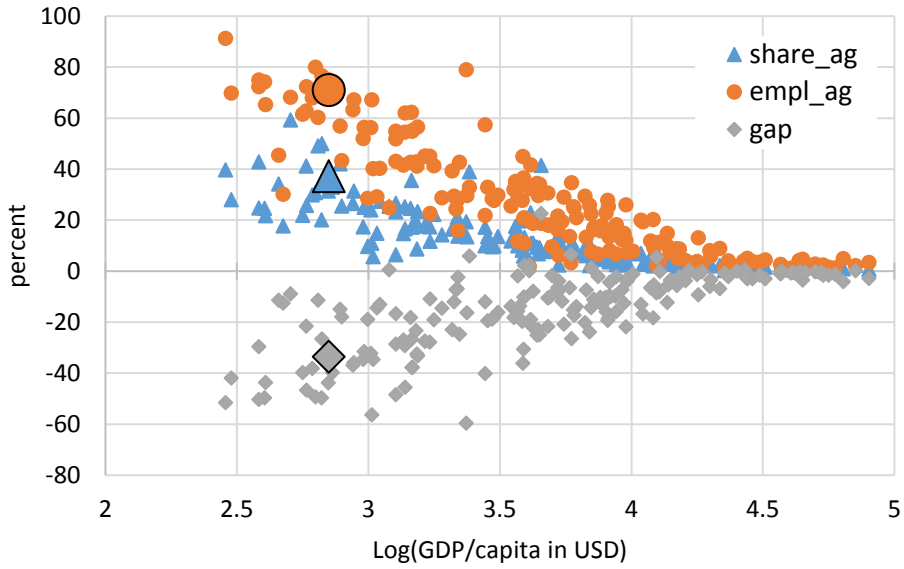
Figure 7.1. Share of different sectors in Ethiopia's economy, 2006/07 to 2015/16



Source: NBE (2018)

While the importance of agriculture in GDP has come down rapidly, the share of workers employed in agriculture has barely changed. Based on data from the national labor survey, Schmidt and Bekele (2016) find that the share of the population employed in agriculture declined by only 4 percent between 2005 and 2013 – from 80.2 percent of those employed nationally in 2005 to 76.7 percent in 2013. The large share of employment in agriculture and the declining share of its economic weight is a typical pattern in developing countries and is reflective of low economic productivity levels in agriculture. Timmer (2014) uses a measure of the difference between the share of agriculture in GDP and employment as an "agricultural gap" to illustrate this phenomenon. We plot this measure for all countries for which World Bank data were available for the year 2016 (Figure 7.2). It shows to what extent the situation of Ethiopia is fairly typical for countries at its level of development. Timmer (2014) further argues that to achieve the desired closing of the gap, growth of all sectors – including agriculture – is required. In the next section, we will assess some of the trends that will likely shape the agricultural sector and food systems in Ethiopia during this ongoing process of structural transformation.

Figure 7.2. Relationship between GDP per capita, share of agriculture in GDP, share of employment in agriculture, and the "agricultural gap" at national level and globally, 2016



Source: Authors' calculations based on World Bank data; Ethiopia is signified with the outlined large symbols.

7.2. Future food systems

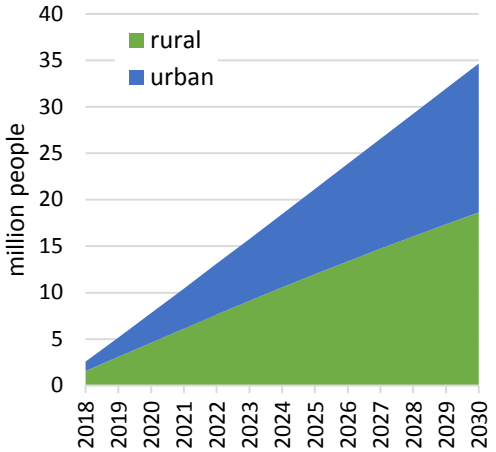
To assess these future developments, we follow the guiding framework of the three transformations discussed above, e.g., dietary, agriculture, and supply chain transformation. To frame the discussion, we compare Ethiopia to other countries characterized by higher and lower levels of GDP per capita. We also simulate through simple empirical models the expected changes in food systems based on income growth and urbanization projections.

Contextual changes

First, while the growth of the population is expected to slow down in Ethiopia, we will still see important growth in the total population through 2030. Figure 7.3 shows the expected growth for both the rural and the urban populations. Projections put the rural population at 106 million in 2030 – 26 million more than in 2016 (World Bank 2015). The share of the urban population is expected to further increase with especially the population in secondary cities growing in importance. The World Bank (2017) estimates that the urban population will reach 40 million in 2030 and that one-third of Ethiopia's population would then be urban.

Second, Ethiopia is planning to continue on its high economic growth path. Several policy documents state that Ethiopia aims to reach middle-income status by 2025 (e.g., World Bank 2015). While the outcome needs to be seen – especially given recent political unrest in the country as well as the increasing constraints on foreign capital (Dorosh et al. 2017) – we assess below the impact of economic growth on Ethiopia's food systems by looking at two scenarios, one with no income growth and a second one with annual income growth of 2 percent to 2030.

Figure 7.3. Projected population growth in Ethiopia from 2017 to 2030, by urban and rural in millions of persons added



Source: Authors' calculations based on World Bank

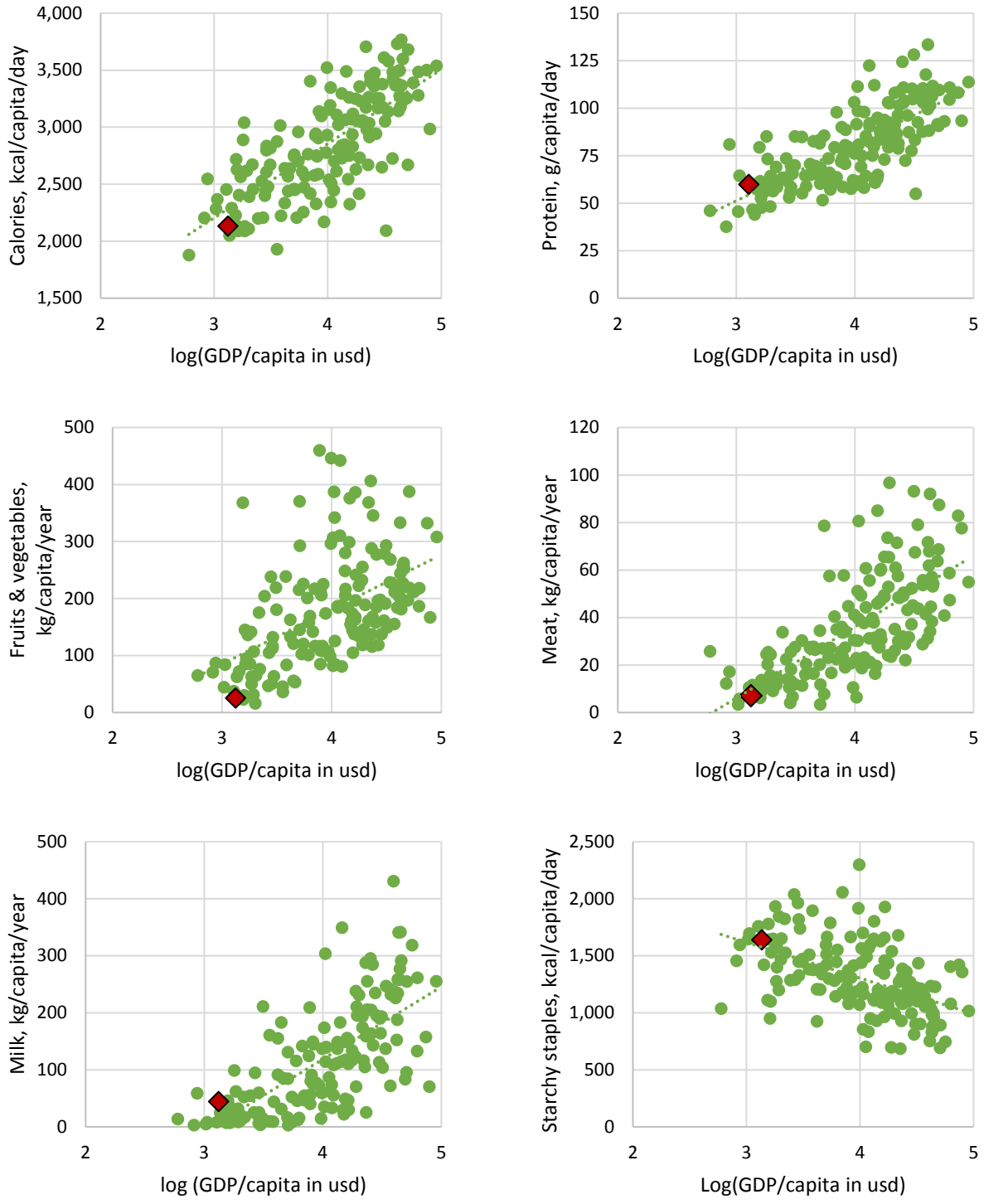
Dietary transformation

Two important dynamics will shape future diets in Ethiopia – higher consumption levels and different types of foods. First, it can be expected that calories and proteins consumed will increase with increasing incomes in the country. Relying on data from multiple countries (FAOSTAT for the year 2013[9]), Figure 7.4 illustrates to what extent calorie and protein consumption are associated with different GDP levels. A doubling of GDP per capita is associated with an increase in calorie consumption of 700 calories per capita, or an increase of 23 percent. On the other hand, protein consumption shows relatively larger differences between poorer and richer countries. A doubling of income leads to 30 grams more consumption per capita, or an increase of 60 percent for lower-income countries.

Second, we further see changes in types of foods demanded with income growth, specifically further diversification in diets and an uptake in the consumption of higher-value products, in particular fruits and vegetables, animal-source foods, and fish, and a decline in the consumption of starchy staples (Bennett 1941). Figure 7.4 illustrates, again using cross-sectional data from FAOSTAT for 2013, to what extent the consumption of these different food groups is associated with different GDP levels. It also shows the current situation of Ethiopia in the international context.

[9] http://www.fao.org/faostat/en/

Figure 7.4. Global association of dietary patterns and per capita GDP



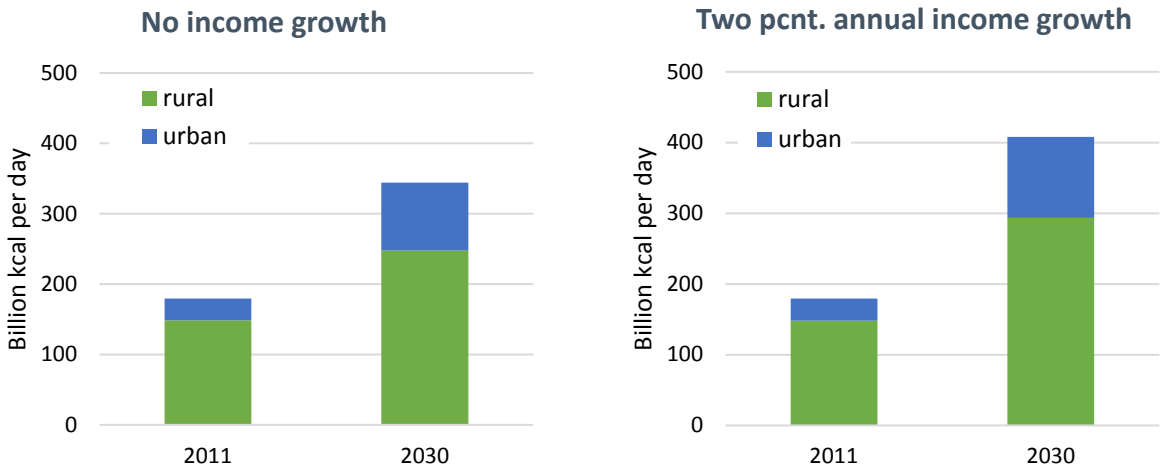
Source: Authors' calculations based on FAO, Food balance sheets (http://www.fao.org/economic/ess/fbs/en/) and World Bank, World Development Indicators (https://datacatalog.worldbank.org/dataset/world-development-indicators). Ethiopia is reflected with a red diamond. Gross domestic product (GDP) per capita is expressed in Purchasing Power Parity.

Agricultural transformation

The rapid increase in population, income, and urbanization will further propel agricultural transformation and intensification (Vandercasteelen et al. 2018). To illustrate the expected changes necessary to feed the increasing population and the growing better-off population, if planned income growth will happen, we

simulate below some implications of this expected change. In the 'no income growth' scenario, we illustrate what expected daily calorie requirements would be with no income growth and stable per capita calorie consumption. In this case, total national calorie consumption would go up by 92 percent by 2030 (Figure 7.5). In a second scenario, we assume a 2 percent growth in income, a change in average calorie consumption from the current third quintile to the current fifth quintile levels as per the data of MOFED (2012). In this case, calorie consumption for the country as a whole would increase by 127 percent by 2030, a 35 percent higher change than in the case of no income growth.

Figure 7.5. National food consumption expansion scenarios between 2011 and 2030 in Ethiopia – No income growth; Two percent annual income growth

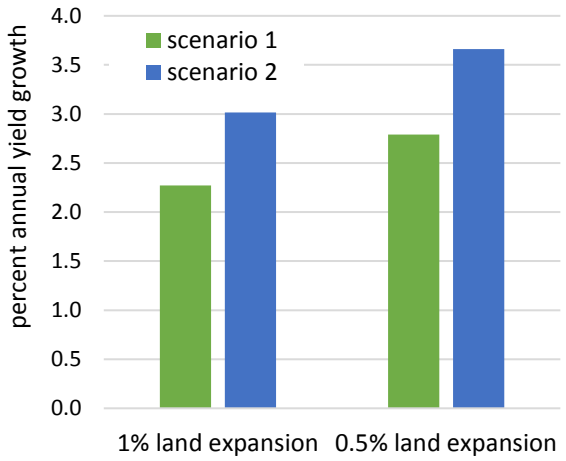


Source: Authors' calculations

Providing this extra food can be met through different channels, i.e., increased productivity in existing agricultural areas, bringing into production additional land, or food imports. For simplicity and illustrative purposes, we show in Figure 7.6 the required annual yield increases for the increased productivity and the land expansion options, respectively, assuming that food imports would not play an important role for local food provision.[10] In the case of no income growth and annual land expansion of 0.5 percent, annual yield growth would need to be 2.8 percent. In the same land expansion scenario but with income growth, yield would need to grow by 3.7 percent annually. If land expansion would be larger at 1.0 percent annually, required annual yield growth would be smaller, at 2.3 percent and 3.0 percent in the scenarios of no income growth (scenario 1) and two percent income growth (scenario 2), respectively. These simulations illustrate the further need for innovation and improved technology adoption so as to increase agricultural yields. They also show the need for further land investments and the opening up of areas previously not used for agriculture to make the provision of sufficient food supplies for the country easier to achieve.

[10] Note that in 2011, food aid/imports (wheat) accounted for about 11 kg per capita per year, i.e., 3 percent of the total quantity consumed.

Figure 7.6: Required productivity increases to assure food self-sufficiency scenarios – scenario 1 = No income growth; scenario 2 = Two percent annual income growth

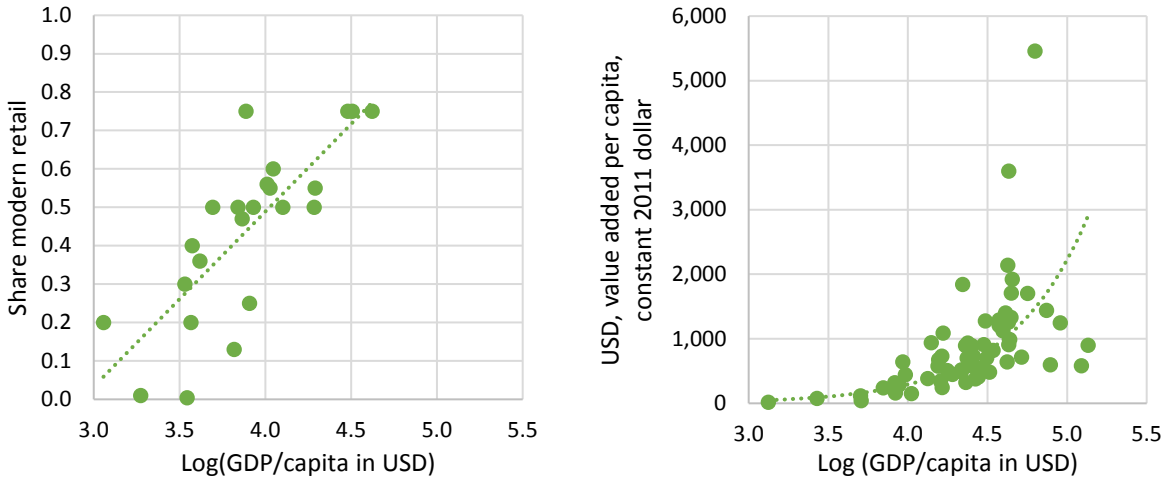


Source: Authors' calculations

Supply chain transformation

A number of changes can be expected in supply chains. First, there will be increasing demand for processed products and convenient and ready-to-eat products. Figure 7.7 illustrates to what extent higher incomes – as measured by GDP levels of countries – are related to a larger food processing sector, given increasing demand for such types of processed foods with a better-off population. We see in the right chart of Figure 7.7 an especially rapid increase after a logarithm of 4 (equivalent to 10,000 USD/capita). However, even below that level, growth rates are considerable.

Figure 7.7. Global relationships of size of modern retail and value-added by food processing industry with GDP per capita



*value added of food, beverages and tobacco in manufacturing sector

Source: Graph left adjusted from World Bank (2008) and right from World Development Indicator database (https://data.worldbank.org/)

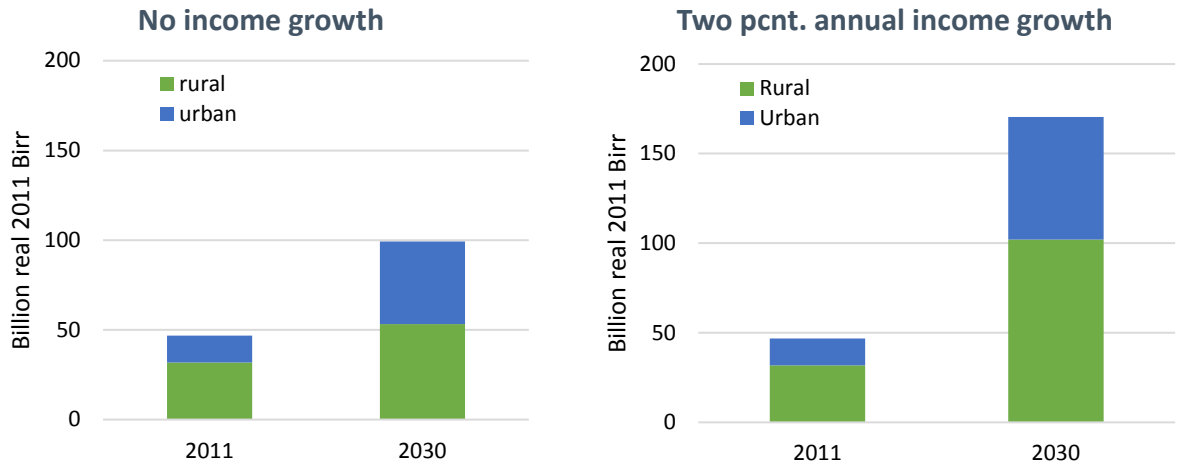
Second, different types of food distribution systems will emerge and grow. Modern retail is currently in its infancy in Ethiopia – partly because of the prohibition of foreign direct investment in retailing – but changes can happen very fast. For example, it is estimated in China that already half of the distribution of rice in urban markets is in the hands of modern retail (Reardon et al. 2014). The left chart in Figure 7.7 shows to what extent GDP levels are associated with the share of modern retail in food markets.

This development has important implications on value chain performance given the limited number of supermarket chains that are often active in a country and the consequent power that they subsequently might have on agricultural and food value chains, e.g., through imposition of standards and prices (Timmer 2014).

Overall, commercial food markets are expected to expand rapidly. We look at two scenarios based on the consumption patterns observed in the national household survey of 2011. In a first conservative scenario, we build upon the differential food expenditures in urban and rural areas, assume urbanization and population growth rates as predicted by the World Bank, and assume no change in purchasing behavior – 58 percent and 97 percent of the food obtained from the market in rural and urban areas, respectively. In this scenario, we see overall a doubling of the commercial food market by 2030, with an increase in the value of rural expenditures by 67 percent and a tripling of the size of the urban food market (Figure 7.8, left side).

In the second scenario, we assume that there is a growth of food expenditures by 2 percent annually and an increase in use of commercial markets in rural areas from 58 percent to 75 percent, driven by better infrastructure and by increasing incomes. Under this scenario, we see almost a quadrupling (a growth of 264 percent) of the commercial food market size, with a 360 percent and 220 percent increase in urban and rural areas, respectively (Figure 7.8, right side). Such large changes have also been found in other developing countries (Haggblade 2011). These numbers indicate that we should expect significant dynamism in food markets in Ethiopia, even with conservative assumptions. The scenarios also point to significant growth in related sectors associated with agricultural production and marketing, including input supply, logistics, trading, and distribution.

Figure 7.8. Commercial market expansion scenarios between 2011 and 2030 in Ethiopia – No income growth; Two percent annual income growth



Source: Authors' calculations

8. CONCLUSIONS

In this paper, we assess the changes that have happened in Ethiopia's food system in the last decade. We do so by documenting changes happening downstream at the consumption level, midstream with agricultural markets, and upstream with agricultural producers. We note major changes in dietary patterns, in agricultural production practices, and in agricultural supply chains driven by major contextual changes including high population growth, rapid urbanization, infrastructure investments, and income growth. To assess developments in the future, we simulate – relying on different assumptions of income growth, urbanization, and population growth – the impact of different income growth scenarios. We also put

Ethiopia in an international context of countries with different GDP levels, as economic growth is an important associate of transformation in agricultural and food systems (Timmer 2014).

At the consumption level, we see important dietary change. Overall food consumption in Ethiopia, measured in calories, has been increasing over the last decades. The relative share of cereals in food expenditures is declining and those of high-value products, including animal-source foods and fruits and vegetables, is rising. We further note the increasing emergence of processed and convenience foods and out-of-home food consumption and a significantly different dietary pattern for urban households. Given fast growth in population, urbanization, and incomes, these diets are expected to evolve rapidly in the future. It is expected that there will be further increasing consumption of high-value products, such as meat, dairy products, and fruits and vegetables. While this will be good for nutritional outcomes, a concern is the issue of the double-burden of nutrition – while food security will likely become less of an issue, at least at the national level, avoiding the obesity and overweight trends that have been noted in other transforming countries will likely become an important new challenge in the decades ahead (Gebru et al. 2018).

To assure that this increased local demand for these high-value products can be met by local supply and not by imports, attention will need to be paid to their production with increased availability of seeds, agro-chemicals, extension advice and cold storages. Increasing the supply of animal-source foods will require increased livestock-related investments. These include broader adoption of improved animal husbandry and feeding practices, increased production of genetically superior breeds of livestock, the provision and use of appropriate veterinary health practices, and the facilitation of an enabling environment that will allow for efficient livestock markets. Changes in these high-value sectors has been slow in the last decade, as illustrated by the increasing real prices of high-value products, which is an indication that increasing demand is outstripping supply.

At the production level, we have noted significant growth in agricultural production in the last decade. We have seen a process of intensification and modernization – but from a low base – as illustrated by the rapid change in the adoption of chemical fertilizers and agro-chemicals. There has been increasing emphasis on large commercial farms as a way to stimulate agricultural production, but only a share of the land allocated to such large-scale farmers is effectively cultivated – amounting to 7 percent of all cultivated land in Ethiopia - and yields have not been much higher on these farms than under smallholder farming conditions. We also see important structural changes with smallholder agriculture – smallholder farmers are estimated to cultivate 93 percent of all agricultural land. We find over the last decade that:

- Average farm sizes of smallholders declined by more than 10 percent over the last decade;
- Farmers are becoming older – the share of Ethiopian farmers under 35 years of age declined from 36 to 30 percent over the last decade;
- Young farmers have smaller and declining farm sizes, declining from 0.9 to 0.8 hectares on average over the last decade;
- Agricultural land rental markets are becoming more important, with 12 percent of cropland now being rented in. Especially young farmers rely on the rental market to access land.

Given increasing land constraints across Ethiopia, agricultural innovations to increase productivity will be increasingly demanded and adopted. Access to land to supply these increasingly demanded products will be crucial and better functioning land markets, in particular, will be needed to assure more efficient land allocations to achieve higher productivity levels.

Midstream, we note that there has been a substantial growth in agricultural commercial surpluses. In consequence, there have been a number of structural changes in supply chains as seen by evidence from the trading and transport, food service, and processing sectors, and from urban retail and distribution. We

see more reliance on markets by consumers, better integrated markets, and smaller spatial and seasonal margins. However, an increase of prices of non-cereals – especially of those products important to improve diet diversity and therefore nutritional outcomes – also is seen in the data, suggesting the demand for these foods is outstripping supply. While food imports are high and the number of food aid beneficiaries is not coming down in the last decade, nonetheless, Ethiopia exports significant amounts of agricultural goods. In a normal year, the country is a net exporter of food in value terms. In the future, supply chains will need to cater to larger and different demands. We should expect to see rapid growth in the agro-processing sector and in the modern distribution sector. Under reasonable assumptions, we further expect that the value of the commercial food sector will almost quadruple over a 20-year period. This will have enormous implications on growth in agricultural input supply, logistics, trading, and distribution sectors, as well as on agricultural production across Ethiopia.

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The Ethiopia Strategy Support Program is an initiative to strengthen evidence-based policymaking in Ethiopia in the areas of rural and agricultural development. Facilitated by the International Food Policy Research Institute (IFPRI), ESSP works closely with the government of Ethiopia, the Ethiopian Development Research Institute (EDRI), and other development partners to provide information relevant for the design and implementation of Ethiopia's agricultural and rural development strategies. For more information, see http://www.ifpri.org/book-757/ourwork/program/ethiopia-strategy-support-program; http://essp.ifpri.info/; or http://www.edri-eth.org/.

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