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Opportunities, Challenges, and Policies for Linking African Farmers with Growing Urban Food Markets

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2 Opportunities in Africa's Growing Urban Food Markets

David Tschirley, Nicolas Bricas[2], Christine Sauer[1], and Thomas Reardon[1]

Key messages

1. Africa's rate of urbanization has been faster, and its urban population is higher, than reflected in official data. Combined with substantial growth in real per capita incomes over the past 20 years, this has contributed to rapid transformation in the continent's agri-food system, presenting new challenges for farmers, consumers, and agribusinesses as well as a wide array of new opportunities.

2. Despite considerable variety in food cultures across Africa, changes in food consumption behavior across the continent have trended broadly towards more purchased, more perishable, more processed, and more prepared foods.

3. Employment in post-farm segments of the agri-food system (trade, processing, storage, distribution, retailing, and food preparation), which currently account for about 25% of all employment, will likely grow more rapidly than employment on the farm.

4. Expected shifts in farm production towards higher value crops — such as animal products (poultry and eggs, dairy, and meat), fresh fruit and vegetables — have proven spotty and modest to date, though over time these shifts are likely to become more pronounced and broad-based.

5. Serving Africa's urban food demand requires more capital intensity and greater knowledge, skill, and organization. As a result, only a small subset of the hundreds of millions of smallholder farmers and micro- and small-scale agribusiness entrepreneurs will be able to compete effectively in this new environment over the medium term.

6. Looking forward, the continent finds itself at a point of profound uncertainty, in the midst of a five-year stagnation of per capita income growth, and dealing now with the massive challenge of the COVID-19 pandemic accentuated by severe regional crises in the Sahel (security) and East Africa (the locust outbreak). Yet there is great room for growth through improved policies and productive investment, and some evidence that these are beginning to emerge. In the current environment, these levers will be increasingly urgent to support ongoing food system transformation and improve citizens' livelihoods in Africa.

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2.1 Introduction

Africa's rapid urbanization, combined with substantial growth in real per capita incomes over the past 20 years and the globalization of food markets, is a major contributor to the rapid transformation taking place in the continent's food systems (McMillan & Harttgen, 2014; Reardon, et. al., 2019; Tschirley, Dolislager, et al., 2015; Young, 2012). Together, these dynamics are confronting rural and urban people alike with new challenges while also providing a wide array of new opportunities. The purpose of this chapter is to better understand these new opportunities, the contribution that urbanization is making to them, and how they might evolve over the next 10 years.

The chapter makes three contributions to the literature. First, it assesses the implications for food systems of insights from new spatial data on human settlement on the continent, which goes beyond the increasingly inadequate rural/urban dichotomy. This provides new insights about emerging new opportunities and about the policies and investments that may be needed to adapt to and take advantage of these patterns.

Second, it brings together highly complementary–but to date separate–findings on changing diets in East and Southern Africa compared to West Africa, and thereby provides the most comprehensive view to date of this central driver of changing opportunities for food system participants on the continent.

Third, the chapter addresses the faltering of per capita income growth on the continent since 2013[3], together with the enormous global shock of the COVID-19 pandemic, to think critically about how the ongoing transformation of African food systems might differ over the next 10 years compared to what has been seen over the past 10–20 years.

The chapter proceeds as follows: Section 2 explains our conceptual approach; Section 3 reviews the empirical record on patterns of change in human settlement and per capita incomes on the continent; Section 4 lays out the expected impacts of these patterns of change on consumer behavior (changing consumer demand for food and its characteristics); Section 5 assesses the consequences of consumer behavioral change for the distribution of livelihood opportunities across the food system (and the participants at each level) and across rural-to-urban space; and Section 6 concludes by considering what the implications of recent faltering in per capita consumption growth, together with the COVID-19 pandemic, might mean for the trajectory of food system transformation over the next 10 years.

2.2 Conceptual approach

In a market-based economy, labor must follow the structure of consumer demand[4]. The distribution of demand for labor — across sectors, levels of supply chains, and by skill requirement and wage level (or profitability, if self-employment) — then defines the structure of livelihood opportunities available to the system's participants. Over time, forces of change external to the system influence the structure of demand and change the set of available livelihood opportunities.

In this chapter, we consider the impact of two forces of change on the structure of African consumers' demand for food and on the resulting distribution of livelihood opportunities: urbanization and income growth. These ongoing forces of change alter behavior in the form of transformed diets and related changes of structure and behavior in the food supply chains (FSCs) that support them.

3 McMillan, Rodrik, and Sepulveda (2017) note the faltering starting around mid-decade and find little reason for optimism going forward; Sy and Talvi (2016) note that the International Monetary Fund (IMF) forecasts for growth in Africa in 2016 were the lowest since 1999; World Bank data (https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?view=chart) show a flattening of real per capita purchasing power parity (PPP) gross domestic product (GDP) in sub-Saharan Africa since 2014 and a slight but steady decline in real per capita USD GDP since the same year. In this chapter, we use World Bank data on per capita consumption expenditure, which show decline after 2013.

4 Changing technology – in particular, differing capital intensities across sectors of the economy and levels of supply chains — mediates the impact of demand on the distribution of labor. Treating this aspect systematically is beyond the scope of this chapter, though we will refer to it when especially relevant.

These diet and FSC transformations then alter opportunities for farmers, rural residents in general, and operators throughout the FSCs and in rural and urban areas in three ways: the magnitude of opportunities, their range or diversity, and their location within the FSCs and the broader economy.

Our thesis is that urbanization and income growth lead to broadly predictable patterns of transformation of diets and of FSCs, and that clear expectations can be formed regarding the effects of these transformations on the level, diversity, and distribution of opportunities. In looking forward, we consider these broad dynamics of change together with the concept of local food cultures, and evidence for their persistence, to consider what aspects of these transformations are generalizable and thus predictable, which are subject to more local influence, and what this implies about the evolution of the system over time.

We ask two broad questions: (1) to what extent are the observed patterns of change in Africa over the past decades consistent with these expectations, and how deep and broad have these changes been?; and (2) in light of the answer to the first questions, where might this process lead over the next 10 years?

To explore these questions, we do three things. First, we empirically examine patterns of change in: (a) the speed and spatial distribution of change in human settlement patterns in Africa since 1960; and (b) consumer expenditure (as the best cross-country proxy for income[5]) and its distribution between rural and urban areas since 1980. To examine human settlement patterns, we use spatial data sets rather than official administrative data on rural and urban populations.

Second, we characterize the evidence regarding the transformation of African diets over the past 10–20 years, hypothesize what the effects of these changes should be on the behavior–primarily the kinds of livelihoods they engage in–of farmers, rural residents in general, and entrepreneurs in FSCs, and review whether the empirical evidence conforms with our expectations.

Finally, we speculate about how the processes documented in the chapter might play out over the next 10 years, and what this implies for policy and investment. In this last section, we emphasize the great uncertainty currently facing Africa and its cities due to growth faltering since 2013, and the potentially devastating impact of the COVID-19 pandemic on economic growth and livelihoods of the poorest[6].

2.3 Patterns of change in urbanization and income growth

In this section we review the evidence on changes in human settlement patterns in Africa since 1960 using data from Africapolis (OECD/SWAC, 2020), then use data from World Bank[7] to examine trends in per capita expenditure on the continent since 1980.

2.3.1 Five findings regarding change in human settlement patterns over the past several decades

Assessing the opportunities presented by African urban areas requires an accurate understanding of the patterns of urban settlement on the continent. Official urban and rural population data are inadequate to this task for three reasons. First, they are inconsistent across countries, with differing national cutoffs for the minimum size of settlement that qualify as "urban" (from as low as 5,000 to as high as 20,000). Comparison across countries is thus problematic.

Second, urban areas in official data are defined administratively, not based on observed settlement patterns of people. This has led to two types

5 Changes in per capita GDP can be a poor indicator of changes in consumer well-being, due to changes in the capital intensity of an economy and thus the distribution of national income across labor and capital. See Arndt, McKay, and Tarp (2016) for a classification of African economies based in part on divergence between growth in GDP and growth in consumption.

6 Evidence suggests that urbanization will continue in Africa even if income growth slows. See Gollin, Jedwab, and Vollrath (2016) and Jedwab and Vollrath (2015) on the conundrum of past urbanization in the absence of rapid income growth.

7 https://data.worldbank.org/indicator/NE.CON.TOTL.KD, file API_NE.CON.TOTL.KD_DS2_en_excel_v2_1129220

of misclassification of physical spaces and their populations: administratively "urban" areas around many city and town cores that enter official urban population numbers but are functionally rural in terms of population density and predominant livelihoods; and sizeable agglomerations of people emerging in rural areas that for extended periods are not recognized administratively as urban and therefore do not enter official statistics on urban populations (see OECD/SWAC (2020, Table 4.1, p. 113) for examples from across the continent).

The third weakness in official data is that cross-country data sets on urban settlements from the United Nations typically include only settlements above populations of 300,000[8]. This means that the potentially large number of people living in urban settlements below this size cannot be examined in a cross-country setting, even if they are recognized as urban at country level.

The Africapolis data set[9] addresses these problems by combining demographic data, satellite and aerial imagery, and other cartographic information around a standardized spatial definition of "urban". The system generates estimates of the number of urban agglomerations, the population of each, and total urban population at 10-year intervals for every country on the continent since 1950. Africapolis defines as "urban" an agglomeration of at least 10,000 people that meets specified criteria of overall density and built-up area. Because Africapolis uses administrative classification as one layer of information, its urban agglomerations include but are not limited to administratively urban areas. The result is a time series with, as of 2018, over 7,500 urban agglomerations across Africa, with total population, spatial extent, and spatial location of each.

8 The UN agglomeration level data includes only cities above 300,000; see https://population.un.org/wup/Download/, file 15 or 16 under Urban Agglomerations. The country level urbanization data by city size class includes a class of "under 300,000". But unlike all the other, larger, size classes, it does not provide data on the number of agglomerations of this size, only an overall estimate of total population in the class and its share in overall population. Exactly how these overall estimates are generated is not clear.

9 https://africapolis.org/home, data downloadable at https://africapolis.org/home/data. See OECD/SWAC (2020) for more on methods and key patterns. The spreadsheet used to generate results in this chapter is available upon request.

We use these data plus WorldPop[10] data on overall human settlement in Africa to examine how settlement patterns have changed over time. We reach five conclusions, each discussed in turn.

Finding #1: More rapid urban growth and higher urban populations: The first conclusion is that urban populations have grown more rapidly and are now much higher than shown in official data as compiled by the UN. Comparing Africapolis data to the United Nations/World Urbanization Prospects (UN/WUP), Table 2.1 shows that urban populations under Africapolis in 2015 are nearly 90 million, or 20%, higher than under UN/WUP data, and their share in total population is 49%, compared to only 41% in UN/WUP.

Growth rates in Africapolis are uniformly higher starting each decade through 2015. Notably, UN/WUP data show a slight slowing in urban population growth rates over time (falling from 4.1% for 1960–2015 to only 3.7% from 2000 to 2015), while Africapolis shows steady (and higher) rates starting in 1960 through 1990, then sharp *increases* starting in 2000. These two data sets thus paint quite different pictures of current urbanization dynamics on the continent, with Africapolis suggesting that the continent is already half urban, and that the continuing rate of urbanization is much more rapid than previously thought.

Finding #2: Decentralized growth — the role of new urban agglomerations, many not administratively recognized: The second finding is that a major driver of this rapid growth has been the rise of thousands of new urban agglomerations, many not officially recognized as "urban". Africa has experienced a dramatically more decentralized urbanization process than is typically appreciated or visible through official data (Table 2.2). The number of agglomerations above the Africapolis cutoff of 10,000 expanded by 15 times across the continent between 1950 and 2015, from just under 500 to over 7,600; in sub-Saharan Africa the number expanded

10 https://www.worldpop.org/, population data downloadable at https://www.worldpop.org/project/categories?id=3. See also https://www.worldpop.org/methods for details and citations on methods. See Arslan, Tschirley, and Egger (2020) and IFAD (2019) for applications.

Table 2.1. Urban populations, share in total, and annual percent growth to 2015, Africapolis versus UN/WUP (1960–2015)

	Africapolis			UN/WUP		
	Urban population ('000)	Share in total (%)	Annual average growth to 2015 (%)	Urban population ('000)	Share in total (%)	Annual average growth to 2015 (%)
1960	41,905	17	4.9	52,072	19	4.1
1970	68,161	21	4.8	81,057	23	4.0
1980	109,953	26	4.8	126,082	27	3.9
1990	170,517	30	4.9	196,050	32	3.7
2000	258,703	36	5.4	280,008	35	3.7
2010	411,847	43	6.6	399,735	39	3.8
2015	567,115	49	---	480,785	41	---

Note: Table includes North African countries; 50 countries in total across the continent.

Table 2.2. Growth in urban agglomerations in Africa and contribution of new and existing agglomerations to growth of urban population (1950–2015)

	Number of agglomerations			Contribution to urban population growth			
				New agglomerations (%)		Existing agglomerations (%)	
	1950	1990	2015	1950–2015	1990–2015	1950–2015	1990–2015
African continent	498	2705	7617	20	20	80	80
Sub Saharan Africa	277	1769	5779	21	21	79	79
Central	26	223	873	22	23	78	77
East	42	333	1483	22	22	78	78
North	221	936	1838	17	14	83	86
Southern	56	249	936	28	29	72	71
West	153	964	2487	18	17	82	83

Notes: (1) Africapolis cutoff for urban agglomeration is 10,000; see OECD/SWAC (2020) for more detail.

Source: Africapolis (https://www.africapolis.org/home) and downloadable data set

by 21 times, from under 280 to nearly 5,800. Just from 1990 to 2015, the number expanded by a factor of 2.8 on the continent and 3.3 in sub-Saharan Africa.

The emergence of these new agglomerations accounted for 20% of all urban population growth since 1950 (21% in sub-Saharan Africa), and the same percent since 1990, driven by steady annual growth of slightly more than 4% in the number of agglomerations. This means that there has been no recent slowing of the contribution of new urban agglomerations, compared to existing ones, to total urban population growth. This rapid and spatially dispersed emergence of urban agglomerations is taking place in the midst of rural areas (a process Africapolis calls *in situ urbanization*; OECD/SWAC, 2020), with major implications for the accessibility of urban markets to farmers and also for urban infrastructural investment policy.

Finding #3: The accelerating emergence of megacities: Despite Africa's highly decentralized urbanization, the continent has seen the emergence of many "megacities" (Figure 2.1). Cities of more than 5 million rose from zero in 1960 to 2 in 2000 (Cairo and Alexandria) and 11 by 2015. Using a cutoff of 2 million, Africa had one megacity in 1950 (Cairo). The continent did not get its second until 1970 (Johannesburg), and by 2015 had 42.

The population in cities of this size is growing very rapidly and the pace of growth is increasing. For example, population in the 11 cities of 5 million or more grew at over 11% per annum from 2000 to 2015, versus only 6.4% from 1970 to 2015; the share of urban population in these cities rose from 8% in 1970 to 17% in 2015. Using 2 million as the cutoff, population grew 7.7% annually from 2000 to 2015 versus 7.3% from 1960, and the share in total urban population in these 42 cities rose from 9% in 1960 to 33% in 2015.

Finding #4: Continuing importance of medium and smaller cities and towns: Despite the rise of megacities, over half (52% both continentally and in sub-Saharan Africa) of Africa's urban population in 2015 resided in towns and small cities of less than 500,000 population. Even towns under 100,000 population accounted for nearly one-third of the urban population. Though this share is declining, this category of smaller cities and towns — many of them only recently emerging as urban areas — will remain for many years tremendously important in determining the opportunities that African urbanization provides for its food system participants. They must therefore figure prominently on the urban policy and investment agenda of African governments. In fact, these smaller cities and towns, being closer to rural areas than the emerging megacities, in many ways already play an outsize role in creating such opportunities by making migratory options more accessible to more people and resulting in substantial poverty reduction (Christiaensen, DeWeerdt, & Todo, 2013; Christiaensen & Todo, 2014).

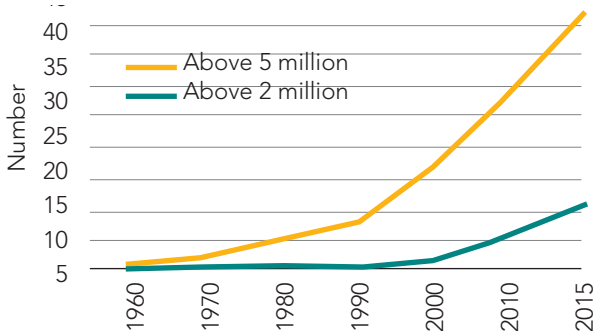


Figure 2.1. Number of cities above 2 million and 5 million in Africa, 1960–2015

Source: Africapolis data

Finding #5: Rural densification and the blurring of rural–urban distinctions: Rural populations have become dramatically more dense in recent decades. This dynamic is still poorly understood but emerges clearly from the WorldPop global spatial settlement data. For example, Arslan, Tschirley, and Egger (2020) and IFAD (2019) show that two-thirds of rural youth live on only 8% of the populated rural land, meaning that average population densities for these two-thirds are more than 23 times higher than for the most remote one-third[11]. Jayne, Chamberlin, and Headey (2014) show that 82% of Africa's rural population reside on only 20% of the rural land, and 62% reside on only 10%. These figures lead to similar conclusions about relative densities of African rural population settlement.

This pattern is functionally related to the rise of new agglomerations and Africa's decentralized urbanization process, as increasing rural populations eventually reach densities that must be considered functionally urban (OECD/SWAC, 2020). The distinction between rural and urban areas thus becomes blurred: densifying rural areas are likely to take on increasingly urban characteristics, especially with respect to their engagement with markets as consumers, while new urban agglomerations are likely to have relatively low densities compared to other urban areas and to support more agriculture-related livelihoods than traditional cities. We revisit these ideas in section 4 regarding expected effects of observed settlement patterns on behavior of consumers and FSC participants.

11 (0.67/0.08)/(0.33/0.92) = 23.3.

2.4 Income growth boomed from 2000, with urban areas likely benefiting most, but has faltered since 2013

We use World Bank per capita final consumption expenditure rather than per capita GDP as GDP includes returns to capital that will have much less impact on the behavior of consumers, and thus on the structure of food demand and resulting opportunities available to participants[12]. Resource-rich countries in particular can see substantially higher growth in GDP than in consumption, as rents from the resource extraction leave the country, or are reinvested rather than spent, or are saved.

Trends in income levels: prolonged boom followed by a bust: Figure 2.2 shows declining average real per capita consumption in sub-Saharan Africa during the 1980s as a result of the growth-inhibiting effects of previous policies and the roll-out of structural adjustment programs across the continent. This period was followed by over a decade of stagnation to 2000. From 2000 to 2013, constant 2010 USD per capita consumption expenditure boomed, growing at an annual average rate of 3.14% and rising 50% from US$874 to US$1,306. This boom in consumer expenditure, tied to urbanization and the accumulating response to the economic opening spurred by structural adjustment[13], is what drove the transformations of diets and FSCs that we discuss next.

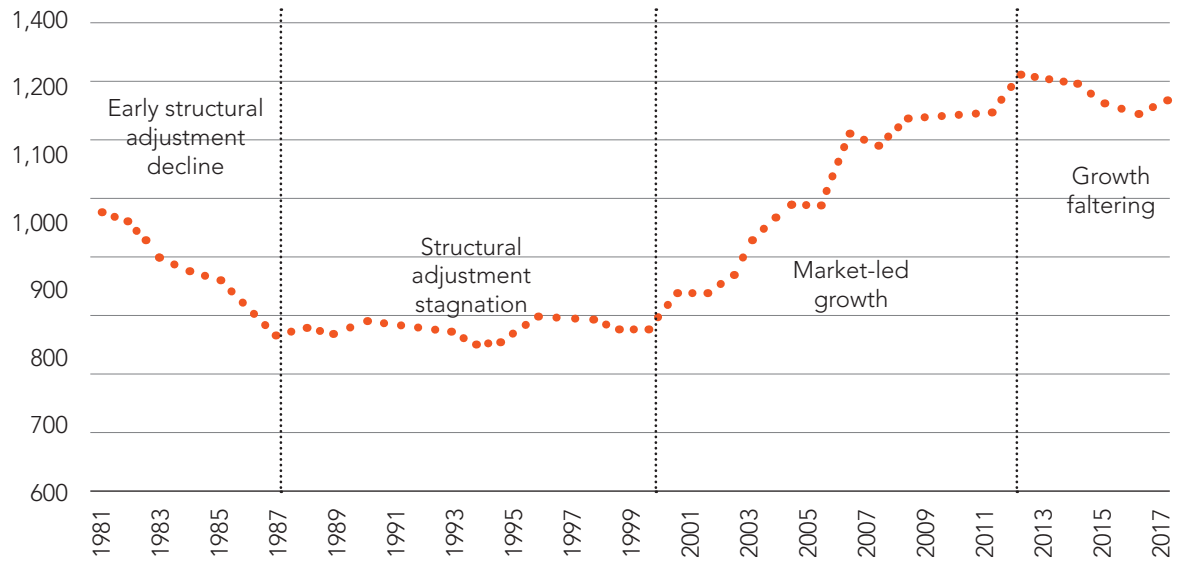
Since 2013, however, average consumption expenditure has slowly declined[14]. Though growth did not decline in all countries, the downturn has been broad: of the 29 countries with data for the entire 2000–2018 period, 9 had higher growth

12 Both series come from national accounts data but use differing methods. See https://data.worldbank.org/indicator/NE.CON.TOTL.KD, file API_NE.CON.TOTL.KD_DS2_en_excel_v2_1129220 for consumption expenditure data used in this chapter.

13 See Sachs and Warner (1997) for the contribution of closed economic policy to the lack of growth on the continent before the mid-1990s.

14 World Bank data on constant 2010 USD per capita GDP and constant 2017 PPP USD per capita GDP show an end to growth after 2014: 2010 USD shows slow decline from 2014 to 2019 while the 2017 PPP USD shows a flat trend. These data are available to 2019 while the consumption data go only through 2018 at the time of this writing. Files can be downloaded at https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?view=chart

Figure 2.2. Per capita final consumer expenditure in constant 2010 USD, Sub-Saharan Africa, 1981–2018



Source: World Bank Indicators, Final consumption expenditure estimated from national accounts data (excel file API_NE.CON.TOTL.KD_DS2_en_excel_v2_1129220).

after 2013 compared to before, but 20 had lower growth; and while only 1 of the 29 had negative growth before 2013, a total of 10 had negative growth since 2013. If this decline continues or becomes a prolonged stagnation, it puts at risk the transformations we discuss and clouds the picture of how rapidly cities can create new opportunities for food system participants[15].

Rural–urban comparison: urban areas are richer and have probably grown faster: Data do not allow a comparison of growth rates over time in consumption or income between urban and rural areas. Extensive research documents, however, much higher living standards in urban than in rural Africa (Sahn & Stifel, 2003), and the little available evidence suggests that this urban advantage is not declining over time. On the first question, the World Bank provides rural/urban consumption expenditure estimates for 2010 across 36 African countries, based on nationally representative household consumption or expenditure survey data sets (Table 2.3). These data show that the ratio of urban-to-rural consumption expenditure is above 1.0 in every country, ranging from a low of 1.37 in Ethiopia (a 37% average income advantage for urban residents) to a high of 5.28 in Rwanda (a massive advantage for urban households, with average expenditure more than 5 times higher than rural). The population-weighted mean ratio is 2.08, meaning that the average urban resident enjoys more than double the consumption expenditure of the average rural resident.

15 See Rodrik (2018) and McMillan et al. (2017) on Africa's future growth prospects. None of these authors are optimistic that the rapid growth of 2000–2013 can be quickly rekindled.

Table 2.3. Urban and rural per capita expenditure in selected African countries, and urban-to-rural ratio (2010 PPP$)

Country	**2010 per capita consumption, PPP$**			*Country*	**2010 per capita consumption, PPP$**			*Country*	**2010 per capita consumption, PPP$**		
	Rural	**Urban**	**U/R ratio**		**Rural**	**Urban**	**U/R ratio**		**Rural**	**Urban**	**U/R ratio**
Ethiopia	1,048	1,440	1.37	Liberia	538	981	1.82	Togo	423	1,004	2.37
São Tomé	3,044	4,344	1.43	Tanzania	418	783	1.87	Niger	459	1,116	2.43
Nigeria	493	758	1.54	Côte d'Ivoire	891	1,761	1.98	Malawi	489	1,293	2.64
Congo	1,013	1,560	1.54	Ghana	875	1,826	2.09	Burundi	277	760	2.74
Gabon	1,698	2,635	1.55	Guinea	580	1,225	2.11	Cameroon	420	1,214	2.89
Benin	489	769	1.57	Lesotho	944	1,995	2.11	Kenya	572	1,661	2.90
Chad	694	1,097	1.58	Madagascar	210	457	2.18	Namibia	859	2,583	3.01
DRC	218	374	1.72	Uganda	796	1,788	2.25	Swaziland	626	1,919	3.07
The Gambia	818	1,440	1.76	Cabo Verde	1,307	2,975	2.28	Zambia	279	933	3.34
Mauritania	1,052	1,869	1.78	Senegal	592	1,367	2.31	RSA	1,598	5,467	3.42
Mozambique	453	811	1.79	Mali	427	988	2.31	Rwanda	294	1,552	5.28
Sierra Leone	1,010	1,832	1.81	Burkina	400	932	2.33				
				Population-weighted ratio			**2.08**				

Source: World Bank, computed from household income-expenditure surveys.

Sahn and Stifel (2003) show similar inequality between rural and urban areas in Africa, based on a multi-dimensional measure of poverty. Across 6 countries, the smallest difference in asset poverty is 30%, and in half of the countries, asset poverty is more than 50% higher in rural areas than in urban areas.

Surprisingly, the study by Sahn and Stifel (2003) is the only one we find that explored whether urban–rural disparities are declining or rising over time. Their general conclusion is that there is no evidence of rural areas catching up in Africa. Depending on the measure of welfare and which countries are examined, evidence can be strong that rural areas are falling further behind.

2.4 Expected impacts on consumer behavior: the structure of demand for food and its characteristics

Our findings so far can be summarized in four broad patterns of change that will influence the behavior of food system participants and through this on opportunities to those participants. These shocks are:

- The share of population living in urban areas has risen rapidly, from less than one-third in 1990 to one-half today (49% in 2015).
- Rural areas on average are now much closer to urban areas and are themselves much more densely populated.
- Megacities are rapidly increasing their population share even as smaller cities and towns hold over half the continent's urban population.
- Incomes rose rapidly from 2000 to 2013, probably more rapidly in urban than in rural areas.

These changes have predictable effects on consumer behavior, and these effects are largely borne-out by empirical study[16]. Tschirley (2017) has characterized changes in food consumption behavior on the continent as food becoming more purchased, more perishable, more processed, and more prepared. He documents how deep and broad these patterns are across countries and across rural and urban areas in East and Southern Africa (Tschirley, Dolislager, Reardon, & Snyder, 2015; Tschirley, Snyder, et al., 2015). Bricas, Tchamda, and Mouton (2016) and Hollinger and Staatz (2015) do the same in West Africa.

We treat each of these four patterns (purchasing, perishability, processing, and preparation) in turn, then close the section with a consideration of how more qualitative aspects of consumer food demand, in particular food safety, perceived quality, and "desirability", are affected by urbanization, rural densification, and rising incomes.

A key insight is that urbanization and income growth have independent effects on diets and thus, through FSC restructuring, on opportunities available to food system participants, but that together they have far higher combined effects. To take one example, consider the demand for convenience. A rural resident who migrates to an urban area will experience lifestyle changes that lead them to put a higher value on convenience, and to increase the share of convenient (typically processed or prepared) foods in their diet, even if their income does not increase (Huang & David, 1993; Regmi & Dyck, 2001). Similarly, a rural resident who sees their income rise but remains in the rural area may value convenience more due to a higher opportunity cost of time. Yet higher costs and (potentially) lower availability of processed and prepared foods in rural areas may limit the extent of this behavioral change. When urbanization and income growth occur together, their impact is far larger: an economist would compute the combined effect as the product of the independent impact of urbanization on demand for convenience and the pure income elasticity of demand for convenience. Transformation can thus be extremely rapid when the two complementary forces of change operate simultaneously.

2.4.1 Purchased foods

Expectations: Greater reliance on purchased food follows directly from greater urbanization, greater density of rural settlements, and lesser

16 The changing behavior and structure of FSCs is reviewed in Chapter 4 (this volume).

average distances from rural to urban areas. Urban households everywhere rely overwhelmingly on markets for their food; denser populations in rural areas reduce land per capita and increase opportunities for specialization, both of which drive greater reliance on food markets for consumption; and lesser average distances between rural and urban areas increases the influence of urban areas on rural, including allowing urban marketing networks to reach more rural areas.

Empirical patterns: Patterns are remarkably similar across regions of the continent. From household surveys in West Africa, Cameroon, and Chad, Bricas et al. (2016) show that over 90% of food in major cities is purchased, more than 80% is purchased in secondary cities, and over half is purchased in rural areas. As causes of the high share in rural areas, they note the increase in urban settlements in the midst of rural areas (what Africapolis calls "in situ urbanization"), and the increasing share of non-farm labor in rural residents' livelihoods. In five countries of East and Southern Africa (Ethiopia, Uganda, Tanzania, Mozambique, and Malawi), Tschirley, Dolislager, et al. (2015) showed that, circa 2010, in rural areas 44% of all consumed food was purchased; over 90% was purchased in urban areas. Later analysis that included Nigeria and Zambia pushed the share of purchased food in total food in rural areas to nearly 50% (Tschirley, 2017).

2.4.2 Perishable foods and other non-staples

Expectations: Bennett and Pierce (1954) first documented the move away from starchy staples towards more perishable foods as incomes rise, a pattern now identified as Bennett's Law. These perishable foods include animal proteins, including fish, meat, poultry, eggs, and dairy, and fresh fruit and vegetables.

Empirical patterns: Perhaps surprisingly, empirical evidence on this pattern in Africa is mixed. The most robust pattern is towards animal proteins. Calculations from annex data in Tschirley, Snyder, et al., (2015) show that these items occupied 20% of all food purchases in Ethiopia, Uganda, Tanzania, Mozambique, Malawi, and Zambia around 2010. Bricas et al. (2016) in West Africa showed similar results — these same categories accounted for 15–30% of all food consumption (including consumed own production) in West Africa between 2001 and 2011. Hollinger and Staatz (2015) also found similar results for the region, and show that this share rose in urban areas of every country (Burkina Faso, Côte d'Ivoire, Ghana, Mali, and Senegal) between 1994 and the mid- to late 2000s (though it fell in rural areas of three of the five countries). They show that meat and dairy (separately) have income elasticities of demand above 1.0 in 26 out of 28 country-by-rural/urban combinations for the 2 food items. Income elasticities for fish typically hover between 0.9 and 1.2. Across income quintiles, meat and dairy budget shares rose with rising income in every country (these are not computed for fish). Overall, these results strongly suggest that demand for animal protein will grow rapidly with income.

The patterns for fruit and vegetables are not as clear. Hollinger and Staatz (2015, Table A6.2 and A6.2) found a mix of modestly rising and declining shares with income in both urban and rural areas of six countries of West Africa. The strongest evidence of rising shares was in Niger, the poorest country in the group, where shares rose most sharply with income but from very low levels. Bricas et al. (2016, Graphique 21) show lower budget shares (but potentially higher total consumption) of fresh fruits and vegetables in urban areas of West Africa than in rural areas.

Even steady budget shares, however, imply rapidly rising per capita consumption of these items as incomes rise. Income elasticities are 1.0 or greater in 8 out of 14 country-by-rural/urban combinations, but never less than 0.7. When combined with rapid rises in urban populations, these patterns produce even more rapid growth in total demand.

Trends for fruit likely differ from those for vegetables, yet the two are typically reported as one group. Tschirley, Dolislager, et al. (2015) distinguished between them in East and Southern Africa and found slowly falling shares for vegetables with income (from 11% among the poor to 9% among the upper class; note that this implies ***higher*** absolute consumption of vegetables among the upper class)

but large rises (from a lower base) in the share of fruits. Tschirley, Cunguara, Haggblade, Reardon, and Kondo (2017) estimate expenditure elasticities in Tanzania of 1.32 and 1.07 for fruit in rural and urban areas respectively and for vegetables of 0.62 and 0.77. Overall, these sources suggest that demand for fruit should rise rapidly with incomes, while demand for fresh vegetables will rise, but much more slowly.

Finally, trends on the share of staples in African diets show modest change. Reardon et al. (2019) used FAOSTAT data to show that the share of cereals declined very little between 1970 and 2013 (from 28% to 26%), roots and tubers remained steady around 20%, and non-staple shares rose from 50% to 55%.

2.4.3 Processed and prepared foods

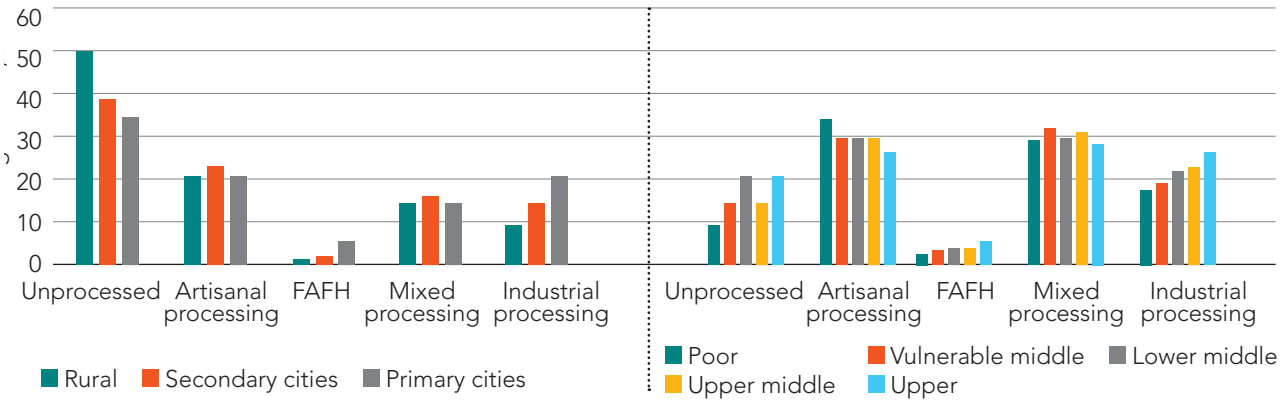
Expectations: Urban lifestyles are busier and urban residents on average have much higher incomes than rural residents. Limited time and high incomes increase the opportunity cost of time, especially for women. The result is that consumers seek convenience in many things, including food. This search for convenience is at the root of the rapid rise in demand for processed food documented across all regions of Africa, particularly for highly processed foods and food away from home.

Empirical patterns: Processed foods: Across 16 countries of West Africa, Bricas et al. (2016) found that processed foods account for at least 48% of all consumption in rural areas, at least 56% in secondary cities, and at least 62% in primary cities (Graphique 32)[17]. Using a different classification scheme to that used by Tschirley, Dolislager, et al. (2015), they found that foods processed by small and medium enterprises (SMEs; the "artisanal processing" category in Figure 2.3) (which will correspond primarily to moderately processed foods in the Tschirley, Dolislager, et al. 2015 classification) show roughly constant shares of more than 20% across rural and urban areas, while the share of industrially processed foods (relating primarily to the more highly processed category in Tschirley, Dolislager, et al., 2015) rises from 10% in rural areas to about 15% in secondary cities and 21% in primary cities (Figure 2.3). They found similar behavior across income groups, with the small-scale processed category remaining steady around 20%, while the industrially processed share rises from 12% in the poorest quintile to about 18% in the top quintile.

Tschirley, Dolislager, et al. (2015) found similar patterns in East and Southern Africa (Figure 2.4). They show that purchased processed foods account for nearly two-thirds of all consumption in urban areas and 30% in rural areas. As a share of purchased foods, the shares are nearly identical in urban and rural areas at 70%.

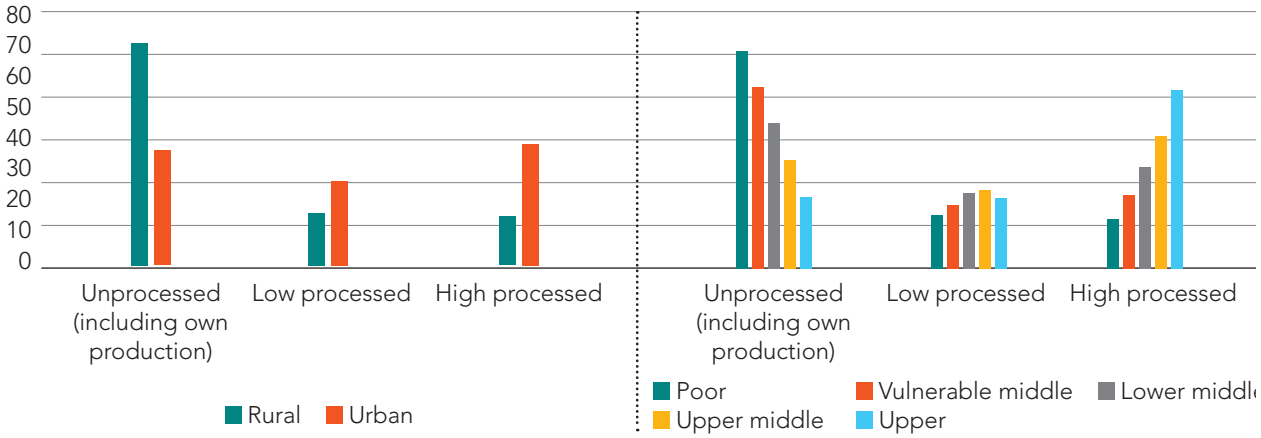
17 They include a category for products whose origin is mixed or unknown — we exclude these shares in what we quote above.

Figure 2.3. Total food budget shares in West Africa by processing level, rural/urban and by income quintile



Source: Bricas et al. (2016)

Figure 2.4. Total food budget shares in East and Southern Africa by processing level, rural/urban and by income class



Source: Tschirley, Dolislager, et al. (2015)

The difference emerges in the degree of processing. The share of more highly processed foods in food purchases is lower in rural areas, at 33%, compared to 42% in urban areas. Yet across income levels, these shares behave nearly the same in rural and urban areas: the purchased food budget share of more highly processed foods rises from 36% to 65% across urban income classes, and from 30% to 52% in rural areas. Meanwhile, the share of moderately processed foods falls with income in urban areas, from 30% among the poor to 20% among the upper class, and remains steady at just under 40% across all income levels in rural areas.

Empirical patterns: Food away from home: Consumption of food away from home shows very similar patterns in West Africa and East and Southern Africa: low overall shares around 2010 (circa 2%) hiding great variation across countries and a very strong positive relationship to income and urbanization. In West Africa, food and food away from home shares were estimated by Bricas et al. (2016) at only about 2% regionally, rising to 6% in major cities, but varying within cities from only 5% in Freetown and Conakry to over 30% in Cotonou, Lomé, and Abidjan. Tschirley, Snyder, et al. (2015) likewise show about a 2% share overall in their 6 countries, but Reardon et al. (2019) and Sauer et al. (2019) found much higher shares in Nigeria (not included in the Tschirley, Dolislager, et al, 2015 work) and Tanzania — about 25% in urban areas and 10% in rural areas. In Nigeria, the share doubles from the lowest to highest income tercile — this implies explosive growth in total expenditure on this item with growing incomes. Tschirley, Snyder, et al. (2015) found a similar pattern with income, projecting higher growth rates over time (based on income elasticities and rates of urbanization) for food away from home than for any other food category and even slightly above demand growth for non-food.

2.4.4. *Food diversity, quality, safety, and desirability*

Expectations: Bennett's Law can be extended and generalized into an expectation of rising demand for food diversity (this follows directly from a declining budget share of starchy staples) and for a broader set of food attributes as incomes rise. Key among these attributes are perceived food safety and quality (including nutrition) and complex notions of food desirability.

Food desirability includes internal factors such as taste, texture, aroma, palatability and (for non-packaged foods) visual appeal, and external factors such as the perceived status or prestige of foods, their relationship to existing cultural norms around food, and one's desired lifestyle[18]. In the globalized, industrialized, market-based food system that now dominates global consumption, lifestyle advertising by large multinational food corporations (both western and African, for example Tiger Brands

18 This conception builds on Herforth and Ahmed (2015).

of South Africa and Bakhresa Group of Tanzania) directly targets all these aspects of desirability, and does so especially for ultra-processed industrial food products (Abrahams, Temple, Mchiza, & Nelia, 2017; Gaber & Write, 2014; Igumbor et al., 2012; Ng et al., 2014). Most obviously, it targets external aspects such as perceived status or prestige and the role of the product in one's desired lifestyle. Yet over time, and especially when targeted at children, such advertising can heavily influence internal factors such as what is considered a desirable taste or texture or smell (Robinson, Borzekowski, & Matheson, 2007; Smith, Kelly, Yeatman, & Boyland, 2019).

Because this advertising takes place within a local food culture, one should expect variability over space and time in how these externally promoted foods and food products are adopted into diets. Spatially, differing local food cultures should drive variation in the particular products adopted and the particular ways in which they are combined with "local" and "traditional" foods to create new dishes (Bricas, 2008; Bricas & O'Déyé, 1985; Soula, Yount-André, & Bricas, 2020). One can also expect that strongly embedded local values around food might slow the adoption of ultra-processed foods in some areas, even controlling for levels of income.

Much innovation around food and eating takes place within households or among small-scale street vendors. This innovation has to do with how foods are combined and prepared into dishes and may be relatively free of large corporate influence. Examples include the expansion of fried plantain banana (***aloko***) all over West Africa, ***attiéke*** made from cassava semolina in Côte d'Ivoire and now in other countries (Sédia, Konan, & Akindès, 2020); rice and fish with oil and vegetables (***ceebu jën***) in urban Senegal (Bricas & O'Déyé, 1985), and ***baabenda,*** a vegetable leaves dish, in urban Burkina Faso (Héron, 2020).

Urbanization increases exposure to other people and their food habits and to modern media, from billboards to TV advertising to smartphone advertisements and embedded advertisements in movies and online shows. In this way, urbanization per se should simultaneously increase the influence of the large corporate sector and of more organic national and regional influences that depend on the mixing of people and informal sharing of "food styles" (Bricas, 2008; Bricas & O'Déyé, 1985; Soula et al., 2020).

We expect that these forces will result in great spatial variation in the particular foods and food products that are adopted into diets and the dishes that they support, but that this variability will be found in the midst of very robust convergence towards food being more purchased, perishable, processed, and prepared (Tschirley, 2017). More specifically, we expect the demand for status and prestige through food, or for "lifestyle foods", to start with iconic global brands such as Coca-Cola (beverages), Frito-Lay (snack foods), and Kentucky Fried Chicken (fast food). As this happens, local firms will find a niche, for example Chicken Republic in Ghana, Nando's in South Africa, and Azam in Tanzania. Street foods will also grow and innovate to adapt to these trends, but this sector and small local firms will be heavily pressed to compete with larger firms. Over time, as incomes rise and as intensified by urbanization, concepts of desirability will change. We expect that they will move back towards foods perceived as more healthy but that still have high processing content or are prepared outside the home. These features are essential for convenience, which is a driving force in urban food demand. We also expect that in most cases these foods will feature strong advertising content, which is needed to penetrate the "noise" of product diversity in modern systems and capture aspirational demand of high-income consumers). The rate at which this happens will vary depending on the rate of income growth and the strength of local food cultures.

Empirical patterns: Extensive research exists on consumer willingness to pay for food quality but generalizing is difficult due to the large number of characteristics that can be considered under the rubric of quality. The literature includes examinations of fortified versus unfortified maize meal in Kenya (De Groote, Kimenju, & Morawetz,

2011); genetically modified foods in Kenya (Kimenju & De Groote, 2008), rice quality in Senegal (Demont et al., 2013); quality protein maize in Tanzania (Kiria, Vermeulen, & De Groote, 2010); Karoo Lamb in South Africa (Van Zyl, Vermeulen, & Kirsten, 2013); African green leafy vegetables in Kenya (Chelang'a, Obare, & Kimenju, 2013; Ngigi, Okello, Lagerkvist, Karanja, & Mburu, 2011) and in South Africa (Senyolo, Wale, & Ortmann, 2014), and organic foods in South Africa (Vermeulen & Bienabe, 2007).

Empirical research on demand for food safety in Africa is scarce. Ortega and Tschirley (2017) found that consumer awareness of food safety issues is lower in Africa than in Asia and found little empirical evidence of consumer demand for food safety in Africa. Hoffman, Moser, and Saak (2019) reviewed six studies of consumer willingness to pay for food safety. Four of the studies are in Africa and all of these are in Kenya. They conclude that African (Kenyan) consumers have low knowledge of food safety and low willingness to pay for it.

Research on perceptions of status, prestige, and lifestyle as drivers of food consumption is nearly absent in Africa's food economics literature, despite the growing ubiquity of global brands of beverages, snack foods, and fast foods on the continent, and of advertising associated with each. Given the rapidly unfolding nutrition transition in Africa and the increase in overweight and obesity and associated non-communicable diseases (Reardon et al., 2020), this should be an area of rapidly increasing research[19].

2.4.5 Megacities and consumer food demand

Little literature exists on the relationship between patterns of food consumption and city size. Sauer et al. (2019) found a threshold effect of the size of urban agglomeration on demand for highly processed food in Tanzania: living in a secondary city compared to a town has no effect on demand for these kinds of foods, but living in a primary city (the largest type) is strongly positively associated with demand for these categories (packaged high processed foods and meals away from home). Headey, Stifel, You, and Guo (2018) showed that residing in a rural area, regardless of its degree of remoteness from an urban settlement, has a meaningful negative impact on child diet diversity scores. In the absence of further empirical or conceptual literature on this topic, we hypothesize that the impact of the rise of megacities on consumer demand will be "more of the same": more demand for food diversity, quality, safety, convenience, and prestige. Megacity impacts on the structure and behavior of FSCs can lead to additional changes in consumer demand based on changing relative prices.

2.5. Consequences of consumer behavioral change for livelihood opportunities

The central effect of changing consumer demand for food is to draw labor and livelihoods — opportunities — off the farm into the non-farm portion of FSCs and entirely outside the food system. We review the literature on this move off the farm, then consider changing opportunities for farmers, before closing with a consideration of the implications of the higher capital intensity, knowledge, and skill that will be required to capture these new opportunities.

2.5.1 Rising opportunities off the farm

The inverse relationship between a country's income (strongly associated with its level of urbanization) and the share of labor on the farm is among the most established empirical regularities in development economics, forming the basis of the earliest development models (Lewis, 1954) and elaborated on by numerous authors under the rubric of structural transformation of economies (see Herrendorf, Rogerson, and Valentinyi (2014) for a review of recent research and Timmer (1988; 2012) for applications to agriculture).

19 We found only one example of research on food advertising in Africa outside of South Africa: a letter to the editor (not an article) in *Food and Nutrition Bulletin* focused on billboard advertising in Maputo, Mozambique (Pinto, Lunet, Williams, & Barros, 2007). Not a single paper citing this work picks-up on the advertising angle. See Igumbor et al. (2012), Moodley, Christofides, Norris, Achia, and Hofman (2015), and Cassim (2005) for South Africa. Use of the term "aspirational foods" remains rare in research on Africa, one exception being Colen et al. (2018), though they do not link this to advertising.

Tschirley, Snyder, et al. (2015) use this relationship together with modeling of the diet transformation previously discussed to project movement of labor both off the farm and across sectors of the agri-food system in East and Southern Africa over 15- and 30-year periods from 2010. Focusing on primary sectors of employment and depending on the level of income growth, they projected that employment in farming would fall from 75% in 2010 to a range of 61% (assuming 4.5% per capita annual growth) to 68% (assuming 2% growth) in 2025, then to a range of 49% (4.5% growth) to 62% (2% growth) by 2040. Due to high population growth absolute employment on the farm will rise, even as its share of all employment falls. The post-farm segment of the agri-food system would increase its share from 8% to between 10% and 12% by 2025 and 11% to 14% by 2040. The biggest winner from this process would be the economy outside the agri-food system, whose share would rise from 18% in 2010 to between 22% (2% growth) and 28% (4.5% growth) by 2025 and between 27% and 39% by 2040.

By focusing on an individual's primary sector of employment, these projections put a lower bound on the share of the non-farm economy (both within the agri-food system and outside it) in total employment. Using much of the same data (LSMS-ISA data from six African countries[20]) and focusing on full-time equivalents (FTEs) rather than primary occupation, Dolislager et al. (2020) capture the fact that economically active individuals in Africa typically engage in multiple livelihoods. They show that only 34% of all labor effort (FTE) in Africa was spent on own farming around 2015, and even rural areas showed only 39%. Together, these are roughly one-half the 75% farm share that Tschirley, Snyder, et al. (2015) reported from an overlapping set of countries, just 5 years earlier, based on primary occupation.

Focusing on work off the farm, Dolislager et al. (2020) show that 25% of all FTE labor — farm and all non-farm including that unrelated to food — is spent in the post-farm segment of the agri-food system, well above the 8% figure (from 5 years earlier) of Tschirley, Snyder, et al. (2015) and again confirming how individuals in Africa engage in multiple livelihoods.

This same research also shows that engagement in the off-farm portion of the agri-food system increases as a household resides in more densely populated areas (Figure 2.5). They do this by applying the same classification scheme used by IFAD (2019) and Arslan et al. (2020) and found that the share of FTEs dedicated to post-farm agri-food system (AFS) work (including wage and self-employment) in the 6 African countries increases from 22% in the rural hinterland (the least densely populated rural areas) to 25% in intermediate zones, 26% in peri-urban areas, and 31% in urban areas. The share of farming falls across these zones from 57% to 38% to 28% before dropping all the way to 7% in fully urban areas. Work shares entirely outside the agri-food system (non-agri-food wage plus non-agri-food self-employment) rise from 22% in the hinterland to 47% in peri-urban and 62% in urban areas. This more disaggregated view of rural spaces is better suited to the population settlement patterns previously reviewed, where we showed that much of "rural" Africa is relatively densely populated.

Summarizing, urbanization and income growth in Africa have already driven a dramatic shift of labor effort off the farm and into the midstream and downstream of the agri-food system (25% of all labor today in the 6 countries analyzed) and outside the agri-food system (39%). Continued urbanization and income growth can be expected to continue this process, with the prospect that in 5–10 years roughly two-thirds of all labor even in rural areas will take place off the farm.

2.5.2 Opportunities for farmers

We identify five impacts that the changing structure of food demand should have on farmers, and review evidence on each.

#1: Crop mix shift towards high-value crops: First, there should be a change in farm production mix towards higher value crops such as fresh fruit and vegetables and animal products (poultry and eggs,

20 Ethiopia, Malawi, Niger, Nigeria, Tanzania, and Uganda.

dairy, and meat). This is a direct response to changing consumer demand and was theorized by von Thunen (1826) nearly 200 years ago. This shift at farm level could be inhibited by surging imports of the high value products, but in the absence of such a surge, the shift would have to come from local production.

Empirical support for this change is tenuous and shallow, with few empirical studies. Headey and Jayne (2014) find some support, showing that increasing rural population densities on the continent are associated primarily with some shifts to higher value crops. Yet they also cite FAOSTAT data as showing a slight decline in the contribution of non-cereal crops to total output in high density African countries.

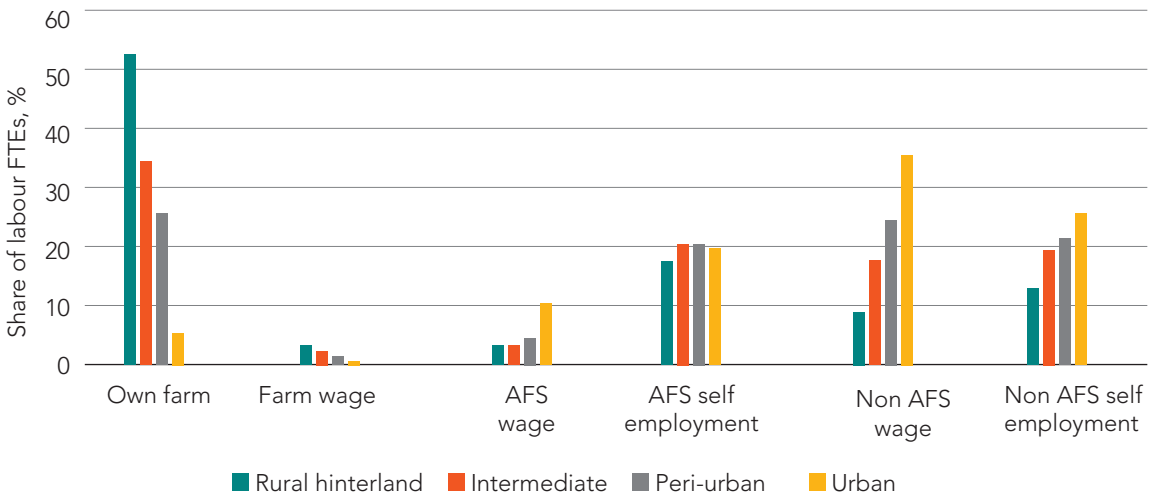
Our own review of FAOSTAT data also does not support the idea that high value crop production has increased its share in total production on the continent. Between 1990 and 2018, the ratio of total production of staple cereals, roots and tubers, and plantains (low value crops) to all other production (high value) trended slowly down, from about 36% to 34%[21].

Problems of accuracy with FAOSTAT data are well-known[22], and under-reporting may be a particular problem with high value crops such as fruit and vegetables and animal products. Opportunities created by rising demand are clear, and many individual studies speak to areas where high value agricultural production — especially for vegetables, dairy, and some meats — is rising rapidly to satisfy this burgeoning urban demand. For example, Chapoto, Hichaambwa and Kabwe (Box 8.2, this volume) show that nearly 200,000 farmers have entered Zambia's vegetable market since 2007, nearly doubling the share of smallholder farmers producing these crops, with a strong reason being rising urban demand. Similar dynamics appear underway in Ethiopia, where growing urban demand has fueled the emergence of peri-urban horticultural farming clusters serving expanding urban markets for fresh fruits and vegetables (Minten, Mohammed, & Tamru, 2020). Various writers have documented the rapid rise in dairy production in peri-urban areas of Kenya (Kiambi et al., 2018; Kiambi et al., 2020; Ngigi et al., 2010). Hollinger and Staatz (2015) show rapid growth in

21 We excluded sugar cane from the analysis because its extreme bulkiness meant that it dominated these production-based ratios.

22 See, for example, Headey and Jayne (2014) who based much of their analysis on FAOSTAT data, since it is the available source, but warn twice of problems with the data.

Figure 2.5. Labor full-time equivalent (FTE) shares by functional (self-employment versus wage) and sectoral (agri-food system or non-agri-food system) category, East and Southern Africa circa 2014



Source: Dolislager et al. (2020)

production of some types of meat in West Africa since 1980.

These findings suggest that it is possible there has been a greater shift than national data show. But recall that Reardon et al. (2019) reported small changes in the staples share in consumption in Africa, and that Tschirley, Dolislager, et al. (2015) and Tschirley, Snyder, et al. (2015) computed modest income elasticities of demand for vegetables. Furthermore, Bachewe and Minten (2020) show in Ethiopia that the prices of nutritious foods (mostly animal-source proteins, and fruits and vegetables) have risen much more rapidly than the prices of obesogenic foods (oils, fats, and sugar) and staples between 2007 and 2016, suggesting that local production is not keeping pace with rises in demand in urban areas.

Together this evidence suggests that there have likely been some shifts in production mix, that they have been modest and spotty to date, but that over time they likely will become more pronounced and broad-based (as long as incomes continue to rise and local supply chains are competitive) with special emphasis on animal protein, fruit, and perhaps vegetables.

#2: Higher input use: Increased input intensity could come from three sources. The first is linked to lower total cost of access to inputs for farmers, which could stem from three effects. For one, shorter average distances between rural and urban areas should result in farmers more frequently connecting with urban-based input dealers, which could lower total costs of such input access due to lower transport costs, and lower prices for the inputs due both to potentially greater competition among dealers in more competitive urban markets and lower unit costs for these dealers based on higher volumes transacted than would be possible with a rural location. More dense rural populations could also make it more profitable (through a threshold effect) for input dealers to locate in rural areas. These rural input dealers may charge higher prices due to higher operating costs and lower volumes transacted, but their presence could increase access and reduce total cost of input acquisition for some farmers, primarily those for whom traveling to the urban center is infeasible or more expensive than any price premium they would pay to a local input dealer.

The second source of input intensification is Boserupian intensification based on changing relative factor prices (Boserup, 1965). This process is driven by the interaction of more dense rural populations and greater proximity to urban areas, which drives up land prices, changes relative factor costs, and makes it more economically rational for farmers to intensify with land-saving inputs such as fertilizers and pesticides. In other words, inputs need only become ***relatively*** cheaper compared to other factors of production to drive input intensification among those farmers that have the cash or can otherwise finance input purchases.

The third contributor to increased input intensity could be a relieved cash constraint due to higher off-farm incomes (including from remittances), interacting with the first two dynamics.

The empirical record on input intensification in Africa is tricky to interpret in part because intensification is highly clustered (Sheahan & Barrett, 2017), meaning that national and continental trends hide a great deal of heterogeneity. The broad story is that inorganic fertilizer use has grown rapidly over the past decade (Ariga, Mabaya, Waithaka, & Wanzala-Mlobela, 2019) but remains far below levels in other areas of the developing world and is driven by maize; that herbicide use has skyrocketed since the early 2000s (Haggblade, Minten, Pray, Reardon, & Zilberman, 2017); and that whatever broad intensification has occurred is strongly related to proximity to an urban market (Vandercasteelen, Beyene, Minten, & Swinnen, 2018a; 2018b). We support each statement in turn.

Ariga et al. (2019) report that inorganic fertilizer use in sub-Saharan Africa rose 8% per year between 2008 and 2018 but at 15 kg/ha remains far below other areas of the world. Forty percent of the use in 2017 was for maize. Bachewe and Minten (2020) showed that modern input use partly drove agricultural productivity growth in Ethiopia but

that area expansion played a larger role in growth in total production. Headey and Jayne (2014) anticipated this result, showing that intensification in high density areas of the continent was achieved primarily through greater intensity of land use (mostly declining fallow periods in favor of more continuous use) and very little to increased input use. Jayne et al. (2019) show that growth in total production over the past decade was driven 75% by area expansion and only 25% by yield growth.

Yet Sheahan and Barrett (2017) found tremendous variability across 6 countries in fertilizer use, with country averages ranging from 26 kg/ha to 57 kg/ha. They also found "immense" variation in use of fertilizer and other chemical inputs across regions within countries, for example in Ethiopia where three regions far surpass the national average of 45 kg/ha while 5 regions use less than 10 kg/ha. Finally, they showed that nearly half the variation in inorganic fertilizer use is related to policy and institutional factors at country levels; household and plot factors explain much less variation.

Sheahan and Barret (2017) also suggest that agrochemical use is far higher than typically recorded, while Haggblade et al. (2017) document the explosion in pesticide use (particularly herbicides) in West Africa. They show that imports rose 8-fold between 2000 and 2013, from about US$110 million to over US$800 million. Drivers of this dramatic rise have been falling prices due to a flood of generic pesticides related to the expiration of patent protection for major active ingredients, together with rising rural wage rates related to urbanization and the growth of off-farm employment.

Examining teff production in Ethiopia, Vandercasteelen et al. (2018a) generated results strikingly in tune with what we showed about the pattern of population settlement in Africa. They show that secondary cities have strong positive effects on input use because their large numbers and wide distribution reduce the distance to urban markets for many farmers. However, the size of the effect is larger for larger cities: hinterland farmers linked to Addis Ababa (fewer than those linked to one of the many secondary cities) used more inputs and achieved higher yields than farmers lying similar distances from secondary cities. Vandercasteelen et al. (2018b) showed sharp increases in the use of diammonium phosphate (DAP), urea, and improved seeds together with higher profits (despite paying higher wages to hired labor) as farmers reside closer to Addis Ababa. Assima and Tamru (Box 8.1, this volume) show similarly sharp spatial gradients for herbicide use in Ethiopia and Mali, with rapidly rising use related to rapidly falling prices closer to cities.

Rural non-farm income has risen with urbanization and food system transformation. The empirical record on reinvestment of this income into farming is mixed, however. Mathenge, Smale, and Tschirley (2014) found that off-farm income generally competes with maize intensification in Kenya. Smale, Kusunose, Mathenge, and Alia (2016) found a negative relationship with maize intensification at low income levels but a positive relationship at higher income levels. On the other hand, Oseni and Winters (2009) found a positive relationship between off-farm income and farm expenses in Nigeria, in particular on labor and fertilizer, though this effect varies across regions. Maertens (2009) found that access to employment in export agro-industry alleviates farmers' liquidity constraints in Senegal and increases agricultural production.

Summarizing, empirical literature remains sparse but is beginning to capture increased use of modern inputs in African agriculture. Progress is rapid but from very low levels and shows great variation across and within countries. Urban proximity (and thus the importance of the decentralized urbanization we document earlier in the chapter) is an important driver of this emerging trend, and rural non-farm income can, under conducive circumstances, also relieve liquidity constraints and allow greater crop intensification.

#3: More marketing: The third expected impact on farmers of the human settlement and income trends we identified is more marketing of agricultural production. This effect stems from three facts: (1) market-dependent consumers outnumber farmers

(urbanization plus movement into rural non-farm employment); (2) these consumers have higher incomes; and (3) market penetration and high population densities in rural areas means that rural people also are purchasing more of their food.

Surprisingly, empirical research on this topic is extremely thin. One flurry of research on "market participation" of smallholders in Africa took place in the mid-2000s (Alene et al. 2008; Barrett, 2008; Boughton et al., 2007). Using data from around 2000, these studies came too early after the start of the rise in per capita incomes on the continent, did not focus on the impact of market proximity, and were also unable to examine trends at household level in crop marketing due to lack of panel data. Later work (for example, Mather, Boughton, & Jayne, 2013) stresses the impact of technology and household resource endowments on participation (much like Barrett (2008) and Boughton et al. (2007)), with less importance found for proximity to market.

A second area of study is contract farming (which is, by definition, market-oriented) but the focus is heavily on the impacts of participation and less on its determinants and trends. A more current burgeoning literature on African food system transformation focuses primarily on diets (Keding, Msuya, Maass, & Krawinkel, 2011; Tschirley, Dolislager, et al., 2015; Tschirley, Snyder, et al. 2015; Worku, Dereje, Minten, & Hirvonen, 2017) and nutrition (Gillespie & van den Bold et al., 2017; Popkin, 2017) or the midstream (Reardon, 2015; Reardon et al. 2019). If it does address farm issues (Jayne, Chamberlin, & Benfica, 2018) it takes a broader focus that does not examine impacts of these transformations on household level marketing behavior.

In short, empirical support for the obvious proposition that increased proximity to urban areas should increase farmer marketing behavior is very weak because the research has not been done; this is an important area for more research.

#4: More profitable marketing: The fourth effect on farmers should be more profitable marketing, stemming from two sources. First, shorter transport distances mean that consumers are now closer to farmers, which should reduce marketing margins, some of which should go to farmers (with the share that farmers capture depending on elasticities of supply and demand). The second source of more profitable marketing should be a volume effect, based on two factors: lower unit costs per kilometer transported due to higher production volumes per farm (this based again on the much lower ratio of farmers to non-farmers), and more dense clustering of farms, which further increases volumes, reduces unit costs for traders and transporters, and should in part raise prices for farmers.

Vandercasteelen et al. (2018a; 2018b) provide strong support for this expectation in the production and marketing of teff in Ethiopia, but we find no other literature that directly examines how the profitability of agricultural production varies with proximity to urban areas.

However, an indirect indicator of the business attractiveness of farming in Africa today is the rise of medium-scale, entrepreneurial farmers. This trend was first identified by research around the effect of "agri-food industry transformation", including the rise of supermarkets, on smallholder farmers in Africa. Neven, Odera, Reardon, and Wang (2009) found that supermarkets in Nairobi sourced their vegetables from wholesale markets and primarily medium-sized horticultural farmers near the city, echoing similar shifts decades earlier in Latin America. Much of this literature emphasized the exclusion of smallholder farmers from these high-value modernized markets, due to standards for quality and regularity of deliveries that smallholders found difficult to meet. Those smallholders that did enter the markets, however, were typically found to earn higher profits (Minten, Randrianarison, & Swinnen, 2009).

Later research by Jayne and colleagues (Jayne et al., 2014; Jayne et al., 2016; Jayne et al., 2019) documents the much broader rise of medium-scale farmers in relatively land-abundant countries, producing a similar range of crops to smallholder farmers. Jayne et al. (2019) found that farmers cultivating between 5 ha and 100 ha accounted

for between 40% and 60% of the increase in total agricultural output over 6–10 years in Ghana, Malawi, Rwanda, Nigeria, Senegal, Tanzania, and Zambia.

Overall, the evidence compiled by Vandercasteelen et al. (2018a; 2018b), Neven et al. (2009), and Jayne et al. (2014; 2016; 2019) paints a consistent picture of agri-food system transformation and associated increased urbanization driving greater profit possibilities in farming, which new medium-scale farmers and a limited number of smallholder farmers are taking advantage of.

2.5.3 *Increasing capital intensity and skill requirements*

A distinguishing feature of the new opportunities arising to serve Africa's urban food demand is that doing so requires more capital intensity and greater knowledge, skill, and organization. This fact means that, unless effective policy and programmatic responses can be found, only a small subset of the hundreds of millions of smallholder farmers and micro and small-scale agribusinesses will be able to compete in this new environment over the medium term.

Daunting challenges for small-scale farmers: The new demand patterns of consumers lead increasingly to changes in the structure (scale) and behavior of FSCs that pose major challenges for smallholder farmers. In the emerging modernized food systems of Africa, agribusiness firms want quality, regularity of delivery, demonstrable safety, and scale to reduce unit costs. These requirements are most predominant in perishable supply chains such as fresh fruit and vegetables and animal products. The early supermarket literature (Minten et al., 2009; Neven et al., 2009; Weatherspoon & Reardon, 2003) highlighted the broad exclusion of smallholder farmers from supermarket fresh produce supply chains, except to the extent that these chains purchased from wholesale markets (though even there, it is the upper quarter or less of smallholder farmers that supply the vast majority of fresh produce). Reardon, Barrett, Berdegué, and Swinnen (2009) concluded that smallholder farmers can be included but in small numbers and not those in hinterland areas or that are asset poor. Tschirley et al. (2018) reviewed the evidence and food system transformation in Africa and suggested that 10–30% of the "commercial farmer" households (already better equipped and more market-oriented) and a smaller portion of the "pre-commercial" households might be able to compete in these emerging markets in the medium-term. The major role that medium-scale farmers have played in rising production in seven countries spread across West, Central, East, and Southern Africa, as documented by Jayne et al. (2019) and reviewed in this chapter (section 5.2), suggests that the turn towards larger, better capitalized farmers is already well underway.

A coming concentration of the midstream: big challenges for SMEs: Tschirley et al. (2018) and Reardon et al. (2019) demonstrate that MSMEs (micro, small, and medium enterprises) dominate the midstream and downstream of African food systems. Roughly 90% of all food retailing takes place through such firms; processing of maize meal in Tanzania is almost entirely in the hands of such firms; and even in Zambia where large-scale trading firms have penetrated more than in most African countries (drawn by the substantial large-scale farmer sector), they carried only 11% of the maize trade in 2015 (Sitko, Chisanga, Tschirley, & Jayne, 2017).

Part of the reason for the limited presence of large companies in Africa's food systems is the daunting infrastructural and policy challenges they face. Poor physical infrastructure (roads, energy, water, and ports) dramatically increases the costs of operation. Heavy bureaucratic procedures further increase these costs. Ad hoc border closures during food crises (Tschirley & Jayne, 2010) can lead to enormous losses. And because the medium and large-scale farming sector is not yet large enough to supply all the product that most need, they face the costs of assembly from large numbers of small farmers or of sourcing product in dramatically congested and inefficient wholesale markets.

Yet the size of the African urban market and its rapid growth (at least until recently) has increasingly attracted large players (Reardon et al., 2019; Tschirley et al., 2018). Policy is also improving, with an encouraging recent example being the

very limited closure of borders in response to the COVID-19 pandemic. The African Continental Free Trade Agreement (AfCFTA) is moving forward and could mark a milestone in improved policy that allows scaling of investment in production, processing, and trade and much lower costs of operation. If policies continue to improve, more large-scale investment will be attracted, and the "J curve" of the evolution of concentration will begin to enter the phase of rapid consolidation, increases in scale of operation, and progressive exclusion of micro and small firms (the right side of the "J"; Reardon et al., 2019).

Africa is behind other areas of the world in this process of consolidation, and the stalling of growth over the past five years may have further slowed the process. Yet the COVID-19 shock may give renewed impetus to consolidation (Reardon, 2020).

Concerns about employment: The likelihood of rising capital intensity raises concerns about employment on a continent where the youth population (those 15–24 years old) is projected to double by 2050, compared to expected declines in Asia and Latin America (Arslan et al. , 2020; IFAD, 2019). Concerns are compounded when considering the near certainty that manufacturing will not create the levels of employment in Africa that were seen in the West in the last century or even in East Asia and areas of South Asia over the past 30 years[23].

The evidence on how rapidly this consolidation is taking place is mixed. What is clear is that medium and large-scale firms are rapidly expanding (far beyond any such private sector footprint of two and three decades ago) even as micro and small-scale firms innovate and maintain very large market shares in some areas. At retail, Tschirley et al. (2017) note the dramatic expansion of modern supermarkets and convenience stores in Dar es Salaam over the past 15–20 years, while noting that this growth has been much less visible in secondary cities. Though there have been few if any estimates of supermarket market shares since the boom in the supermarket literature in the 2000s, overall shares likely remain in the single digits outside of capital cities of nearly every country except South Africa. Tschirley et al. (2017) and Reardon et al. (2020) also note that some large industrial food companies in Tanzania are losing market share in the maize meal market in the face of a huge expansion of micro and small processors, while these same large industrial firms are seeing major growth in other food items (for example, sales of Bakhresa up 10 times in 10 years, and of MeTL up 40 times in 15 years) and are also expanding regionally. Companies like IndoFoods in Nigeria (Reardon, et al., 2019) and Zambeef in Zambia are also growing rapidly both domestically and regionally. Chapter 4 provides more detail on this issue.

Addressing this challenge is a thorny problem. Tschirley et al. (2017) caution that the popularity of programs to promote SMEs far outruns any evidence of their effectiveness, and note that the little empirical that does exist tends to show modest impacts and low rates of return. Where such investments are made, they suggest that they focus on clusters of firms, to reduce unit costs of service delivery and maximize learning. Legislation around secured transactions reform built around collateral registries might also help small firms gain access to credit. Finally, improved transport and energy infrastructure in rural areas might help attenuate the current very heavy concentration of food processing in urban areas, and allow the emergence of more small-scale firms in rural areas or in secondary cities. Solar and micro or mini-grids may be part of this push for more distributed food processing (and small-scale manufacturing in general) in favor of higher employment ratios.

2.6 Looking ahead

Growth in urban populations and incomes are the fundamental drivers of the opportunities that African urban areas will generate for food system participants over the coming years. We argued in section 4 that these two shocks have

23 This difficulty relates to many factors: the dominance of East Asia, especially China, in this sphere; the post-industrial structure of consumer demand in developed countries where services take up a rapidly expanding share of consumer expenditure; and automation that drives down labor to capital ratios and leads to much more rapid deindustrialization in employment even than in output.

independent effects on diets and thus, through FSC restructuring, on the range, distribution, and level of opportunities available to food system participants. The effect is far larger, however, when the two dynamics occur together, jointly driving very rapid transformation of diets — making food more purchased, more perishable, more processed, and more prepared — and of FSCs, and thus of the opportunities available to food system participants.

These trends are robustly predictable. Other factors will also come into play, however. Local conditions — the resilience and diversity of the local production base, the country's level of development, and the strength of its local food culture — will drive spatial variability in the particular ways in which these processes unfold. Regulatory response to the increasingly rapid rise of overweight and obesity and associated non-communicable diseases (diabetes, hypertension, and others) may also lead to variations across countries and modify the particular types of processed foods that get produced.

COVID-19 is likely to have major and potentially opposite effects. The disease is likely to speed-up consolidation in the midstream and downstream that is also driven by diet change and food system transformation. It is also likely to speed the movement to online platforms (Reardon, 2020), thereby reinforcing the rising need for skill and capital mentioned earlier. However, it will dramatically reduce income growth at least over the next two years, which will tend to hold back the transformation process. Climate change will have major effects and these, too, will vary across countries, but their consideration is beyond the scope of this chapter.

2.6.1 Past projections

Tschirley, Dolislager, et al. (2015), Tschirley, Snyder, et al. (2015) and Zhou and Staatz (2016) show this for East and Southern Africa and West Africa respectively. For East and Southern Africa, Tschirley, Dolislager, et al. (2015) and Tschirley, Snyder, et al. (2015) projected that, with real annual per capita income growth equal to the average of the preceding 10 years (4.5%), overall market demand for food between 2010 and 2025 would increase 2.8 times led by perishable products (3.2 times) and especially the most highly processed perishable products (3.6 times). These massive increases were a result of the rapid income growth that increases demand for food and especially for value added in food, and continued urbanization and rural densification that leads to greater reliance on markets for food. At a growth rate of only 2% per year, overall market size would double, again led by perishable and especially highly processed perishable foods. These large increases even with a modest 2% per capita growth are driven by high population growth, continued urbanization, and increasing reliance on markets.

Zhou and Staatz (2016) applied similar methods to West Africa to project increase in demand from 2010 to 2030 (20 years compared to the 15 used in Tschirley, Snyder, et al., 2015). Assuming continued high per capita income growth, their results pointed to increase in demand of over 4.5 times for dairy products and meat, and 2–3 times for other commodities. Growth of one percentage point below previous growth would still increase demand for dairy products and meat by nearly 4 times, and for other products again in the range of 2–3 times. Considering that growth in the farming labor force would be very slow in these growth scenarios, this level of growth implies massive new opportunities for farmers and agribusiness firms, especially the millions of SME firms making up the "hidden middle" of these FSCs (Reardon et al., 2019).

2.6.2 Uncertainty around drivers

Looking to the future, evidence strongly suggests that urbanization is likely to continue at a rapid pace. Both UN and Africapolis show high growth in the urban population share regardless of income trends. Jedwab and Vollrath (2015) show that global urbanization has been trending rapidly upwards since the 1500s independent of income: urbanization today is 25–30 percentage points higher than in 1500 at comparable levels of income.

Income growth is far less certain. Though not known at the time, both the Tschirley, Snyder et al. (2015b) and Zhou and Staatz (2016) analyses were

done at the end of Africa's 15-year growth spurt, when optimism about future growth prospects still reigned. Even at that time, however, skeptical voices were being raised (Rodrik, 2014). These voices continued into 2018 (McMillan et al., 2017; Rodrik, 2018), struggling to find ways in which African growth could continue at high rates without the rapid industrialization that drove previous sustained growth but that is increasingly difficult to achieve today.

Since 2013, as we have shown, growth in average real per capita consumption and GDP has been negative. In 2019, the International Monetary Fund (IMF) forecast 3.5% growth in GDP for the continent that year and 3.6% in 2020, barely positive in per capita terms and well below the lowest projections in the studies mentioned above. Now, with the COVID-19 pandemic, the severe locust outbreak in East Africa, the Fall Armyworm infestation since 2016, and growing security problems in the Sahel, the IMF forecasts GDP growth of ***negative*** 3.2% in 2020 (negative 5.4% per capita!) and a recovery to 1.1% overall (still negative in per capita terms) in 2021 "assuming that the pandemic abates, and lockdowns ease further in the second half of 2020" (IMF, 2020, p. 5). By the end of 2021 under these projections, per capita incomes on the continent would be back to where they were 10 years ago. If the pandemic instead worsens and economic life is further disrupted, the regression will be even greater.

In urban areas this negative income growth is likely to be most severe among the poorest, who are reliant on informal markets requiring in-person interactions, which have fallen dramatically as a result of the pandemic. Because the mass of low-income consumers in Africa have been central to the diet transformation and resulting growth in farm- and off-farm opportunities (Tschirley, Dolislager, et al., 2015), severe economic shocks to this group will have large impacts on growth and transformation in the system.

A ray of hope is that the IMF projections are the least negative for the African economies that are not dependent on natural resources or tourism. For these countries, if Africa is able to continue opening its local markets within a regional free trade area and make associated investments in trade and productive capacity, it may be able to sustain some positive growth in per capita incomes for some period of time.

2.6.3 Local food cultures and emerging health concerns

Our fundamental contention is that local food cultures and emerging concerns about the health effects of poor diets among the non-poor are likely to lead to flourishing innovation without meaningfully altering the basic dynamic of more purchased, perishable processed, and prepared food. This argument is based on three factors.

First, demand for more diverse food as incomes rise strikes us as a fundamental human tendency. In section 4.4 we reinterpreted Bennett's law as "an expectation of rising demand for food diversity … and for a broader set of food attributes as incomes rise." This diversity is served by greater reliance on markets— more purchased food — and the large number of products they can make available. Food processing outside the home is a major avenue through which this demand for diversity can be satisfied and becomes a major focus of innovation in the midstream of FSCs.

Second, higher demand for more perishable foods, especially animal products, as incomes rise is a robust empirical pattern over many decades. Perishable animal products are, at the level of the consumer (albeit not from a whole FSC perspective) extremely efficient providers of protein, fat, and minerals. For people coming out of poverty, such foods almost certainly improve nutritional outcomes rather than worsening them (as they increasingly do in rich economies). At this stage of development of most African countries, it is difficult to imagine a development path that does not lead to more consumption of these products.

Third, consumers will always have a higher demand for convenience when they perceive a higher opportunity cost of their time. Urbanization increases this perceived opportunity cost of time for many of reasons, from longer commutes to dual-

income couples to the basic psychology of being in an environment with many people in motion pursuing innumerable activities in front of you. Food processing and preparation outside the home respond directly to this fundamental demand.

Local food cultures will influence the particular staple foods, animal products, and fresh produce that consumers demand, the way in which they are prepared, and the particular foods they are combined with. They will also influence the kinds of processed and prepared foods that consumers desire. We find implausible in the extreme, however, to expect them to diminish the fundamental demands for diversity and convenience that come with rising incomes and urbanization.

Emerging concerns about the deleterious health effects of ultra-processed food consumption in middle and higher income countries, and among the middle and upper classes of low income countries, is leading to much new regulatory activity in Latin America (HLPE, 2020, Box 8) and is putting such options on the table in other areas of the developing world. In similar vein to our argument above, we expect that such new regulations, rather than stopping or seriously slowing the trend towards more food processing, will lead to new innovation around more healthy but still highly palatable and convenient foods in the attempt to meet fundamental consumer demands for diversity, convenience, and status in consumer diets.

2.6.4 Concluding remarks

Rapid urbanization has transformed the face of Africa over the past few decades. Paired with rapid growth in per capita incomes since 2000, it generated dramatic change in the foods that African consumers demand and drove big improvements in the opportunities available to farmers, micro-enterprises, and consumers. Yet the continent now finds itself at a point of profound uncertainty, in the midst of a five-year stagnation of growth and dealing now with the massive challenge of the COVID-19 pandemic accentuated by severe regional crises in the Sahel and East Africa. The result is that the projections of just five years ago now have little if any likelihood of being realized.

This does not mean that transformation in the directions we have discussed will stop, for two reasons. First, it is very likely that urbanization will continue at a relatively rapid pace, for the reasons discussed above. And as we have said, urbanization alone will have some, though much less, transformative effect on eating habits and thus on structural change in the economy.

The second reason that transformation need not come to a halt is that Africa has much room for increasing economic growth through improved policy and investment, and both are improving. The most recent example is that few if any border closings were imposed during the COVID-19 pandemic, in stark contrast to previous behavior by governments faced with food crises (Tschirley & Jayne, 2010). The AfCFTA is moving forward and promises reduced costs of trade, greater scale of operation, and rising productivity and incomes. This provides some hope that persistently low intra-Africa trade might begin to rise (Awokuse, et al., 2019), thus allowing firms not yet able to compete in the global market to expand operations regionally and potentially to develop the knowledge and capabilities to compete globally. Though various sub-regional free trade agreements on the continent have done little to reduce costs and increase volumes of intra-Africa trade, some optimism now exists that forces are aligning to make this time different and take a major step towards growth-enhancing policies on the continent. Infrastructural investment has also been increasing, up in value in 2018 by 24% over 2017 and 33% over the 2015–2017 average (ICA, 2018). Continuing this trend, prioritizing sectors effectively, and delivering on the promise of AfCFTA could go a long way towards helping the continent regain its footing in the wake of its own faltering and COVID-19, and resume the level of growth and transformation that many anticipated five years ago.

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