

The SMEs' quiet revolution in the hidden middle of food systems in developing regions

by
Thomas Reardon
Saweda Liverpool-Tasie
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Abstract

Food systems comprise the segments of food production, processing, packaging, distribution, retail and consumption. Recent emphasis on the food system regards it as comprising a cluster of different kinds of value chains, including output, lateral, and research and development value chains. The “midstream” segments of all the supply chains in this cluster include wholesale, logistics and processing. These segments, in particular the micro, small and medium-scale enterprises (SMEs) that dominate in Africa and Asia, are the focus of this paper. The importance of midstream SMEs to food security in developing regions is disproportionately greater than their share of ink and speech in development policy debates. This paper focuses on them to help reduce that disproportion and orient discussions of support to their further development.

The paper situates the rise of SMEs in developing country food systems in the overall three-stage transformation of food systems, from traditional, through transitional, to modern. We discuss the evolution, structure and conduct of each segment of the midstream, with a focus on the proliferation of SMEs and their roles, and examine the impacts of the rise of midstream SMEs on employment, small farms, the environment and consumers.

The main conclusion is that multilateral agencies, donors, governments and non-governmental organizations do not need to “kick-start” SMEs in the midstream, put in place services these firms are already providing, or “reinvent the wheel”. Donors and governments should not waste resources trying to “organize” SMEs into cooperatives, force them into formal patterns or try to “create them” with programmes that set up firms. Rather, support should focus on leveraging the rapid growth of SMEs already in place, and addressing their constraints to faster growth and better impacts.

Keywords: food systems, value chains, SMEs, developing regions

1. Introduction

Food systems comprise the segments of food production, processing, packaging, distribution, retail and consumption. In their essence, these systems then can be seen as the set of food supply chains which, for each product, include these segments and their commercial and social interactions, as well as their environmental, nutritional and socio-economic outcomes (Ericksen, 2008). Research on food systems has begun to emphasize two sets of considerations of the holistic complexity of interacting environmental, social, economic, political and institutional processes that interact and produce feedback loops in food systems (Brouwer et al., 2020; Tendall et al., 2015; Ingram et al., 2010).

Moreover, there has been a recent emphasis on the food system as comprising a cluster of different kinds of value chains, including output value chains, lateral value chains that supply intermediate services (such as logistics) and factor inputs (such as labour) to each segment of the output value chains, and research and development (R&D) value chains that condition the efficiency and innovation of each segment of the first two sets of value chains (Reardon et al., 2019). The “midstream” segments of all the supply chains in this cluster include wholesale, logistics and processing. These midstream segments, and in particular the micro, small and medium-scale enterprises (SMEs) that dominate them in Africa and Asia, are the focus of this Cornerstone Paper.

Food systems are the main purveyors of food access to consumers, including poor people, in developing regions. This is because most food consumed is purchased. Based on data from Ethiopia, Malawi, Nigeria, Tanzania and Uganda,¹ Liverpool-Tasie et al. (2020) found that 78 per cent of food consumed is purchased. On the one hand, 40 per cent (in value terms) of all food consumption is in urban areas (that is a conservative estimate because the figure in Nigeria is 58 per cent), where 94 per cent of all food is purchased, and 60 per cent is in rural areas, where on average 67 per cent is purchased (again a conservative estimate because the figure for Nigeria is 78 per cent; hence 60 per cent plus 20 per cent). By similar calculations, Reardon et al. (2020) found that purchases constitute 92 per cent of food consumption in India. Based on the above, we see that only a small proportion of food consumption (22 per cent in sub-Saharan Africa, 8 per cent in India) comes from the complement of purchases – i.e. home consumption from own farming (subsistence farming). This underscores the importance of food systems, since purchased food is by definition delivered by food systems.

Domestic food systems are highly dominant, as imports are minor. Calculating from 2018 data in tons from FAOSTAT, 90 per cent of food consumed in sub-Saharan Africa (measured as consumption by disappearance) comes from domestic food systems, and 10 per cent from imports; in Latin America and the Caribbean, 93 per cent domestic versus 7 per cent imports; and in developing Asia in general, 91.5 per cent domestic versus 8.5 per cent imports.

In domestic food systems, the post-farmgate segments, comprising the midstream (wholesale, processing and logistics) and the downstream (retail and food service) constitute an important share of the overall food system. Controlling for the product, the share of the post-farmgate segments tends to vary, as one would expect, with the length of the value chain: the longer the chain, the more handling is required. It is also a function of other value-added activities, such as cold storage, as shown below.

For rice, for example, in the (long) rice value chain from northeast China to Beijing, farmers' costs form 44 per cent of the total costs of the value chain (and 54 per cent of the total margins, as a share of the final retail price in Beijing); rice milling 36 per cent; wholesalers and retailers 20 per cent. For the (medium length) rice value chain from central Uttar Pradesh to Delhi, farm costs were 62 per cent of the total costs in the value chain (and their share of the final retail price 66 per cent); mills 7 per cent; wholesalers and retailers 31 per cent. For the (shorter) rice value chain to Dhaka, Bangladesh, the farm share of costs is 87

¹ Based on data on household purchases and home consumption from own production in value terms from Living Standards Measurement Survey (LSMS) data for Nigeria (2018/19), Tanzania (2014/15), Uganda (2015/16), Ethiopia (2015/16) and Malawi (2013) with a sample of 20,367 households. See: <https://data2x.org/resource-center/living-standards-measurement-survey-lsms/>

per cent, and the total margins (measured as the share of the retail price) 79 per cent (Reardon et al., 2012).

Controlling for the product and for the length of the value chain, the season studied can affect the share of the post-harvest segments. For potato, for example, in Bangladesh, the farm share of costs is 85 per cent, and of the final retail price in Dhaka, 69 per cent, in the harvest season. But in the off-season, after storage, the farm share of total costs is only 64 per cent, and of the final price, 43 per cent, while the cold storage segment constitutes 25 per cent of the value chain's costs and 34 per cent of the final price. In India, potato farmers in the harvest season received 57 per cent of the final price in the harvest season, but only 18 per cent in the off-season, with the cold storage segment receiving 34 per cent of the final price.

Despite the variations in the shares of the post-farm segments, it is clear that the midstream segments are important in their formation of the costs of the food systems and the final prices facing consumers.

Moreover, the post-farmgate segments of the food systems are important to rural and urban employment. Averaging over sub-Saharan Africa, Asia and Latin America (with each region discussed in detail below), Dolislager et al. (2020) found that the post-farmgate food systems employment constitutes roughly 20 per cent of rural employment (measured in full-time equivalents – FTEs), compared with 29 per cent in own farming, and 25 per cent of employment in urban areas. Most of this employment is in the midstream, in wholesale, logistics and processing.

Moreover, as we discuss in further detail below, most of midstream food systems employment appears to be in SMEs, with variation of course over regions and products, especially in sub-Saharan Africa and South Asia, where the great majority of the food systems are in the “transitional stage” and not yet mainly in the “modern stage”. SMEs appear to constitute (conservatively) at least 80 per cent of midstream activity in Africa and South Asia. This “lower bound” is not testable formally, as there is a lack of official statistics in the agrifood sector for the shares of SMEs versus large enterprises in the segments that are usually nearly fully informal sector (such as wholesale and logistics), and in those regions, mainly informal sector in food processing.

For sub-Saharan Africa, Reardon et al. (2021a) work backwards to this lower bound by noting that large enterprises are rare in wholesale and logistics except in the tiny export sector (4 per cent of agrifood output in tonnage terms) and the small import sector (9.7 per cent of consumption), calculating from FAOSTAT 2018 data. Large processors still have a limited role and share in Africa, and are mainly present in formal sector rice and wheat milling, some of the edible oil sector, the export crop milling such as the small cacao sector, and ultra-processed foods.

For India, Reardon et al. (2020a) infer from statistics on the shares of large processors and large retailers a lower bound of an 80 per cent share of SMEs in the midstream sectors. Again, as in Africa, in India there are large wholesale and logistics firms operating in the export sector, but that constitutes only 2.6 per cent of output, and imports constitute only 1.7 per cent of consumption.

By contrast, in Latin America, the penetration of large processors has proceeded much further than in sub-Saharan Africa or South Asia (Popkin and Reardon, 2018), and large logistics and wholesale firms entered food systems in the 1990s and 2000s in part to service supermarket procurement systems (Reardon and Berdegue, 2002, in general; and Echánove and Reardon, 2006, for Mexico). These trends imply that the share of SMEs in the midstream has declined, but without official statistics on this or precise quantification in the literature. Similar trends have occurred in Southeast Asia and developing East Asia (Reardon and Timmer, 2014; Reardon et al., 2010).

The importance of midstream SMEs to food security in developing regions is disproportionately greater than their share of ink and speech in development policy debates. In this paper we focus on them to help reduce that disproportion and orient discussions of support to their further development. When midstream SMEs are evoked in the international policy debate, they are often referred to as stagnant, traditional, severely constrained, part of a “missing middle”. As we find evidence of rapid proliferation and dynamism of midstream SMEs instead, we counter “missing middle” with our term the “hidden middle”. This indicates that it exists but is neglected in or hidden from the debate. We will also contend that it does not need to be

“created” or its development “started”, which would be “reinventing the wheel”, but rather encouraged and its constraints diminished so that it can grow faster and further yet.

While we spend little space on large enterprises in the modern sector, such as large processors, our focus on SMEs is not meant to downplay the growing role and importance of large enterprises. Reardon and Timmer (2012) have contended that large enterprises are also developing rapidly and, by modernizing their procurement systems, are tending to restructure food systems in regions where large enterprises are starting to become dominant, such as Latin America, developing East Asia and some parts of Southeast Asia. We think that in a decade or two, large enterprises will also be major forces in sub-Saharan Africa and South Asia, as they are already emerging rapidly in those regions. We will bring large enterprises into the discussion in selected comparisons with SMEs (in particular, regarding technology, market arrangements and employment impacts). The comparison is possible because in all development regions in at least a few product food systems, SMEs and large enterprises coexist and already compete against each other.

We use the term “SME” because it is commonly used in international debates. By it though we mean micro, small and medium-scale enterprises, but eschew use of “MSME” simply because it is unfamiliar in common parlance. The SMEs we treat can be classed in two categories: (1) micro-enterprises, often home-based, operated by one or two family members, and often in the hinterland; (2) small and medium-scale enterprises, usually non-home based, operated by family but also non-family hired workers, and often in the intermediate or peri-urban rural areas and cities.

Our paper proceeds as follows. Section 2 discusses our information sources. Section 3 situates the rise of SMEs in developing-country food systems in the overall three-stage transformation of food systems, from traditional, to transitional (when SMEs are dominant), to modern (when large enterprises become dominant). Section 4 discusses the evolution, structure and conduct of each segment of the midstream (processing, wholesale and logistics), with a focus on the proliferation of SMEs and their roles. Section 5 treats the impacts of the rise of midstream SMEs on employment, small farms, the environment and consumers. Section 6 concludes with policy recommendations.

2. Sources of information

In this paper, we rely primarily on product-specific surveys of SMEs for our supply-side analysis and Living Standards Measurement Study (LSMS) surveys for our employment analysis. Most of the product-specific survey data are drawn from field surveys undertaken in the past 15 years by ourselves and our collaborators, and usually comprise “stacked surveys”. The latter are surveys of representative samples of the various segments of the supply chain (rather than relying on small-sample key information surveys). When comparable surveys are found in the literature, we cite them as well. These surveys allow detailed analysis of SMEs in each segment of the food systems.

Stacked surveys by definition allow a comprehensive view of the different segments of the midstream, as well as detailed information on their relations with downstream firms such as retailers, and upstream firms such as midstream firms upstream from them (such as rural traders selling to urban traders) and farms; they also permit analysis of a range of other detailed themes such as waste and loss by midstream firms, packaging, branding and food safety; they permit detailed analysis of specific product value chains. Moreover, literature surveys done in the studies reviewed here, such as rice and potato in various Asian countries, fish in Bangladesh, coffee and teff in Ethiopia (the two best-known indigenous products and the two leading marketed crops), and even maize in Nigeria, had not had substantial surveys done on mills or traders for several decades before these studies, and for several (such as teff) never before.

These themes are seldom if ever researchable using nationally representative SME surveys that usually focus on one segment (such as manufacturing, Central Statistics Agency, 2014, for Ethiopia), and seldom focus on SME wholesalers, rural brokers, transport, warehouse and cold storage firms, nor allow product-specific analysis, to the best of our knowledge.

Stacked surveys thus also allow inter-segment information “triangulation”. For example, a number of our trader surveys show that the practice of value chain finance “advances” by traders to farmers is now relatively rare, in contrast with traditional views on this and current conventional wisdom. In a number of

stacked surveys, we were able to compare findings from farm household surveys in the same zones to verify whether few farmers are receiving such advances from traders – such as for rice and potatoes in Bangladesh, China and India (Reardon et al., 2012). Moreover, stacked surveys allow us to calculate margins of costs and rewards received by the various segments, an analysis that single-segment surveys – such as of nationally representative SME manufacturers surveys, e.g. for Ethiopia (Central Statistics Agency, 2014) and for Nigeria (Kale, 2019) – do not permit.

There are several limitations to the stacked survey data that we mainly rely on compared with nationally representative SME and medium and large enterprise surveys such as those on SMEs and large manufacturers in Ethiopia (Central Statistics Agency, 2014; 2018). First, the stacked surveys usually focus on a product value chain rather than all products in the segment.

Second, the stacked surveys typically focus on a limited area such as firms in wholesale, milling and *enjera* (teff pancake) preparation to and in Addis Ababa (Minten et al., 2016a). However, the stacked surveys usually focused on main and representative supply chains and key staple products such as teff in Ethiopia to the largest city, and rice and potatoes to the capital cities of Bangladesh, China and India (Reardon et al., 2012), poultry and feed and maize feeding main cities in northern and southern Nigeria (Liverpool-Tasie et al., 2017), and aquaculture fish supplying Dhaka and other main cities in Bangladesh (Hernandez et al., 2018).

Third, the stacked surveys typically focus on the informal sector SMEs that dominate the midstream of food systems in Africa and Asia; this limits their utility in comparing SMEs and large firms such as in productivity and returns to capital, such as was done for food manufacturers in Ghana with national surveys of firms (Owoo and Lambon-Quayefio, 2018) and of manufacturers in Ethiopia (Siba, 2015).

3. The transformation of food systems to situate the evolution of the midstream segments and the rise of SMEs

We conceive of three stages of transformation of the food system (Reardon et al., 2019). These stages are functions of characteristics of the structure and conduct of the food system, as well as the phase of the product cycle.

3.1 The traditional stage

In the traditional stage, the following patterns are common. The reader could imagine cereals or dairy into rural village markets in Ethiopia and Nepal today, or food markets in most developing regions in the 1970s, or in the United States in the 1920s/1930s.

First, in terms of structure, traditional food systems are spatially short because the urban share of the population in the food market is low. They are also intermedationally short because much of the market is in the rural area and even the same village. The share of grains and other staples in the food economy is very high: there is relatively little production of non-grain products, hence few supply chains for them, except in pockets of traditional cash crops. The share of value added in post-harvest segments of the food system is small: home processing reigns, and the wholesale and logistics sectors are small because food is not moved far. Most of the segments are fragmented. Concentration is mainly observed where governments assured grain supply to emerging urban populations at subsidized prices via parastatals.

Second, in terms of conduct, as the bulk of the food system is in niche phase for non-grains and niche-to-commodity phase for grains, there is little quality differentiation, and few standards or economies of scope. Technologies are labour-intensive per unit of output. Enterprise scale is tiny. Spot market relations dominate food systems; contracts are not used.

3.2 The transitional stage, the “golden age of SMEs”

In the transitional stage, the following patterns are common. The reader could imagine teff, aquaculture fish and maize into urban markets in Bangladesh, Ethiopia and Tanzania today, or food markets in the United States in the 1940s-1960s.

First, in terms of structure, transitional food systems are spatially long because the urban share of the population in the food market is moderately high. The exception, where short supply chains still dominate, is in highly perishable products such as leafy greens and farmed fish and dairy. Food systems are intermedationally long, as many small- and medium-scale actors in the midstream of the food system emerge to add value and move food from rural areas to urban areas. In the transitional phase the share of value added in post-harvest segments of the food system is moderately large, as wholesale, processing and logistics sectors have blossomed.

By the transitional stage, governments have largely dismantled output and input parastatals, and private firms, especially SMEs, have flooded in, as part of what Reardon (2015) calls a J curve of concentration: in the traditional stage, there is moderate concentration (parastatals in the public sector alongside a fragmented “parallel market” private sector). Then, with liberalization and privatization of parastatals (in the 1980s and 1990s in developing regions), there is de-concentration with the proliferation of SMEs.

By the transitional stage, the share of grains and other staples in the food economy is a minority share. Bennett's Law in consumption and diversification in farming beyond grains has radically increased production of and food systems in animal and horticultural products.

Second, in terms of conduct, the bulk of the food system by the transitional stage is in a major shift from the niche to the commodity phase of the product cycle. There is still little quality differentiation, but public standards have started to emerge for grades and quality, and in some cases for product safety. The exception is mostly on the side of value added, as purchased processed foods and differentiated products for grains (convenience foods and increases in quality) develop rapidly in this stage.

Technologies in the transitional stage are still labour intensive, but machine use has emerged in farming and in the rest of the food system. For example, home processing such as hand pounding of grain found in the traditional phase has given way to the proliferation of SME milling companies, alongside a few emerging large-scale companies. SMEs also start playing a bigger role in logistics and wholesale. Spot market relations still dominate, but in a few cases, contracts are beginning to emerge.

3.3 The modern stage

In the modern stage, the following patterns are common. The reader could imagine today's food systems for Senegal mangoes into export markets, rice into the main urban markets in China, and dairy products in Brazil, as well as US food markets since the 1970s/1980s.

First, in terms of structure, modern food systems are spatially long, as the urban share is high. Even perishable products such as poultry, dairy and vegetables are by this stage produced far from cities and shipped frozen, chilled, packed and so on. (But in the most advanced modern stages there is a renaissance of peri-urban production of some of these products such as in vertical horticulture.)

By the modern stage, food systems have become intermedationally short, with a trend towards “disintermediation” – as supermarkets and large processors transact directly between themselves and in some cases buy direct from farms. The right-hand side of the J curve noted above has occurred, with substantial concentration in all segments at least upstream and downstream from farms, as well as in the farm sector in some countries. The SMEs that remain stay competitive through product differentiation or a shield of high transaction costs (such as those in the hinterlands). By the modern stage, the liberalization of Foreign Direct Investment (FDI) that started in the transition stage has caused widespread multinationalization of a number of food systems segments.

The wholesale sector has evolved to be off-market (outside wholesale markets) with the rise of large logistics and wholesale firms. In the transitional phase, the share of value added in post-harvest segments

of the food system is large (in the United States around 90 per cent) in long and complex supply chains. The “food service sector”, such as fast-food chains, has increased to a substantial share of the food economy (from a modest share in the transitional stage and a tiny share in the traditional stage).

By the modern stage, the share of grains and other staples in the food economy is now a small share of overall food, about a quarter or less. Non-grain supply chains and processed food dominate the total food sector.

Second, in terms of conduct, the bulk of the food system by the modern stage is in a major shift from the commodity to the differentiated products phase of the product cycle. There is now substantial quality differentiation, and private standards for quality and sometimes food safety have emerged to begin to eclipse public standards (Henson and Reardon, 2005), such as occurred in the dairy sector in Brazil in the 1990s (Farina et al., 2005).

Technologies in the modern stage are largely capital intensive – i.e. mechanized all along the food system. Information-based systems such as smart chips in packaging and logistics, and drones in agriculture have emerged. Spot market relations are relegated to some sectors such as fruits and vegetables, but in meats, grains and dairy, contracts have come to dominate.

4. Patterns in SME development by midstream segment: Processing, wholesale and logistics

4.1 SMEs in the processing segment

4.1.1 The rise of SMEs in the long transformation of the processing segment

The sequence of transformation of processing can be described by a J curve posited by Reardon (2015). This shows the development of scale in processing over time in developing regions. The average scale in the early stage was a combination of micro enterprises (such as custom millers in the traditional stage below) in the large informal sector and large parastatals in the small formal, urban sector.

The second stage was a proliferation of SMEs after the privatization of the parastatals in the 1980s and 1990s. This is what we refer to above as the transitional stage, the major stage in developing countries today. It is dominated by SMEs. The proliferation of processors is rapid because there is soaring demand for processed foods as incomes rise and women work outside the home (for a review of the spread of consumption of processed food in Africa, see Reardon et al., 2021).

The third stage (of the J curve) features FDI after trade and FDI liberalization in the 1990s, and competitive local investment, which creates large food-processing enterprises that begin to win share from the SMEs in various product lines such as cookies and noodles.

4.1.2 The evolution of processing SMEs in the transitional stage

In the traditional stage, little processed food is purchased, and the great majority of processing and preparation is home processing. The exceptions are traditional snacks and beverages sold in the village. Emerging in the later traditional stage, with the advent of hammer mills and other mechanized milling (such as occurred in Africa in the 1970s/1980s), is the spread of village custom milling of grain and edible oil. There was a demand among women to use these custom mills to avoid the onerous hand pounding of grain and tubers (averaging 4 hours per day per woman in African villages; see Barrett and Brown, 1994).

It is during the transitional stage that a steady rise of demand for purchased processed food and the concomitant proliferation of processing SMEs can be seen. First, this stage sees a rapid rise in SMEs in minimally processed food such as bulk edible oil and flour. They win share from custom milling and shifts from loose, unpackaged and unbranded to packaged and branded; and from sales in wet markets to sales in small shops. This is illustrated for maize meal in urban Tanzania by Snyder (2018) and in rural Tanzania

by Alphonse et al. (2019); for milk in Ethiopia by Minten et al. (2020a); and for rice in China by Reardon et al. (2010).

Second, as we will show also for SMEs in logistics and wholesale, there is a tendency for SME processors to form spontaneous clusters, such as near wholesale markets for ready inputs (Snyder, 2018, for Tanzania maize processing). As with wholesalers, processing SMEs tend to operate in the informal sector, facing no public standards. They are often run by or employ women, as in Nigeria (Liverpool-Tasie et al., 2016). Snyder (2018) shows the very rapid proliferation of maize flour SMEs in Tanzania; Chase-Walsh (2018) for millet porridge with dairy dishes and so on. There are many cases of the rapid spontaneous development of these clusters. Sometimes the clusters are “organized” as cooperatives. This is most common in dairy, such as in Ethiopia (Minten et al., 2020b) or Zambia (Neven et al., 2017).

Third, in the transitional stage, SMEs producing highly processed foods emerge. Initially these tend to be traditional products; in Africa, for example, this includes millet gruel with fermented milk, wheat donuts, cowpea fritters, fermented leaf condiments and so on. Further along, SMEs begin to produce non-traditional products for urban markets, such as pickled sauces in India or bread in East Africa. As with minimally processed foods, highly processed foods made by SMEs shift from loose and non-branded (such as fritters on a tray) to being packaged and branded and sold in small shops. Again, this is an important source of employment for women, requiring relatively small initial investment. For a detailed review of processed and prepared food consumption and supply via SMEs and large firms in Africa, see Reardon et al. (2021a).

4.2 SMEs in the wholesale segment

4.2.1 The rise of SMEs in the long transformation of the wholesale segment

The long-run transformation of the wholesale segment can be seen as a shift in various categories of structure and conduct. In general, wholesale traditional and modern “extremes” are as follows, with transitional between the two (and recall that the transitional stage is by far the main stage in the developing regions’ food systems at present):

- Structure: the wholesale “market shed” shifts from local to long-distance, especially rural-urban
- Structure: shifts from locally concentrated to nationally fragmented (hence SMEs) to nationally and internationally consolidated (large enterprises in wholesale)
- Structure: shifts from vertical integration with logistics (i.e. wholesalers have their own trucks) to separation, i.e. traders rely on SME third-party logistics services (3PLS), to a resumption of vertical integration in the modern stage
- Conduct: with a shift in product composition of wholesale along the product cycle, from niche local products to wholesale of bulk undifferentiated “commodities” (by SMEs in the transitional stage) to differentiated products
- Conduct: from no standards to emergent public standards to private standards
- Conduct: from no contracts (in the traditional and transitional stages) to emerging contracts on behalf of retail in the modern stage with wholesalers acting as agents
- Conduct: from food systems finance (advances by traders) to the collapse of tied-output credit (in the transitional stage), to a resumption of food systems finance as part of contracts in the modern stage.

4.2.2 The evolution of SMEs in the wholesale segment: the traditional stage of the wholesale segment as prelude

We summarize briefly wholesale in the traditional stage, in part because it is simple, and in part because the traditional food system stage is largely a thing of the past in the developing regions except in hinterland areas far from cities. The rural population covered is very small in South Asia, and even small in Africa. For example, Sauer et al. (2021) find that only 10 per cent of the population in rural Tanzania are more than 5 hours from urban areas.

Traditional wholesale is mainly local to rural areas and local villages and towns simply because in this early stage the urban share of the food market is very low – say, some 10 per cent – compared with the average

today in Africa and South Asia of 60 per cent of total national food consumption. The rural wholesalers mainly gathered at periodic markets that covered several villages, such as the *haats* in India. In some enclaves, traditional cooperatives set up by the State for supplying cities or export markets act as aggregators for those longer chains.

Wholesalers (rural brokers) are micro or small scale in traditional settings and face relatively high transaction costs due to poor roads and hard-to-access villages in mountainous areas and forests, such as shown by Minten and Kyle (1999) for the former Zaire. They show that these transaction cost barriers also created higher margins for the rural brokers, as competition was low.

The transaction cost barriers also created monopsonistic competition and leverage for the wholesaler *vis-à-vis* the hinterland farmers. In the traditional setting, farmers had little rural non-farm employment or other cash sources and so relied on traders for advances that then, in “tied credit-output market” arrangements, locked in the farmers to sell to the trader at harvest time. This led to the “exploitative trader hypothesis” that in turn gave an impetus to the formation of the parastatals to obviate the traders (Reardon and Timmer, 2007). Below we show that in the transition stage these arrangements have been eroded and have largely disappeared (despite their firm place in conventional wisdom).

4.2.3 The evolution of SMEs in the wholesale segment: spatial change and growth of wholesale in food systems in the transitional stage

Wholesale is a major part of food systems; thus wholesale grows with food systems. This has happened in several ways.

First, the volume of rural-urban food systems has grown quickly over the past several decades. For example, for Africa, Haggblade (2011) gives a figure of 800 per cent in the preceding 25 years. For India, Minten et al. (2009) note that 25 per cent of national food expenditure was by urban consumers in 1971; Reardon et al. (2020a) show that by 2011 in India, 60 per cent was consumed in urban areas. Given that only 9 per cent of African and 3 per cent of Indian food consumption is from imports, the great majority of urban food thus comes from rural-urban food systems, hence with a major involvement of wholesalers.

Second, long food systems are the fruit of urbanization and integrated national markets, with wholesalers playing a central role in mediating food security for urban areas, which constitute about 60 per cent of the national food consumption in Africa and South Asia. The Nigerian maize food system illustrates this (with the wholesale counterpart of the 3PLS case presented in the previous section). Liverpool-Tasie et al. (2017) report results from a large survey of urban and regional wholesale market-based maize wholesalers in northern and southern Nigeria. The great bulk of Nigerian maize is produced in northern Nigeria and consumed there and in southern Nigeria, 1,000 km away. Around 85 per cent of the maize volume of all the traders in the large sample is sourced by traders from the northern “maize basket”. About 80 per cent of the southern traders buy maize from the north. The northern trader makes the sale to the southern trader in the northern wholesale markets, and then the southern trader takes it 1,000 km to the south via 3PLS.

Third, contrary to what we think is a popular image of rural areas feeding themselves and food systems going only in the direction from rural to urban, we found that rural-rural and urban-rural food systems have grown a lot over the past several decades. On the one hand, about 50 per cent of rural food consumption (in value terms) in Africa comes from purchases, *ipso facto* from food systems into rural areas from either urban or rural suppliers (Reardon et al., 2019); in India, that figure is 80 per cent (Reardon et al., 2020a).

On the other hand, evidence is emerging that rural consumers in one zone buy food from other rural zones and from urban areas. For example, in Tanzania, rural consumers in zones that do not produce particular kinds of fruits and vegetables buy them from food systems coming from other rural zones (Lazaro et al., 2021), and they buy processed food produced in urban areas in their zone and far away in the capital city (Sauer et al., 2021) with substantial participation of wholesalers based in both urban and rural areas.

Fourth, whichever direction the food systems, their growth has engendered a rapid proliferation of wholesale SMEs. Here are some examples from domestic food systems for fish in Asia and Africa:

- As farmed-fish food systems grew in the delta area of Myanmar (the main aquaculture zone, supplying 90 per cent of its fish to Myanmar cities), Belton et al. (2018) report that from 2006 to 2016 the number of fingerling traders increased by 60 per cent. The farmed-fish wholesaling at the wholesale market in Yangon grew from zero in 1991 to 70 per cent of the national supply of fish in 2014 (with the rest from sea catch). The number of licensed traders grew by 40 per cent between 2004 and 2014, the number of sedentary unlicensed traders on the periphery of the market grew by 400 per cent during that period, and the number of mobile traders by 600 per cent. The number of rural traders in the fish farm zone increased by 50 per cent in the period.
- As farmed-fish food systems grew in Bangladesh in the past two decades, Hernandez et al. (2018) report a doubling of rural and rural-urban fish traders and feed dealers in 10 years (2004-2014).
- As the food systems of farmed fish and river and lake fish grew in Nigeria, Gona et al. (2018) report that the poor state of Kebbi in the north of Nigeria saw an increase of 30 per cent in 10 years (2008-2018) in the number of rural and urban wholesalers.

4.2.4 The evolution of SMEs in the wholesale segment: agglomeration, concentration and scaling of SMEs in the transitional stage

The transitional stage sees the rapid spread of wholesale markets and off-market “spontaneous clusters”, some activity of cooperatives as aggregators, and the emergence of off-market wholesalers, as follows.

First, as cities grew in one developing region after another, rural periodic markets and urban truck markets gave way to urban wholesale markets. The latter started in primary cities, then spread to secondary and tertiary cities and eventually rural towns in Asia (e.g. China – see Ahmadi-Esfahani and Locke, 1998; and Huang et al., 2007 – and India – see Fafchamps et al., 2008; and Minten et al., 2009) and Latin America (for Mexico, see Echánove and Reardon, 2006). In these two regions, a number of national and municipal governments pursued policies of promoting wholesale market development beyond the large cities where they started in the 1950s-1980s. The policy goal was to reduce market transaction costs for farmers to sell to rural towns and tertiary cities, and for populations there to be served as the share of the non-primary cities in total urban populations rose.

In much of Africa, with the exception mainly of South Africa (where governments promoted the spread of wholesale markets into smaller cities), the development of wholesale markets has lagged, and was mainly in primary cities in the 1970s-1990s (Tollens, 1997), before spreading in some cases (such as Nigeria) into secondary cities in the 2000s-2010s (Liverpool-Tasie et al., 2017).

Second, in general there has been a shift from a highly fragmented/intermediated “dendritic” wholesale system supplying the wholesale markets in the early transitional stage, to a somewhat “disintermediated” wholesale system in the late transitional stage. Town-based wholesalers have increasingly sourced directly from farmers instead of from rural brokers, thus cutting out the role of the latter. The rural brokers were replaced in those cases by 3PLS that picked up the product from the farmers and moved the product from rural town wholesalers to large city wholesalers.

The disintermediation has occurred more in the dynamic states and provinces with rapidly growing cities, such as in western and central Uttar Pradesh in India, and less in lagging, hinterland areas such as eastern Uttar Pradesh (Reardon et al., 2011). There is substantial evidence of this disintermediation – for example, in Indonesian horticultural food systems (Natawidjaja et al., 2007), and rice food systems in Bangladesh, China, India and Viet Nam (Reardon et al., 2014).

There is also emerging evidence of the wholesale disintermediation emerging in Africa. As there are few surveys on this theme to date, it is not yet possible to evaluate how far this trend has proceeded. But there are important cases emerging. In Nigeria, Liverpool-Tasie et al. (2017) report that urban traders are “de-fragmenting” supply chains: most buy direct from farmers and cut out the extra step in the chain of field brokers. About 50-60 per cent of the traders in the north of the country source directly (using 3PLS) from farmers, and 60 per cent of southern traders buy direct from farmers. In the north, however, 70 per cent of the volume of the urban traders still comes from field brokers selling to them on commission in the wholesale markets.

In Bangladesh, China and India, Reardon et al. (2014) found disintermediation in the form of rice mills buying directly from farmers (bypassing middlemen such as village traders), correlated with the degree of development of the zone (and thus lower transaction costs) and with farm size (with medium-sized farms selling directly to mills and thus benefiting from controlled prices, but very small farms still selling via village traders or aggregators). Urban rice traders also have disintermediated by reducing their use of semi-wholesalers to procure from rural rice mills, with a correlation between direct purchase from mills and the size of the mill.

Third, the above studies tend to show an increase over one or two decades in the average size of wholesalers. This is partly because improved roads and larger vehicles allow traders to achieve greater scale, especially in the non-hinterland areas. It is also because of the rise of 3PLS, reducing the transport constraint to traders (Liverpool-Tasie et al., 2017). Finally, the shift of the locus of traders from rural brokerage to town wholesale markets as the latter proliferated allowed them to increase their scale.

Fourth, in the later part of the transitional stage, off-market wholesaling companies begin to emerge. These tend to:

- start as large wholesalers in an urban wholesale market, and keep a stall there;
- then rent stalls in the wholesale markets of other consumption cities, as well as towns in the diverse production areas, to source across seasons;
- then rent a warehouse outside the main wholesale market and set up a distribution centre (sometimes with their own trucks); an example of such a firm (which followed this sequence) is Pedraza, dealing in tomatoes and chillies, in Mexico (Echánove and Reardon, 2006); and
- add (or shift into) custom wholesaling for supermarkets, fast-food chains and processors that require transaction traits (volume, timing), packaging, and private standards of quality and sometimes of safety. This requires the addition of cold chain, sorters and so on. These wholesalers then become “specialized dedicated wholesalers” (Reardon and Berdegué, 2002) acting as quasi agents for the modern food industry. They may also manage contract-farming schemes for these firms. Examples of such firms can be found in Indonesia (Natawidjaja et al., 2007), India (Reardon and Minten, 2011) and South Africa (Weatherspoon and Reardon, 2003).

Fifth, wholesalers tend to form what we call “spontaneous clusters”, as opposed to managed clusters such as Special Economic Zones (SEZs) and “agroparks”,² where there are logistics clusters, and *vice versa*. An example of a logistics and wholesale spontaneous cluster is that of cold storages in Agra, India, discussed in the logistics section. Interestingly, while the Agricultural Produce Market Committee Act in India forbade traders from operating outside the official wholesale markets (*mandis*) in Uttar Pradesh at that time, the many cold storages that emerged became local transaction points for farmers (after they withdrew their stored potatoes) and wholesalers from Delhi and other cities. The locus of the market in fact shifted *de facto* (but counter to *de jure*) to being clustered around the cold storages and away from the official wholesale market in Agra. This reduced transaction costs for traders and farmers, as they could make the deal and exchange at the cold storage. The cold storage firms facilitated this by reducing search costs for traders by calling them to alert them when farmers withdrew potatoes from cold storage and were ready to sell (Das Gupta et al., 2010).

Spontaneous clusters of off-market wholesalers also form in agriculture (and aquaculture) farming zones. An example from Indonesia is Hikmah Potato Agribusiness, which wholesales and processes potatoes on various islands in Indonesia, and produces certified seed potato. It co-locates in the potato zones and is accompanied (like “follow sourcing”) by domestic logistic companies (Natawidjaja et al., 2007). Another example is the aquaculture zone in Myanmar, where large wholesalers (that are also backwards integrated in fish farming) locate in the fish farming zone as well as in the main urban wholesale market (Belton et al., 2018).

² As noted above, we believe spontaneous clusters are far more important, quantitatively, than managed clusters, which receive a lot of attention and government and donor investments but have many challenges with a gap between their artificial placement and design and the needs and dynamics of the real food economy, and often fail (for the African case, see Ulimwengu, 2019).

4.2.5 The evolution of SMEs in the wholesale segment: change in conduct of SMEs in the transitional stage

First, the transitional stage has, in some countries, nascent public standards, but mainly linked to trade standards such as for soybean lipids and protein and the rate of broken grains. Few public standards apply to domestic food systems and to the mainly SME traders operating therein.

Second, in the transitional stage, the product cycle phase is commoditization. This features supply of bulk cheap products, without particular quality differentiation, let alone other traits such as safety, environmental impact and so on. Wholesalers are selling mainly to SMEs in retail and processing and on the whole are not playing agent for contract-farming schemes which mainly emerge in the modern stage. In the later part of the transitional stage, when off-farm wholesalers emerge and coordinate procurement networks of their own across provinces, the wholesaler may itself impose grades of quality and pay for them, as one sees in the guava zone in Mexico (Hernandez et al., 2012).

Third, there is emerging evidence that the “tied output-credit” market arrangements that were common in the literature about the traditional stage have largely disappeared in the transitional stage. Adjognon et al. (2017) show this in an analysis of LSMS data from a number of African countries in which they found that extremely few farmers received advances from traders either in kind (such as inputs) or in cash. Reardon et al. (2014) analysed data from “stacked surveys” on rice in China, India and Bangladesh, and found that extremely few farmers received advances from traders. However, a substantial share of traders received advances from retailers and processors, but these advances were just for a one-week transaction cycle and were not conceptually the same as the tied output-credit arrangements that had been said to be common in the traditional stage.

The reasons given in these studies for the demise of the arrangement were that: (1) rural households had other sources of cash, especially rural non-farm employment; and (2) the improvement in roads and the proliferation of traders meant competition was keen, so farmers “side sold” regardless of the tying. It is interesting that the exceptions to the demise include traders giving advances to large farmers, such as in Myanmar in aquaculture (Belton et al., 2018), as traders considered this a good investment in reducing transaction costs to obtain larger volumes in one go.

Fourth, competition in wholesale appears to reduce traders' margins in the transitional compared with the traditional stage. The evidence is scarce, but some studies such as Minten and Kyle (1999) note that traders' margins in the hinterland are higher than in the more competitive and lower transaction cost peri-urban and intermediate rural zones. This suggests that margins are lower in this stage due to cost and competition. Moreover, Minten et al. (2014b) show in Ethiopia that as SME traders and truckers invested over the past decade and proliferated: (1) margins – i.e. price gaps between farms and consumers – were reduced, as the market became more efficient; (2) spatial integration over the country's wholesale markets increased; (3) mill and retail margins reduced; and (4) a proliferation of traders occurred, competition increased greatly, and the average size of traders declined somewhat.

4.3 SMEs in the logistics segment

4.3.1 The rise of SMEs in the long transformation of the logistics segment

Generally, there has been an inverted U curve for the share of logistics outsourcing versus in-house by the other segments of the food system over the stages of food system transformation. That is:

- In the traditional and early transition stages, wholesalers and processors have in-house logistics, such as their own vehicle and storage area, as distances are short and volumes are low.
- In the later transitional and early modern stages, when both distances and volumes are large, the 3PLS segment takes off, as firms in the other segments outsource logistics rather than acquire and manage their own large trucks and warehouses.
- In the later modern stage, large enterprises in the other segments invest in in-house capacity in logistics.

4.3.2 The evolution of SMEs in the logistics segment: the traditional stage of the logistics segment as prelude

As noted above, in the traditional stage, logistics is mainly in-house in the other segments. We believe it is for that reason that the food system policy debate in developing countries usually ignores the logistics segment, as there is often an assumption that most (except for the modern slice) of the food system is still traditional and firms in the other segments do their own logistics; there is thus a lack of awareness that in the transitional stage the 3PLS emerges and becomes very important in the food system.

The traditional food system is spatially short, and volumes are small, so processors and wholesalers mostly use their own small vehicles such as bicycle, bullock cart or pack animals, or just walk the product to the village market. The exceptions are cash crop enclaves and early parastatal operations that are modern-stage operations in an otherwise traditional food system.

As noted in section 3, this traditional-stage own-logistics can be common in a lagging zone, such as the hinterland, where it might still look like the 1980s (imagine a bullock cart on a mountain road in the upper hills of Shan state in Myanmar today), while other stages of logistics occur in other zones (imagine motorbikes and trucks plying the roads of the dry and delta zones of Myanmar today).

Moreover, there can be a very rapid shift from a traditional stage to a transitional stage; Minten et al. (2016b) present data showing that the teff food system from rural areas to Addis Ababa leapt from bullock carts, horses and walking teff to market in 2005 to mainly small and large trucks in 2015, with the cart and horse transport gone, induced by growth in Addis and improved roads. The same thing occurred in only five years in the dry zone of central Myanmar – from bullock carts to motorbikes and small trucks, induced by the rise in the economy after the 2011 liberalization and “opening”, and improved rural roads.

Storage is part of logistics. Traditional storage is on-farm, such as potatoes underground in China (Reardon et al., 2012) or in mounds covered in straw in India in the 1990s (Fuglie et al., 1997). No energy is used to cool or aerate, so that storage is at ambient temperature, prone to mould and fungus beyond a short storage period, or traditional fumigants such as ash are used. Grain is stored in rafters or traditional granaries.

For the small marketed surplus in the traditional stage, traders buy it and store it in their own warehouses, or parastatals buy it and store it in silos. Perishables are pickled, dried or smoked, or stored underground. Produce is transported on the tops of rural buses by small-scale traders, and in trucks by medium-scale traders.

As noted above, the traditional stage can be present at the same time as the transitional stage (below), but in different zones. The differentiation is often driven by transaction costs that render a zone “hinterland” by dint of high transport costs from poor roads and institutional taxes (e.g. bribes easily taken when roads are tortuous and traffic is slow). The hinterland is thus “protected” from transport scale increases observed in zones with better roads that can handle heavier vehicles, and small rural brokers and traditional small-scale transport dominate in the hinterland. Subsequently, trader and transporter margins are higher in the hinterland, where information flow is less and farmers' bargaining leverage is slight (Minten and Kyle, 1999, for the former Zaire).

4.3.3 The evolution of SMEs in the logistics segment: logistics segment in the transitional stage

In general, food systems lengthen with urbanization, because the larger the city, the further into the rural areas its food system must reach to feed itself. This spread was depicted by Braudel (1978) for London as it grew in the 1600s and 1700s, starting by sourcing locally and ending by sourcing all over the United Kingdom and beyond, with the birth of its food imports. A similar process occurred for Delhi in the past two decades, with rapid growth of rural-urban food systems (Minten et al., 2009), and in Africa in general (Haggblade, 2011) and Nigeria as an example (Liverpool-Tasie et al., 2017). The exception, of course, is where cities grow but source from imports rather than from the country's rural areas, such as desert entrepôts on trade routes such as Dubai, island capitals such as Singapore, and mining and forestry enclaves in remote areas.

As noted above, we perceive it as common in the transitional stage to see the formation of “spontaneous clusters” of SMEs of transporters and wholesalers, as well sometimes as processors. For transporters, these clusters can be in or next to wholesale markets, at highway crossings, near river and sea ports, and near clusters of processors. Food service (street vendors) further clusters near these three. These clusters appear to grow quickly when there is a confluence of demand- and supply-side factors, as illustrated below.

Demand-side factors include the growth in the urban market, so that these clusters form in or near primary cities but also near secondary and tertiary cities and even rural towns. Supply or facilitation factors (which we illustrate in the four cases below) include improvements in roads, electrification, symbiosis and co-evolution (such as truckers in 3PLS near wholesalers who increasingly depend on them rather than owning their own transport), and large investment in the aggregate by many SMEs building the capacity base. We did not ever observe active government policies or measures to form or even encourage these clusters, except for the building of wholesale markets. The government initiatives such as SEZs usually appeared as enclaves, separate from these spontaneous SME clusters.

As food systems lengthen, the number and eventually scale of logistics firms and their vehicles and warehouses increases. We present survey-based case studies because there are no systematic statistics on how many “spontaneous clusters” of logistics SMEs there are in food systems in developing countries. Managed clusters such as SEZs receive far more attention in the literature, but we think they are far less important quantitatively than these spontaneous clusters. Four cases of SME private sector logistics growth illustrate this for the transitional stage of the food system.

India potato cold storages. There has been an extremely rapid proliferation of SME cold storages for potatoes, and concomitant investment by wholesalers and truckers, in several main potato areas in India in the 2000s, as reported in Das Gupta et al. (2010) and Minten et al. (2014a) for the cases of Agra in Uttar Pradesh near Delhi and Bihar near Patna. For instance, in Agra (the area of the Taj Mahal), in the early 1990s few farmers grew potatoes, and there were almost no modern cold storages. By the late 1990s, however, cold storages had risen to store 40 per cent of the far larger potato output, and by 2009, 80 per cent. Traditional on-farm storage went from nearly all potato farmers in 1999 to just 1 per cent of the potato harvest in 2009.

They found that the SME cold storage logistics boom in the 2000s was driven by:

- rural electrification;
- rapid urbanization;
- improved rural-urban road links;
- the introduction of more disease-resistant and storable potato varieties;
- increased investable funds drawn from retained earnings such as rural income, especially rural non-farm employment;
- increased consumer expenditure on vegetables (per Bennett's Law); and
- in Agra, there were government subsidies for cold storage construction, but the survey showed that only 5 per cent of the cold storage capacity built was financed by drawing on subsidies.

Ethiopian teff supply chain transport boom. Minten et al. (2016a; 2016b) found rapid growth and upgrading of the teff food system in the 2000s driven by investments by large numbers of SME truckers and wholesalers (the latter discussed above). To feed the increase in the Addis Ababa teff market, an additional 500,000 tons of cereal was brought to Addis over the 2000s, carried by 65,000 additional trucks of 7.5 tons/truck. None of the investment received government subsidies; in fact, it was the opposite: the fuel subsidy was eliminated during that time, so fuel became 60 per cent more expensive. Yet transport costs dropped by 50 per cent in that decade, and the time from farm to market decreased by 20 per cent. The authors attributed the drop in transport costs to three factors: (1) the government invested in surfaced roads (doubling in length in 15 years); (2) private SME truckers invested enormously in trucks to meet increasing demand; and (3) the share of small trucks declined, whereas the share of 7.5-ton trucks went from 15 per cent in 2001 to 33 per cent in 2011.

Nigerian maize supply chain transport and warehousing. Liverpool-Tasie et al. (2017) report results from a large survey of urban and regional wholesale market-based maize wholesalers in northern and southern Nigeria. They show the great importance of 3PLS in supply chains from farmers to traders and

among traders across the country. Yet we observe that the role of and policy debate concerning 3PLS is rare.

3PLS is crucial to maize trading. The great bulk of Nigerian maize is produced in northern Nigeria and consumed there and in southern Nigeria, 1,000 km away; traders in the south source 85 per cent of their maize from the north. Yet only 4 per cent of the traders own trucks. The other 96 per cent rely on the 3PLS trucking services market. Half goes by trailer trucks (for comparison, the share is 13 per cent in the Minten et al., 2016b, Ethiopia study). Traders “comingle” their product in big trucks. Traders make deals by telephone and then despatch 3PLS to deliver. Wholesalers also use 3PLS to acquire maize from farmers. About 50-60 per cent of the traders in northern Nigeria source directly (using 3PLS) from farmers, and 60 per cent of southern traders buy direct from farmers.

3PLS is crucial to maize storage. The warehouse rental market is very active. Only 24 per cent of the traders store maize; all of them are in the north, and they store for only a few weeks. Nearly no southern traders own a warehouse, but a third of them rent one. In the north, 40 per cent of the maize that is stored is in rented warehouses.

SME 3PLS boom in aquaculture “spontaneous clusters” in Bangladesh and Myanmar. Belton et al. (2018) and Hernandez et al. (2018) report results from their stacked surveys of wholesalers, 3PLS, feed sellers and farmers in the main aquaculture areas of Myanmar and Bangladesh, respectively.

In Bangladesh, there was dramatic growth in the aquaculture food system in a short time, driven by urbanization and the increase in the demand for fish with income increases over two decades. The share of paved roads in total roads grew to more than 80 per cent from 2004 to 2014. The number of fish farmers increased by 70 per cent, and the number of rural and rural-urban traders doubled. None of the wholesalers owned trucks, and only 6 per cent rented them. The other 94 per cent, as in the Nigeria case, relied on 3PLS SMEs for transactions with farmers and other traders. No government subsidy or direction was involved.

Myanmar had a similar experience with the rapid development of 3PLS. The number of fingerling traders and (specialized) fingerling 3PLS boats each increased by 60 per cent from 2006 to 2016. 3PLS SMEs proliferated for transporting fish from farms to the Yangon wholesale market, and thence to the rest of Myanmar. Liberalization of regulations on vehicle imports and transport after the “opening up” year of 2011 played a key role in facilitating 3PLS development. Boats, mainly 3PLS with a minority of farm-owned boats, accounted for 80 per cent of the fish transported to the Yangon wholesale market. The rest went by truck, and that share had grown since 2011 with the relaxation of restrictions on trucks.

From Yangon to the rest of Myanmar, transport is by trucks and public express buses. The number of trucks increased rapidly, and the average size of fish delivery increased by 70 per cent over the period (much like the truck volume increases in Ethiopia) from 10-ton to 16-ton trucks.

The growth of bus services played an even more important role in developing the domestic food system for farmed fish. Bus services doubled from 2011 to 2014 following a policy change in 2011 relaxing limits on the number of intercity bus firms and the completion in 2011 of the Yangon-Mandalay highway. Wholesalers then started to transport fish on the buses; bus companies competed to accommodate fish traders. The cost of transporting fish fell from \$8 to \$5 per polystyrene box between 2011 and 2014. From nothing in 2011, fish transport on buses expanded to 75,000 tons per year in 2014. The number of ice plants in the aquaculture zone rose by 84 per cent between 2006 and 2016 to pack the fish in ice for transit.

5. Impacts on food system employment, farm incomes, the environment and consumption

In this section we discuss the pathways of impacts on employment, farms, the environment and consumption of midstream SMEs, which we showed above are proliferating so rapidly in the midstream of the food system. Some of our evidence will combine the impacts of both midstream and downstream SMEs, and we will treat both output and input value chains as distinct parts of the food system.

There are few systematic surveys and case studies of food system SMEs, and within those, few trace impacts on employment, and fewer still on consumption and the environment. We are constrained to work with the evidence we found and use it to illustrate a conceptual structure of pathways of impacts of SMEs.

5.1 Impacts of midstream SMEs on food system employment

Below we synthesize findings derived from results in Dolislager et al. (2020). Their study is based on a uniquely broad data set of LSMS surveys of 178,794 households with 460,654 individuals in Africa (represented by Ethiopia, Malawi, Niger, Nigeria, Tanzania and Uganda), Asia (Bangladesh, Cambodia, Indonesia and Nepal) and Latin America (Mexico, Nicaragua and Peru), in all age cohorts (youths 15-24 and adults 25-64) and both genders. They report employment in terms of FTEs in own-farming versus farm-wage labour, and non-farm wage and self-employment. Non-farm employment includes: (a) food system employment post-farmgate in food processing, wholesale of food, food-related logistics, food retail and food service; and (b) non-food system employment.

5.1.1 Post-farmgate food systems have an important share of employment in rural areas

First, food system employment (mainly in SMEs as wage or self-employment) is important in overall rural employment in all three regions, averaging 20 per cent of rural FTEs; it is higher in Africa (24 per cent) than the other two more developed regions (18 per cent in Asia and 21 per cent in Latin America). What is observed here is expected (Haggblade et al., 2010), as the share of food-linked jobs declines as more development spurs income diversification into service sector jobs linked to rural towns, and thus the share of off-farm employment not directly linked to the food sector rises. Dolislager et al. (2020) show the latter, with the shares of non-farm employment not in the food system 34 per cent in rural Africa, 43 per cent in Asia and 50 per cent in Latin America.

The share of own-farming in total rural FTEs averaged 29 per cent. The own-farm share is highest in Africa, at 39 per cent, and lower in Asia (27 per cent) and Latin America (16 per cent), as expected from the theory of economic transformation bringing a lower share of farming in total activity. Notice that these own-farming shares in total employment are much lower than the usual estimates one sees in the general debate saying “the great majority of rural people are employed in agriculture”. The latter is reckoned by the share of persons declaring farming as their primary occupation, but here we show that only a minority of FTEs are in own-farming, because rural households tend to have diversified employment; this point was made from the income point of view in Haggblade et al. (2010).

Moreover, while farm wage labour is often a focus of attention as a key alternative to farming and the object of concern with respect to increasing mechanization, farm wage labour averages only 9 per cent of FTEs over the regions. As expected, its share is in inverse relation to the degree of development of farming and off-farm opportunities: it is only 3 per cent in Africa, but 13 per cent in Asia and 12 per cent in Latin America. One can say that mechanization of food system enterprises may have much more effect on rural employment than farm mechanization.

Second, Dolislager et al. (2020) show that dependence on food system employment is similar between youths and adults. The ratio of the shares of food system employment in total FTEs of employed adults versus youths in Africa is 24-21, in Asia 26-32 and in Latin America 21-23.

Third, rural women are much more dependent on employment in food systems than rural men. Averaging over the regions, Dolislager et al. (2020) show that the share of food system employment in females' total FTEs is 30 per cent, versus only 19 per cent for males. These findings coincide with SME enterprise studies – for example, in agro-processing in Ghana – where Ampadu-Ameyaw and Omari (2015) find that women dominate the segment.

Fourth, Dolislager et al. (2020) disaggregated food system employment into wage and self-employment and showed that self-employment had an 83 per cent share in Africa, 44 per cent in Asia and 48 per cent in Latin America. Food system employment, and self-employment as a share of it, varied a lot over zones and regions; it is notable that the patterns at this large-sample level of Dolislager et al. (2020) are similar to patterns seen in micro survey studies in the various regions (Haggblade et al., 2010). In Africa, the share of

food system employment in total FTEs was 26 per cent in the peri-urban rural zone, 25 per cent in the intermediate zone and 22 per cent in the hinterland. The self-employment share was 82-84 per cent across African rural zones. In Asia, the food system employment shares were 20 per cent, 12 per cent and 11 per cent across the three zones, and the self-employment shares were 40 per cent, 62 per cent and 72 per cent. In Latin America, the food system shares were 26 per cent, 13 per cent and 15 per cent across the three zones, and the self-employment shares were 38 per cent, 52 per cent and 60 per cent.

In sum, the inter-region, inter-zone and inter-functional patterns were thus:

- The share of food system employment in total FTEs in Africa barely drops from the peri-urban to the hinterland zone, whereas in Asia and Latin America it drops quickly, suggesting that food system employment is concentrated nearer the towns and highways, mirroring a finding of Bhalla (1997) showing the gradual shift of rural non-farm enterprise distribution from widely scattered decades ago to closer and closer and clustered near highways and towns over the decades. It appears that this pattern is reflected in the Dolislager et al. (2020) data. This could be explained by food system infrastructure such as wholesale markets being more concentrated in towns and secondary cities in Asia and Latin America, creating economies of agglomeration for food system enterprises near them.
- Africa's self-employment share was nearly double that of Asia and Africa; this goes along with findings of rural non-farm employment studies for a number of countries comparing more and less developed areas within the countries. It also suggests that the average size of SME is smaller in Africa than in Asia, employing fewer per firm (Hagglade et al., 2010).
- The African share of self-employment, about 83 per cent, does not vary much over rural zones. However, in Asia and Latin America, the share of self-employment in total food system employment jumped by a factor of 1.8 and 1.6 from peri-urban to hinterland zones, for the two regions respectively. This pattern of an inverse correlation between level of development of a zone and the share of self-employment was noted in the rural non-farm employment literature, such as in Latin America (Reardon et al., 2001), with an explanation similar to the regional one above.

5.1.2 Post-farmgate food systems have an important share of employment in urban areas

Urban food system employment is important in absolute terms because urban areas now constitute about 60 per cent of all food consumption in Africa and South Asia, 70 per cent in Southeast Asia and 80-90 per cent in Latin America. Moreover, food system employment is important to urban workers, as follows.

First, the penetration in Africa and South Asia of large-scale processing firms and supermarkets is still slight, and processing, wholesale and logistics are nearly completely dominated by SMEs. For example, in Ghana, in a survey of 282 agro-processing firms, Afful-Koomson et al. (2014, cited by Owoo and Lambon-Quayefio, 2018) found that 97 per cent of the agro-processing firms were, using their terms, "very small or small SMEs", and only 3 per cent were medium-sized firms (although the latter accounted for 30 per cent of total processing employment). In Ethiopia, medium- and large-scale agro-processing firms are defined as those that employ 10 or more people and use electricity-driven machinery. They represent only 1 per cent of all agro-processing firms and 7 per cent of their employment, with the rest accounted for by small firms (Minten et al., 2016a). We thus assume that the great majority of what Dolislager et al. (2020) record as urban food system employment is in SMEs as wage or self-employment. That assumption weakens in Southeast Asia and Latin America, at least for retail and processing, while in those regions wholesale and logistics tend to still be performed mainly by SMEs.

Second, data from Dolislager et al. (2020) show that **urban** food system employment is important in all three regions, averaging 25 per cent of urban FTEs (compared to 20 per cent in rural areas); as with rural areas, it is a somewhat higher share in Africa (31 per cent) than the other two more developed regions (27 per cent in Asia and 22 per cent in Latin America). Note that the share in rural Asia was only 18 per cent, thus a lot of the agrifood system activity is agglomerated in urban areas. Note that in all three regions, nearly all the rest of the FTEs are in non-food system non-farm activity; the shares of own-farm and farm-wage FTEs are tiny in all three regions in urban areas.

Third, the reliance on food system employment is similar between urban youths and adults. The urban ratios of the shares of food system employment in total FTEs of employed adults versus youths are similar to the rural ratios: in Africa 31-29, in Asia 26-32 and in Latin America 21-26.

Fourth, Dolislager et al. (2020) disaggregated food system employment into wage and self-employment and showed that self-employment had a 65 per cent share in Africa (compared to 83 per cent in rural areas), 37 per cent in Asia (versus 44 per cent in rural areas) and 27 per cent in Latin America (versus 48 per cent in rural areas). As with rural areas, the share of self-employment in urban areas is twice as high in Africa as in Asia and Latin America, but the average of the shares is 25 per cent lower than that of rural areas. These patterns show again the continuum of more to less share of self-employment as one goes from less to more developed areas, and rural to urban areas; the wage labour market grows in parallel.

5.1.3 Food system SMEs create substantial aggregate employment: illustrations

Food system employment shares of 25 per cent of total FTEs in urban areas and 20 per cent in rural areas in the three regions together, the great majority of which is in SMEs, indicate enormous impact. We showed that the share of own-farming in rural FTEs in the three regions together is 29 per cent, close to the 20 per cent of food system employment. We contend that in the development debate farming is seen as an enormous employer and food system SMEs are an interesting but marginal set of actors – indicating a deep gap in perception of reality.

That gap might decline if in a particular country and a part of the food system the enormity of such employment is observed. There are several estimates of numbers of persons employed in various segments of the midstream and downstream of the food system.

In Ethiopia, for example, Minten et al. (2016a) showed that commercial *enjera* markets in urban Ethiopia are growing rapidly and employing 100,000 people, mostly women. They are a combination of processor/food preparation in the midstream and often retail in the downstream. There are also emerging larger-scale, more capital-intensive *enjera* processing firms that sell to the food service sector and export. They review an enterprise survey by the Ethiopian government in 2010/11 of medium and large firms and small firms; these surveys showed 1 million workers employed in food processing, with a limited number of larger firms (around 67,000) that employ mainly men, and the other large number of small firms (with fewer than 10 employees) employing mainly women.

In Nigeria, for example, employment in a subset of the segments of the maize-food-poultry complex was estimated based on primary survey data in Sauer et al. (2021). The sampling approach (Liverpool-Tasie et al., 2017) used two consumption centres as the purposive first node: Greater Ibadan in southwest Nigeria, and Kaduna City in northern Nigeria. In total, 2,500 farms and firms were surveyed, including chicken farms, maize farms, maize traders, feed mills and chicken retailers. The paper calculated each segment's use of own and hired labour by age and gender. They used total consumption of chicken in Nigeria calculated from LSMS data combined with extrapolation to the population, and the input/output coefficients calculated from the survey data (input from maize to feed and feed to chicken), to estimate roughly total numbers of actors in each segment in the total population.

Sauer et al. (2021) found that all the segments of this single complex employed roughly 900,000 people (of which 34 per cent are women). If one includes all labour employed by the maize farms and urban traders, the total increases to 5.7 million persons. About 64,000 people on maize farms are directly employed in supplying maize to the feed segment (as a small subset of all marketed maize); 78,000 are employed on poultry farms, the portion of maize traders selling maize to the feed segment is 7,200 workers (out of 72,000 persons employed by the estimated 12,000 urban maize traders in Nigeria), chicken retailers employ 35,000 workers, and 1,380 persons dedicated to chicken feed are employed in the feed mills. Comparing the labour-output ratio over the segments, maize and poultry farming are the most labour-intensive, followed by retail, and then by relatively capital-intensive maize trading and feed milling. These figures underestimate the off-farm total employment impact of the complex, in that the survey did not include rural maize traders, chicken and egg traders, 3PLS firms serving traders (an important missing piece as, for example, maize traders in Nigeria move 75 per cent of their volumes via 3PLS), day-old chick farmers and traders, and other "lateral" supply chains of inputs to the complex.

5.1.4 Employment effects of SMEs increased by dynamic processes and inter-midstream-segment multipliers

First, technological change in SMEs increases their capacity and thus the employment they induce. An example is shifting from a maize hammer mill to a roller mill, often coincident with a shift from custom milling in a village to urban milling with packaging and branding for a larger customer base. Another example is the shift in *enjera* processing from traditional wooden plates to new electric plates (*mitads*), which led to a higher capacity of the SME, better quality of the product and a marked increase in employment in the sector (Minten et al., 2016b).

Second, there is emerging evidence that SMEs “climb the value ladder” to achieve higher incomes through branding and product differentiation. For example, Reardon et al. (2014) show that in Bangladesh, China, India and Viet Nam, rice mills have gone from custom milling (where customers bring paddy to be milled) to packaging and branding their rice. Branding and packaging have also been emerging in Africa – for example, among maize millers in rural Tanzania (Alphonse et al., 2019) and urban Tanzania (Snyder et al., 2015).

Third, SMEs' growth typically creates multipliers in other midstream SME segments, thus further spurring employment and creating spillovers for consumers and farmers. An example is the extensive use that urban maize traders make of 3PLS in Nigeria, moving some 80 per cent of maize with these services; only 4 per cent of traders own their own trucks (Liverpool-Tasie et al., 2017).

5.1.5 Midstream SMEs facilitate employment creation by saving women and men time shopping and home-processing food

Fourth, SMEs produce time-saving goods and services that liberate especially women but also men to pursue more employment (or leisure time). A first major example is food processing itself. African girls and women had regularly spent 4 hours a day pounding millet and maize – and yam in West Africa – before custom grain millers became common in the 1990s and then packaged flour from the 1990s and 2000s onwards (Reardon et al., 2021). In the 1980s and 1990s, Nigerian SMEs made substantial investments in cassava processing (into *gari*), and in the 2000s industrial (medium-sized SME) *gari* processors and packagers invested in urban markets (Abas et al., 2011). In the 1980s, Cadbury Nigeria developed and mass marketed an industrially processed yam called pouno yam (Hahn et al., 1987) that has now become common in Nigeria (Nweke et al., 2013); it is manufactured by a number of SMEs, such as Yusol International Foods (www.yusolfood.com) with the Ola-Ola brand. In Ethiopia, millers shifted from custom milling only to also selling teff, cleaning teff and delivering teff flour to homes, and *enjera*-making enterprises – mostly operated by women – rapidly emerged, both developments creating an important time saving in food preparation for women in Addis Ababa (Minten et al., 2016a). Liverpool-Tasie et al. (2016) show that greater access to processed food in Nigerian villages is associated with more female employment.

A second example of SMEs saving consumers-cum-workers time is in delivery services. There has been a rapid growth (accelerated by COVID-19) in SME (as well as some large firms) “delivery intermediaries” facilitating e-commerce by SME food service and retail firms, as well as large firms' e-commerce, especially in Asia and Latin America. There is a proliferation of proxy shopping and delivery services such as Help Me Waka (www.helpmewaka.com/) in Nigeria and Ghana, working with mobile phones and an app. But there are also non-electronically networked services such as the *boda boda* motorcycle taxi service in East Africa, and similar versions around Africa (Ehebrecht et al., 2018).

5.1.6 SMEs are generally more labour-intensive than large enterprises in the food system

First, a common finding in the limited number of studies of midstream enterprises in developing regions is that SMEs are less capital-intensive than large enterprises. Examples of this include: (1) the positive correlation of the capital-labour ratio shown for small versus large *enjera* enterprises in Minten et al. (2016b); and (2) a positive correlation between capital-labour ratios and rice mill size based on mill surveys of a wide spectrum of mills and mill sizes in India, China and Bangladesh (Reardon et al., 2014).

The corollary is that it appears that SMEs are usually more labour-intensive (in terms of labour-output ratios) than larger firms. For example, for China, Reardon et al. (2012) show that SME rice mills used 1.5 times more labour per ton of rice sold than large mills. For Tanzania, Snyder et al. (2017) show that as total milling enterprise receipts increase 300-fold from very small to very large mills, the productivity of FTEs of labour to produce nearly US\$500 of maize flour drops 140-fold.

Second, a common concomitant finding is that larger firms have a higher capacity (capital) utilization rate. This was shown, for example, in the rice mill survey results presented in Reardon et al. (2014) for Bangladesh, China and India. The country studies showed that larger mills had a wide procurement acquisition area that allowed nearly continuous purchase of paddy from different production regions, while small village mills relied on the local paddy production and thus had higher fixed costs per unit of output. This is likely a reason for the rapid disappearance of village mills over time in these countries.

Yi and Reardon (2015) found a similar correlation of capacity utilization – as well as profit and allocative efficiency – with scale (traded volume) of shrimp traders in Indonesia. Allocative efficiency was also correlated with education, social networks and shrimp variety specialization. However, distance from the market, the quality of the road and the perishability of the product can influence traders' profits; Minten and Kyle (1999) surveyed traders in the former Zaire and found that larger traders had the capital (larger trucks and ability to wait longer for a turnover) to go long distances and work on poor roads, and earned higher profits, as they were in a position of monopolistic competition in the farm zones; smaller traders earned lower profits and worked closer to the markets with less perishable products.

Third, it is not just quantity but also quality-cum-diversity of function of machines that is correlated with size of processing enterprise. For example, Reardon et al. (2014) show in Bangladesh that the larger the mill, the more likely the mill is to have colour sorting and rice polishing equipment lines which increase the rice grade; this is a significant threshold investment not feasible for small mills.

However, capital intensity increasing and labour intensity decreasing with scale of midstream firms is not a hard and fast rule. For example, Afful-Koomson et al. (2014) found for a range of agro-processing firms in their Ghana survey that the capital-labour ratio (and the capital-output ratio) declined with firm size; they interpreted this as underinvestment by larger firms. They found a strong correlation of product type and capital-labour ratio, with a high ratio for vegetables, moderately high ratios for cereals and alcoholic beverages (with all three of these more apt to use machines), and lower ratios for palm oil, cassava processing (for *gari*) and non-alcoholic beverages, all three of which tend to use more labour-intensive traditional processing technologies in rural Ghana.

However, Afful-Koomson et al. (2014) also hypothesized that the lack of a positive correlation of capital and firm size may be because the quality and the efficiency of use of the machines by medium-sized firms is better than by smaller firms. We would add that the smaller firms may have a lower capacity utilization rate of their capital, as we noted above for the case of Chinese, Indian and Vietnamese rice mills; the greater capacity utilization could create a situation where there is a greater “flow” of use of capital such that a mill can occur in a larger firm (measured by volume of milled output) even while the ratio of fixed capital to output does not rise quickly with total scale.

The Ghanaian rural survey findings (Afful-Koomson et al., 2014) imply that it is important to differentiate by type of product when analysing the correlation of labour intensity and scale. However, as the Ethiopian *enjera* study illustrates, a product which may only be produced with a traditional, labour-intensive (manual) technology in traditional settings such as rural areas may see an abrupt increase in the capital-output ratio among firms with much larger scale that are also standardizing processes to meet quality and safety requirements, such as the larger-scale *enjera* firms noted above.

5.2 Midstream SMEs' impacts on farmers' incomes

First, SMEs in the midstream of output value chains are the proximate interface of farmers with “markets”. SMEs have been crucial in creating a “vent-for-surplus” and value addition which facilitates farmers' commercialization. SMEs signalling quality requirements and opening markets and services for high-value

products help small farmers to shift from low-value basic food grains; an example is the rise of cold storages in the poor state of Bihar, India (Minten et al., 2014b).

Second, SMEs in the midstream of output value chains help small farmers indirectly by establishing resource-provision relations with farms that bring farmers services such as logistics, inputs and credit. These complementary services are usually associated with large companies in contract relations with farmers, but in a scoping review of the literature, Liverpool-Tasie et al. (2020) found this provision is common among SMEs as well, and have the added advantage of being far more numerous than large contracting companies, and in close proximity to small farmers. The studies noted above of mills and traders in Asia and Nigeria, as well as cold storages in India, provide illustrations of such resource-provision relations with small farmers. It is possible that small farmers who shift from relations with SMEs to contract relations with large companies do not experience an advantage, and may even lose some of the benefits of dealing with SMEs; this has not yet been explored empirically, to our knowledge.

Third, SMEs help small farmers directly in output markets with services such as transport and cold storage, but SMEs in the midstream of input and agricultural services supply chains help farmers as well. On the one hand, SMEs in input wholesale and retail such as fertilizer and seed agro-dealers in Africa help farmers unable to go to cities to access these inputs (Liverpool-Tasie et al., 2019). In some sectors, output value chain SMEs also sell inputs to farmers, such as in the case of medium-sized dairy processors in Uganda (van Campenhout et al., 2021).

On the other hand, SMEs provide agricultural services such as harvest, farm management and input procurement in cotton in Peru (Escobal et al., 2000), combine harvesting rice in China (Zhang et al., 2017), land preparation, spraying, pruning, harvesting and marketing mangos in Indonesia (Qanti et al., 2017), and seed propagation, digging wells and ponds, spraying, land preparation, harvesting and loading trucks for vegetable farmers in Ethiopia (Minten et al., 2020b). These services help farmers without the finances to invest in machines, the skills to use machines and other inputs, or simply the time to use in farming because of non-farm employment.

5.3 Midstream SMEs' impacts on the environment

First, SMEs' technological choices can have effects directly on the environment. An example of where such choices can be beneficial is the rapid and profound shift over just a decade that Ethiopian grain-trucking SMEs made in the size of their trucks, with a concomitant 50 per cent decline in transport costs translated into lower fuel use per ton of grain moved, despite a parallel elimination of fuel subsidies (Minten et al., 2016b).

Second, SMEs' can affect the environment via their effects on farms. On the one hand, small farm commercialization takes place via midstream SMEs, in the main: selling to traders and small processors (as only a tiny share is sold directly to large firms via contracts). That commercialization induces productive input use such as of fertilizer, and soil integrity amendments via manure use, and soil conservation measures such as bunds and terraces, such as in Rwanda (Clay et al., 1998). Reardon et al. (1995) showed the combination of intensification and sustainable practices in Africa and called it "sustainable intensification". They also showed its correlation with farm links to food systems. That intensification can in turn reduce pressure to extensify into the commons, the Borlaug hypothesis (Angelsen and Kaimowitz, 2001). Sometimes SMEs get involved in directly affecting farmer sustainability practices: Liverpool-Tasie et al. (2020) noted that agro-dealer SMEs sometimes bundled training in proper input use with the provision of chemicals that could harm the environment if used incorrectly or excessively.

On the other hand, by facilitating and encouraging small farmer intensification, midstream SMEs in input value chains and food systems help small farmers use more inputs that can cause pollution from farm chemicals, siltation from aquaculture, manure from pig and chicken production, and so on – in short, negative externalities for the environment.

5.4 Impacts of midstream SMEs on consumers: food security, quality and safety

5.4.1 Midstream SMEs benefit consumer food security

First, SMEs have been observed to cheapen food for consumers and transmit farm productivity gains to consumers, all else equal. On the one hand, where midstream SMEs themselves invest in their capacity and efficiency, farm production gains can be passed on as cheaper food to consumers. Of course, where the midstream is inefficient or non-competitive, gains in farming better may not translate into cheaper food for consumers. On the other hand, midstream SMEs in input and agricultural service value chains themselves condition the availability and cost of inputs to farmers to make productivity investments. We showed examples of these effects of SMEs above, such as in Ethiopia (Minten et al., 2016b), where growth in the number of wholesale and transport SMEs reduced wholesale and retail margins and transport costs; a similar effect was seen from the growth in the number of midstream SMEs in the aquaculture value chain in Bangladesh (Hernandez et al., 2018).

Second, SMEs have been observed to reduce waste in value chains (with the implication for greater food access by consumers). For example, rapid proliferation of cold storage SMEs in Bihar, India, displaced traditional on-farm storage and thus reduced wastage rates (Minten et al., 2014b).

Third, SMEs have been observed to de-seasonalize consumer food access (while raising the prices that farmers receive). Again, cold storages in India – in Bihar (Minten et al., 2014b) and Agra near Delhi (Das Gupta et al., 2010) – serve as examples: Agra is a main source of the potatoes consumed in Delhi; in 1999, 99 per cent of the potato farms used traditional on-farm storage, and 1 per cent used modern cold storage SMEs; by 2009, those percentages had inverted, and two thirds of the potatoes going to Delhi were sold from cold storages in the half year after the harvest, greatly reducing the seasonality of the potato market in Delhi. SMEs that dry and smoke fish have a considerable impact on Nigerian fish consumption volumes, reduced seasonality relative to the fresh fish market (Liverpool-Tasie et al., 2021), and employment in the poorer north of the country (Gona et al., 2018).

5.4.2 Midstream SMEs have mixed effects on food quality/nutrition for consumers

First, it has been observed that many SMEs respond to consumer demand for nutritious foods by creating the mainstay supply chain of these foods for consumers. For example, about 75 per cent of mangoes produced in Indonesia are consumed in rural areas, with nearly all of this supply chain operated by SME traders and retailers (Qanti et al., 2018); dairy SMEs in processing, logistics and wholesale are the mainstay of milk supply to Uganda (van Campenhout et al., 2020); the great majority of fish and chicken supplies to urban areas of Nigeria (where the great majority of these products are consumed) are mainly operated by SMEs (Liverpool-Tasie et al., 2017); and SMEs are the mainstay of the supply chain functions of transport, packing and wholesale of vegetables to Addis Ababa (Minten et al., 2020b).

Second, SMEs produce and sell nutritious traditional meals, especially in urban areas, such as millet and dairy dishes in Senegal (Chase-Walsh, 2018) and in Burkina Faso (Reardon et al., 1989) and teff *enjera* in Ethiopia (Minten et al., 2014a), and make and sell milled nutritious flour such as pulses and coarse grains as weening foods in Tanzania (Snyder et al., 2015).

However, a subset of SMEs that produce and market processed foods manufacture ultra-processed foods that are bad for consumers' health, such as a range of snack food SMEs in Africa (Reardon et al., 2021). Moreover, most consumers' purchases of ultra-processed foods are made in small traditional shops, mainly because they still dominate food retail, such as in Kenya (Demmler et al., 2018).

5.4.3 Midstream SMEs have mixed effects on food safety for consumers

First, as noted above with examples of maize and rice branding and packaging in Africa and Asia, and Pingali (2007) noting it in general in Asia, there has been a rapid recent emergence of packaging and branding by SMEs in the midstream in developing regions. This is often meant to signal safety (such as cleanliness) and permit quality differentiation.

However, the labelling does not always guarantee safety or even improved quality, as there are usually poor regulatory systems in developing countries, such as lax or missing labelling and food safety regulations. For example, Minten et al. (2013) point out for the case of *makhana* (an aquatic crop made into a snack or a high-protein low-fat food), branding in India spread recently and rapidly, but that did not guarantee that the quality or safety of the product was superior to non-branded *makhana*, due to a lack of regulation. Mis-labelling-cum-fraud is also present among SMEs in the midstream of input supply chains, such as Haggblade et al. (2017) note for herbicide wholesalers, retailers and manufacturers in Africa and Asia.

Second, as expected, there is uneven adoption of food safety measures by SMEs in the midstream. Strict public standards and even more demanding private standards, such as of large food manufacturers and supermarket chains, can result in exclusion of food-processing SMEs that cannot meet the standards, such as in Brazil for the cases of milk and shredded coconut (Reardon and Farina, 2002). The needed “threshold investments” in skilled labour practices, equipment and building refitting are sometimes beyond the means of SMEs.

Nevertheless, it is not a hard and fast rule that large enterprises use better food safety practices than SMEs. For example, there is evidence of SME safety practices that are not worse than modern big firms, as seen in the dairy value chain in Ethiopia (Minten et al., 2020b).

However, some SMEs make the requisite investments and undertake innovation to pursue food safety where the market rewards it. An example is the use of lactic acid fermentation to reduce aflatoxin and fumonisin in maize by SME processors making a Nigerian porridge called *ogi* for weaning infants (Ademola et al., 2021). Another Nigerian example is a medium-scale chain – Habib Yoghurt and Fura of Habib Industries (<http://www.habibyoghurt.com.ng>) – of small food service outlets selling *fura da* yoghurt (a millet and dairy traditional dish) as a product differentiated from the traditional version. These outlets have spread in towns and competed by promoting their milk products as more hygienic than traditional fermented milk used in the millet dish. It is probable that a combination of labelling regulations, food safety regulations and government assistance to make requisite investments and learn practices (such as with the help of digital apps that show processors best practices) will help more SMEs to make food safety investments.

6. Conclusions

We showed the rapid rise of SMEs in the midstream segments of food systems in developing regions, especially in the “transitional stage”, which is dominant in Africa and South Asia and still important in the other regions. We showed the dynamism of these firms in processing, wholesale and logistics – segments often dismissed in the international debate as the “missing middle”. We found that it is indeed not missing but rather hidden from the debate, hence the “hidden middle”.

The main implication is that multilateral agencies, donors, governments and non-governmental organizations do not need to “kick-start” SMEs in the midstream, put in place services these firms are already providing, or “reinvent the wheel”. Donors and governments should not waste resources trying to “organize” SMEs into cooperatives, force them into formal patterns or try to “create them” with programmes that set up firms. Rather, support should focus on leveraging the rapid growth of SMEs already in place and thriving or trying to thrive, and addressing their constraints to faster growth and better impacts, as follows.

First, the main need is infrastructure. This is the key constraint we constantly hear in the field, far ahead of finance. SMEs are constrained by poor wholesale markets, bad roads, unreliable electrification and bribes on the roads. Addressing these issues should be the first and main priority; all else pales next to this.

Second, there is a need to address bad regulations that constrain SMEs. Of course, bribes are a kind of informal regulation or informal tax that the government at various levels imposes on SMEs and is the foremost regulatory problem. Other bad regulations include needless red tape for redundant certifications, confusion and ambiguity in zoning and premises, and in times of crisis such as COVID-19, deleterious restriction of mobility (such as shown in Nigeria by Liverpool-Tasie et al., 2020).

Third, there are missing regulations, in the form of missing or poorly implemented food safety and hygiene regulations that make SMEs with unsafe practices a danger to consumers and a constraint to themselves. This also extends to the need for truth in labelling regulations.

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