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# The Economics of the Food System Revolution

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## Abstract

A revolution in food systems—food supply chains upstream from farms, to the food industry in the midstream segments of processing and wholesale and in the downstream segment of retail, then on to consumers—has been under way in the United States for more than a century and in developing countries for more than three decades. The transformation includes extensive consolidation, very rapid institutional and organizational change, and progressive modernization of the procurement system. In this article we examine the economics of these system-wide changes. We argue that the steps of conceptualizing and empirically researching this transformation—its patterns and trends, determinants, and impacts on farms and processing small and micro enterprises—are still in their infancy because of (a) remaining limitations on data suitable for formal modeling and hypothesis testing and (b) the sheer complexity of food system-related decisions that need to be modeled and understood. With the rapid accumulation of high-quality data now under way, conceptual and theoretical progress is also likely to be rapid.

## INTRODUCTION: A SHORT HISTORY OF A LONG TRADITION AND A RECENT REVOLUTION IN FOOD SYSTEMS

For 10,000 years human food systems were traditional in structure, conduct, and performance. At first, people grew or hunted and ate their own food. As agricultural technology changed and surpluses developed, exchange occurred, and daily or weekly village markets appeared. As towns and cities emerged, urban markets rose with them, channeling grain, meat, fish, fruits, and vegetables from the villages. As roads and shipping developed, grain, spices, silk, hides, and salt made their way in long-distance trade along the Yangtze River, the Nile, the Rhine, the Rhone, the Appian Way, and the Silk Road. With that trade some markets grew to be great centers, great nodes, like the famous Champagne fairs linking southern and northern Europe (Braudel 1979), part of the so-called commercial revolution in the eleventh to fourteenth centuries described by Greif (1993). The steam engine and great iron and steel boats and trains increased food trade in the nineteenth century.

Yet for 9,900 years, while cities and trade flourished, the basic domestic food system, the set of connections that purveyed the great majority of food from farm or river or sea to the dinner tables of the world, stayed, until approximately the end of the nineteenth century, “traditional.” By traditional we mean that farm inputs were collected from groundwater, rainfall, pastures, and privies; grain was ground at the small village mill; milk was churned into butter or cassava ground into *gari* by households or small enterprises; village traders bought the products from farmers and traded in towns and cities with small-scale merchants (mixed with the occasional large trading house); and the food was sold in wholesale truck markets and from retail wetmarkets full of small stalls, from pushcarts or hawkers, or from small shops. Governments often set the legal price of bread or rice in town markets, but the market relations were spot exchange. Most food was sold raw—grain in husk, live animals, fresh milk, fresh produce—to be milled, slaughtered, and processed at home or by small local processors. The great majority of the food came from the local area (mirroring the fact that even today 95% of food consumed still comes from domestic supply, now often at a national level rather than at a local level; international trade remains important at the margin, the edge, of the food system).

Then suddenly, over roughly the past century—starting in Western Europe and the United States and coinciding with the industrial revolutions in those places—much of the food system underwent a revolution. In the latter third of the nineteenth century, a gradual process of transformation of the food industry got under way. This transformation affected downstream (retail) and midstream (processing and wholesale) segments of the food system stretching from input supply to farms upstream through midstream and downstream to the consumer. Over the next century, consolidation of food processing occurred with the rise of large-scale, first-stage processors like Bunge and Swift and second-stage processors like Nestlé; with the rise of large retail store chains (like A&P and more recently Carrefour, Tesco, Walmart, and large-scale fast-food chains like McDonalds); and with the rise of large-scale wholesale and logistics companies (like Sysco) and large wholesale markets like Rungis in Paris.

More recently and more quickly than in Europe and the United States and quite unexpectedly, the food systems in developing countries in Latin America, Asia, Eastern Europe, and some of Africa underwent a revolution starting in the 1980s. In countries where traditional food systems had thoroughly dominated before the 1980s, as had been the case in Western Europe and the United States a century before, large-scale processors, retailers,

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and wholesalers quickly arose. We say “unexpectedly” because this food system transformation had often been predicted to be impossible. For example, a leading student of food retail, Ariel Goldman (1974), cogently and persuasively argued that supermarkets could never take off in developing countries, due to the economics of demand clashing with the characteristics of the modern sector’s supply of retail services. Goldman’s prediction was made just before the supermarket revolution took off in developing countries in the 1980s and 1990s (Reardon et al. 2003).

The relative suddenness and unexpectedness of the food system revolution in the past century in developed countries, and the added element of the greater speed of change in the past 30 years in developing countries, present us squarely with the questions, why did the food system revolution take place, and what were its impacts? In this article we address those questions with a review of economics research on these questions.

We focus on developing countries, but at most points make a brief comparison with the developed country experience, to show the origins of the structural change and the analytical insights from it. From the mid-1980s to now, there has been a renaissance of food system economics focused on rapid transformation in developing countries. Although similar to the US/Western European transformation of the food system in some ways, the transformation in developing countries is different in other ways: It is occurring faster and in a situation of an emerging middle class (as in developed countries) but in a context of many small-scale actors on the supply side and persistent strata of poverty among both consumers and suppliers. State intervention fed the transformations at first; then they were stimulated by privatization and liberalization of markets, leading to rapid foreign investment.

The system nature of the food system means it is conditioned by many factors and thus studied by many disciplines (anthropology, sociology, geography and so on). However, we confine ourselves to its economics.

But this system nature means that analysis requires a variety of economic models and approaches. The best approach draws on the frontier with respect to (a) industrial organization economics for analysis of structure and structural change in food systems, (b) new institutional economics for analysis of the institutional and organizational conduct of relations among actors within and between supply chain segments, and (c) microeconomics of threshold investments for analysis of adoption and diffusion (as well as nonadoption or disadoption) of new technologies and market channels (this analysis can include analysis of poverty traps and lumpy investment under uncertainty, such as in real-options analysis). Moreover, the system nature of the food system means that study of the system is necessarily an integrative enterprise through combinations of the above analytical approaches.

In summary, this literature for developing countries is in its infancy and is still mainly in a descriptive and discovery phase (as was the first strand of food system work in the 1950s and 1960s. . .). We argue, however, that it is moving rapidly into an analytical phase that has the potential to benefit from the best of economic modeling.

The article is laid out as follows. We first focus on the overall system and its analysis in a review of food system economics over the past 60 years, drawing mainly on US experience because of the methodological sophistication that has been used to understand it. We then focus on developing countries and explore the drivers of consolidation in the food industry (the downstream and midstream segments of the food system). Third, we examine the impacts of transformation of the food industry upstream on the farm segment [and on other suppliers, the small and micro enterprises (SMEs) in processing]. We conclude with an agenda for research, identifying gaps in the literature.



## ENTER THE ECONOMISTS: TWO STRANDS OF FOOD SYSTEM ECONOMICS OVER 60 YEARS

### The First Wave: Focus on Structure and Transactional Conduct

By the 1950s and 1960s, the United States and Western Europe were 80 years into the food industry revolution: Consolidation was becoming evident, and policy issues and concerns were arising as to whether and how this recently consolidated food economy would deliver food consistently and efficiently to cities. At that time, economists began to focus on this revolution as not just a farming transformation, a processing sector change, or a retail modernization but as a transformation of a whole system: the food system.<sup>1</sup>

The food system denotes the flow of inputs and food products over segments: farm input suppliers, farms, food industry firms (in two midstream segments, wholesale/logistics and processing, and one downstream segment, retail), and consumers. These segments are connected by linkages that are both product and service flows and institutional linkages (like contracts and standards as coordination arrangements).

The first wave of food system research relied on the methods of industrial organization economics, in particular the structure-conduct-performance triad of Cassels (1933). The food system's performance is key to the food security of consumers, to incomes of producers (in all segments of the system), and to the cost and quality of food in the overall food economy. Performance is in turn driven by the system's structure and conduct. Structure is measured by the degrees of consolidation, market power, and foreign capital content. The food system's conduct is composed of the following: technology, institutions (contracts, standards), and organization (what segments are included in the system and the clusters and agglomerations among actors per segment or over segments).

This first wave of integrative work on food systems was launched in the late 1950s. The themes of the work focused on the rapid structural transformation of the US (and Western European) food systems; changes included consolidation, agroindustrialization (including technical, institutional, and organizational change), commoditization of grains and meat, and geographic lengthening (long-distance chains). The policy focus was mainly on the system's efficiency and growth rather than on issues addressed later in the literature, such as equity or inclusion/participation of small-scale players, quality and safety, and environmental impacts of the system change.

The first wave applied industrial organization economics to agrifood systems. In turn, the approach was related to and rooted in the following: (a) the structure-conduct-performance (or SCM) model of Cassels (1933), further elaborated by Clodius & Mueller (1961); (b) interindustry linkage analysis, starting with the input-output analysis of Leontief (1936) and followed by the work by Rasmussen (1958) and Hirschman (1958); (c) work on agribusiness systems by Davis & Goldberg (1957) and Goldberg (1965); and (d) industrial organization analysis of market power and structure in agriculture (Hoffman 1940, Nicholls 1941, and Bressler 1964; for a review, see Sexton & Lavoie 2001). The SCM approach was a key influence on this first wave. The SCM approach emphasizes that the structure of an industry (the extent of buyer-seller concentration, product differentiation, and entry conditions) determines the conduct of firms (input, production, marketing,

<sup>1</sup> We select this term as the most general and neutral out of a variety of terms used for roughly the same idea: agribusiness system, commodity chain, subsectors, filières, supply chains, netchains, and so on (see, for example, Davis & Goldberg 1957, Goldberg 1965, Jaffee & Morton 1995, Loader 1997, Lazzarini et al. 2001, Haggblade 2007).

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pricing), which in turn determines (market) performance (margins of prices over costs, efficiency, and quality or type of products) (Sexton 2000).

The literature on the industrial organization of food systems continued to develop into the 1970s and beyond in what Sexton (2000) terms the “new industrial organization.” This added the perspective of dynamics (with early work on this by, for example, Rausser 1971), risk and uncertainty, and interfirm competition modeled as game theory.

### The Second Wave: Focus on Coordination Mechanisms and Distribution of Rents

Although the first wave emphasized the exchange and production and structural aspects of the food system, it did pay preliminary attention to the use of mechanisms for vertical and horizontal coordination. A deeper focus on coordination mechanisms developed into a second wave of food system work. Such work focused on institutional arrangements to govern or coordinate economic relations between segments and transacting parties, such as the use of quality and safety standards, contracts (such as contract farming), and other horizontal and vertical coordination arrangements such as cooperatives and networks to minimize transaction costs. This wave was rooted in Coase (1937) and was extended especially in the 1980s in the new institutional economics literature, such as Williamson (1981) and Hoff et al. (1993) (see Goodhue 2011 for discussion).

Several forces spurred this second wave of food system literature in the 1980s and 1990s. These forces include the following: (a) consolidation and rapid spread of the use of contracts and private standards in agribusiness in the United States and Western Europe (Caswell et al. 1998, Sexton 2000, Goodhue & Rausser 2003); (b) globalization and rapid growth in world food trade; (c) privatization of parastatals and liberalization of formerly controlled markets in developing countries (Swinnen & Maertens 2007); (d) foreign direct investment (FDI) in agrifood industries in developing countries; and finally (e) the takeoff of transformation of food supply systems in developing countries, as we discuss further below.

One strand of this second wave was inspired by the agribusiness management perspective, which sought strategies to achieve competitive advantage in cost, quality, or both in an environment of rapidly consolidating commodity sectors (driving heavy competition on costs) and rapidly differentiating product qualities over market segments. Porter (1985) argued that to drive down costs to compete in commodity markets, or to drive up quality to compete in differentiated product markets, firms need to employ value chain governance. Governance mechanisms include the setting, monitoring, and enforcement of vertical coordination mechanisms such as contracts and standards. This strand focuses on how managers use these mechanisms to minimize costs in the supply chain while using contracts and private standards to steer suppliers toward meeting the quality criteria demanded by the niche markets.

A second strand of this second wave was inspired by what Goodhue & Rausser (2003) term a marriage of two literatures: agribusiness and agricultural economics. This strand explored complementarities over technology and institutional choice on the one hand and marketing and management on the other hand. These complementarities are manifest in a set of activities that occur as a food system upgrades from a commodity system to a value- or quality-differentiated system: identification of consumer preferences, translation of those preferences to the implied specific and needed product attributes, production of those attributes with needed technologies, and coordination over activity stages (within firms) or over supply chain segments (and thus over firms). The literature emphasizes the



conscious management and coordination of the above set of activities to efficiently produce and then market the products with those targeted attributes (e.g., to create and market food safety attributes; see Hennessy et al. 2001). The literature treats this complementarity in three ways: (a) among firms; (b) between supply chain segments; (c) over activities, within a firm (e.g., Goodhue & Rausser 2003).

This literature employs supermodularity, a mathematical concept applied to the analysis of changes in manufacturing by Milgrom & Roberts (1990). Supermodularity “captures the idea that jointly undertaking certain activities will create benefits which could not be realized by undertaking each activity separately; i.e., there are benefits created by adopting the complementary activities as a group” (Goodhue & Rausser 2003, p. 382). Goodhue & Rausser (2003) cite as an example the case of changes in the broiler industry in the United States. In this example, firms first identified the attribute consumers wanted (chilled rather than frozen chicken meat). The industry then innovated with ice-bath transport of the meat, plus genetic improvement of chickens so that meat would be less porous to water penetration and would stay chilled without becoming waterlogged. These innovations allowed broiler meat to be shipped further and thus reach a larger market. Finally, firms coordinated with farmers via contracts specifying the use of that specific type of chicken. Goodhue & Rausser also cite a similar case with hogs. In both cases, the product systems transformed quickly in terms of technology change, the use of contracts, and market size.

A third strand of this second wave involves a mix of disciplines (in particular economics, sociology, and geography) and focuses on how globalizing value chains affect the distribution of income along the chain in developing countries—and whether small-scale actors and the poor are included in these chains. This recent literature echoes a similar debate in the United States in the 1950s and 1960s, when distributional and market power issues emerged as the extent of food system consolidation became evident. Examples in developing countries include work by Gereffi (1999), Kaplinsky & Morris (2000), and Swinnen & Vandeplass (2010). The analytical approach particular to this strand is the study of the links among the generation and distribution over value chain segments of rents (extranormal earnings based on some competitive advantage and thus presenting barriers to entry); market power of the segments; and the ways that investment requirements and governance mechanisms condition that distribution, such as how standards limit the participation of the asset-poor or how resource provision contracts relieve asset constraints and idiosyncratic market failures limiting the participation of the poor in modern supply chains.

### Assessment and Critique of Food System Literature: Strong on Researching Distribution Along the Chain But Weak on Micro Behavioral Foundations

Most of the food system literature has been primarily descriptive, focusing on the structure, conduct, and performance of food supply chains. This included research questions focusing on measures of concentration over and within the segments; the distribution of costs and rents over the segments; some measurement of how cost shocks in particular segments play out in impacts on prices at the end of the chain; and what linkage arrangements are used over different kinds of value chains, such as domestic versus global value chains.

These waves of detailed descriptive work using the food system perspective to study rapidly modernizing domestic food value chains (in the mid-1950s through the mid-1970s in the United States and starting in the mid-1990s in developing countries) have been a crucial development in the field of agricultural economics. Very little analysis or few hard

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data were available about these systems before these literatures. Few government data in developed countries, and far fewer in developing countries, were or are available on these supply chains. Thus, the analyses required, especially in developing countries, building the entire information base from scratch with micro surveys and case studies. Even available national household surveys like the living standards measurement study surveys from the World Bank are of only partial use because they usually do not have the necessary details such as into what specific market channels farmers sell, and they do not have modules for samples of traders, processors, and retailers. In an article in *Science*, Gómez et al. (2011) assess the state of simply descriptive knowledge of food value chains in developing countries and conclude that the descriptive phase itself is far from over and is still needed and that both economic modeling and policy prescription require this descriptive base. They note, “. . . we need to be humble about how little we know about complex FVCs [food value chains] and their effects on poverty and the environment and cautious in our policy prescriptions on FVCs” (p. 1,155).

However, although this integrative approach addressed descriptive patterns that were important for policy needs and that had specific research questions, it tended not to be linked to basic economic theories of behavior of decision makers in the supply chain. Accordingly, research questions related to the determinants of the structure and conduct of the food system segments, to the distribution of behavior and outcomes over different scales and types of actors per segment, and to the dynamics of the systems lacked a cogent analytical framework for the system studies.

The economics of food systems needs to be deepened and extended in two ways. First, although the initial descriptive base of the research is important, food system or value chain economics in developing countries has been mainly descriptive, has been relatively recent (its founders are all still practicing economists), and has so far lacked an overarching economic theoretical framework or integrative view. Interestingly, Bressler (1965) made the same critique after a decade or two of intense description by agricultural economists of concentration in the segments of the American food system.

It is thus important that there be major work on development of theoretical frameworks to underpin, explain, and complement the empirical work. Along that line, Gómez et al. (2011, p. 1,155) call for a broadening of the food system analysis to develop a

transdisciplinary, multidimensional conceptual framework to study developing country food value chains. . . to explicitly link among the multiple dimensions of food value chain performance—such as economic costs, distributional equity, environmental impacts, energy use, and consumer and farmworker health and safety. Within such a conceptual framework, scientists can construct rigorous models and conduct empirical research to test their validity.

Second, as most of the food system work is descriptive, emphasizes the meso level of the system, and often uses small samples per segment, it is important to delve into the micro behavioral foundations of the segments to undertake empirical analysis that uses cross-section and panel data sets capable of testing causal hypotheses about the distributional and intertemporal attributes of the food systems and eventually to theoretical frameworks that treat the behavior of the system as a whole. The discipline has come to a similar point today as in the mid-1960s (as Bressler 1965 noted), when food supply chain research had become accomplished in empirical depth but lacked theoretical foundations that would allow that research to be of interest for and to contribute to economics more broadly.



This research had also strayed into research “in silos” but was challenged at that time by Bressler to build toward an integrative vision.

A new wave of efforts to this end is occurring empirically through the innovation of comparative stacked-survey analysis of food systems, with full sample surveys at every segment of the value chain and similar sets of surveys across countries for the same value chain to compare the patterns in and evolution of structures, conduct, and performance of the food system. An example is the unique set of surveys in Reardon et al. (2012b) of rice and potato value chains in China, India, and Bangladesh. These researchers find the coexistence of traditional, intermediate-transitional, and modern value chains.

In summary, the food system literature is broad and integrative, focusing on patterns in and evolution of the systems. It provides the broad context in which to place specific analysis of particular segments and their relations with other segments. For the rest of the article, we focus on the second gap in food system work by delving into behavioral and structural evidence within and across the segments of food systems in developing countries. We focus on the shock to the food system by the rapid transformation in the food industry (the downstream and midstream segments), in terms of the patterns, determinants, and impacts of those segments, as the driving force of the food system revolution in developing countries.

## CONSOLIDATION IN THE FOOD SYSTEM AND WHAT DRIVES IT

In this section we focus on consolidation of the food industry. The food industry is composed of the retail, processing, and wholesale segments, or the downstream and midstream segments of the food system. The food industry is important to both consumers and farmers and is an important and increasingly large part of the food system. In the United States, Sexton (2000) notes that from 1960 to 1980, the share of the food industry in the food economy (the total market basket bought by the consumer) was stable at 60% (and the farm share was stable at 40%). By 1990 the food industry share was 70%, and by 1998, the share was 78%. For better or worse, the industrialization of the US food system is proceeding rapidly. It is beyond the scope of this review to discuss the burgeoning literature that rejects this trend (see, e.g., Pollan 2006, Nestle 2007), but virtually none of it is produced by economists.

Moreover, in the United States (and Western Europe), the segments of the food industry have been rapidly consolidating. We cite from Sexton (2000), but these processes continued throughout the 2000s. He notes that the C20 (the share of the top 20 firms) doubled from approximately 25% in 1954 to more than 50% in 1995. Furthermore, the C4 in the beef sector went from 30% in 1978 to 86% in 1994, with a similar rapid concentration in other food processing. Finally, the C6 in the supermarket sector (which had taken over from the traditional retail industry, the first wave of concentration in retail, from 1930s to the 1980s) increased from 32% in 1992 to 50% in 2000, and it is even higher today in Western Europe and in particular US regional markets (Sexton 2000).

In this section, we focus on a similar consolidation in the food industry in developing countries. This consolidation started later but is occurring even faster than in developed countries. We begin with a review of efforts in the economics and marketing, management, and retail literature to conceptualize the determinants of this consolidation. We then present evidence concerning those trends and finally assess gaps in the literature on this theme.

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## Conceptualizing the Determinants of Consolidation in the Food Industry and Change in Food Industry Procurement Systems

The consolidation of the food industry in developing countries can be thought of as a recursive process. The first step is the increase in the share of modern food industry firms (MFIF) at the expense of the market share of the traditional firms, such as modern retail taking over the retail segment. We use the term large scale as synonymous with modern (discussed further below). The second step is consolidation within the food industry segments. We illustrate these two steps above in the case of the United States: First, the supermarkets displaced traditional retail (which, before the 1930s, had been not only dominant but the only retail) from roughly the 1930s through the 1970s and 1980s. Then, from the 1970s through the 2000s, the retail sector was in a crescendo of consolidation.

To make the conceptualization of the determinants of these processes manageable here, we make two simplifying assumptions. First, the determinants of the two steps above are roughly the same, and we can discuss just one set of determinants. Second, a generally similar set of determinants drives the rise of the share of large-scale firms in each segment of the food industry, and thus we focus on one segment for simplicity. We focus on retail but emphasize the similarities for the other segments.

Reardon et al. (2003) conceptualize the determinants of the diffusion of supermarkets (a term emblematic of all formats of modern retail) in developing regions as a demand-and-supply system: (a) demand by consumers for supermarket goods (such as processed foods and fresh produce) and for services [such as assembly under one roof (a one-stop shop); delivery; credit; and provision of contexts such as parking, air conditioning, informing and advertising, and receipts] and (b) supply by firms of these goods and services, which in turn implies investments by firms in plants (stores and distribution/warehouse facilities), equipment (such as cold shelves), real estate, vehicle fleets, and so on. In turn, both sets of actors' behaviors are a function of incentive and capacity variables.

**Conceptualizing the modern food industry firms: demand-side determinants.** The great majority of the modern retail diffusion literature before the 2000s was focused on the demand side. As noted by Goldman et al. (2002), the early literature was rooted in Becker's (1965) model of utility maximization by households. That is, demand for goods and for services (such as the offering of many different goods under one roof) was linked to the household's objective of meeting its material needs while minimizing transaction costs of time in the household production function; the household seeks convenience in proportion to its opportunity costs of time. Bucklin (1966) formally linked this view to the demand for modern retail.

To this base the US literature added consideration of other incentive variables (e.g., demographic variables reflecting time demands at home, income reflecting the opportunity cost of time, and demand for diversity of goods) and capacity variables (e.g., means of transport and food storage, such as refrigerators) (see Betancourt & Gautschi 1986). The socioeconomic, demand-side variables were included in early discussions of the nascent demand for supermarket services in developing countries (see Goldman 1974, 1982; Samiee 1993; Goldman et al. 2002).

If the above demand-side determinants are controlled for, two other variables (and meta processes that form them) affect food shopping preferences, in particular the demand for use of supermarkets: (a) the opportunity cost of time and (b) transport. Urbanization tends



to increase the demand for supermarket services. Urban areas have increased women's employment outside the home (and thus their increased opportunity cost of time for shopping) and have usually increased income. Urbanization in developing countries has been occurring faster than it did historically in the United States. Henderson (2002) notes several points about urbanization in developing countries. (a) Urbanization is highly (70% in his cross-country regression) correlated with per capita income; one thus expects and finds the highest urbanization growth rates in the countries with the fastest-growing incomes. Below we note that the sequence (over countries) of adoption of supermarket takeoff was correlated with the timing of income growth and urbanization surges from the 1980s to the 2000s. (b) Compared with the urbanization experience of the United States and Western Europe over the twentieth century, urbanization in developing countries since the early 1960s and 1970s has featured a far higher concentration of the urban population in large cities and megacities. (c) Again compared with the United States and Western Europe, urbanization in developing countries has occurred far faster. For example, 40% of the US population was in cities in 1900, 70% in 1960, and 75% in 1990; thus, the proportion of urbanization increased from 40% to 75% in nine decades. By contrast, Brazil and South Korea made this same urbanization leap in three and two decades, respectively.

Moreover, usually tightly correlated with urbanization is an increase (relative to rural life) in the collective and individual assets that facilitate (a) getting to supermarkets (via vehicles or public transportation), (b) storing food in the home (via refrigerators) after shopping at supermarkets so that daily shopping is not necessary, and (c) receiving advertising (via radios and televisions) that communicates brands and product diversification and sales by supermarkets.

Moreover, Bennett's law (Bennett 1954, Senauer et al. 1986) observes that as per capita income rises, the share of food expenditures on basic staples declines, and the calorie price rises, along with the share of processed food. The demand for greater diversity of diet, combined with a desire to reduce time shopping, would well position supermarkets as so-called one-stop shops. Moreover, as in the United States and now in developing countries, supermarkets tend to do best first in the penetration of processed food markets—partly because of economies of scale in production (in the case of processors) and in marketing and procurement (in the case of processors and retailers) (discussed more below). Even early studies of supermarkets in developing countries (such as Goldman 1982) found partial adoption of supermarket shopping by consumers; they shopped for processed foods at supermarkets and for fresh produce at wetmarkets. (That was also the pattern in the United States for the first three to four decades of modern retail.) In any case, supermarkets rode on the shoulders of the rise of demand for processed foods.

Conceptual models of and empirical work on modern retail in developing countries before the 2000s focused on the above demand-side variables (most of which, as determinants, were common to choice of shopping at supermarkets in both developed and developing countries). The demand side seemed mainly to explain well the gradual increase in the share of supermarkets in retail in the United States and Western Europe over six decades. But the main theme of the early studies on developing countries was to emphasize that supermarkets would not take off in developing countries. Such studies contrasted a supply-side image of supermarket retail services as (a) scarce and thus far from homes of consumers mainly because they were “big boxes” that could not penetrate dense urban neighborhoods or small towns, (b) expensive, (c) not consonant with local cultures that



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have a tradition of wetmarkets and small shops (the authors of such studies perhaps forgot that wetmarkets and small shops were also the mainstay of the food culture in the United States and Western Europe before supermarkets), and (d) not offering credit and home delivery like traditional shops did.

But a fundamental fact flew in the face of the predictions of the early work: A supermarket revolution took off in developing countries and spread very quickly (in many cases much faster than it had in the United States and Western Europe) starting roughly in the early 1990s (Reardon et al. 2003, 2010). These trends are discussed in the following section; here we focus on the conceptualization that the work in the 2000s brought to the debate. The new work affirmed the earlier demand-side perspectives, noting that in the 1990s to 2000s, the overall transformation of developing economies (linked with liberalization) led to rapid urbanization and income increases and to the fast spread of refrigerators, motorcycles, cars, and buses. Such changes made for fertile ground for supermarkets. These conditions had existed in subsets of regions (such as in parts of South America) in the 1970s and 1980s, but one had not seen anything like a supermarket revolution there.

**Conceptualizing the modern food industry firms: supply-side determinants.** Above we show that consideration of the retail demand-side determinants was necessary but not sufficient to explain the takeoff of modern retail (and other food industry segments, modern processing, and wholesale) in developing countries in the 1980s and 1990s, and new work (such as Reardon et al. 2003, 2009; Dries et al. 2004; Traill 2006; Coe & Wrigley 2009) added to the conceptualization of the determinants of the spread of modern retail to those of the supply side of supermarket services (and procurement systems). The key points are as follows.

First, there was massive FDI into developing regions into the food processing and retail sectors and eventually into food logistics, from the late 1980s to now. Much of the retail capital was from Western Europe, the United States, and Japan initially and then later from early adopters of supermarkets in developing countries such as Chile, Thailand, South Africa, South Korea, Hong Kong, and Taiwan, moving from near-saturated markets to markets with higher initial profit rates. For example, multinational retailers in Latin America could earn three times the profit rate achievable in the Western European and US markets; see Shwedel (2003). The timing was determined by structural adjustment programs; bilateral and multilateral trade agreements; and liberalization of trade and domestic economies, which was often coupled with a liberalization of FDI regulations. FDI often induced competitive domestic investments (whether public or private). Also, the liberalization of FDI harnessed capital for the privatization of public-sector processing facilities and retail chains such as those in the transition countries. (See Dries et al. 2004 for Central and Eastern European illustrations.) The FDI factor had not been present in the earlier slow takeoff of supermarkets in the United States and Western Europe. Besides injecting large investments, FDI represented a technology transfer in the broad sense of technology (e.g., technologies of the organization, management, and institutions of retailing and the physical technologies of marketing and procurement).

Traill (2006) regressed the penetration of modern retail on a set of demand-side factors plus openness to retail FDI in 84 countries and found that the strongest explanatory variables were GDP/capita and openness to retail FDI. This is not a hard-and-fast rule, however; Reardon & Minten (2011) show that since 2006, India demonstrated a takeoff of supermarkets, despite continued FDI restrictions, but in the presence of large domestic



conglomerates that have invested in retail. These domestic Indian food retailers are fully aware of external retail technologies.

Second, retail format diversification was identified as a key retail supply-side factor. Moving from slow, minor, incremental spread of supermarkets to the rise of large chains meant that store density and thus transaction costs for consumers could be reduced. Format diversification aided the rise of density and reduction of transaction costs with a proliferation of formats, starting with supermarkets, then convenience stores and hypermarkets, and later formats in between supermarkets and convenience stores such as neighborhood market format stores and hard-discount stores (Coca-Cola Retailing Research Council Asia 2007, Reardon & Minten 2011). Some formats even featured unique hybrids and amalgams, such as in Hong Kong, where hypermarket companies built wetmarkets inside their vast stores to give the consumer the experience of the traditional market (and thus help the company to compete with wetmarkets) and the convenience of the one-stop shop of the hypermarket (Ho 2005). Chains of convenience or neighborhood stores combined economies of scale in procurement (because they are in a chain with a common procurement system) with small footprints that allow the small stores to penetrate dense urban neighborhoods and to diffuse over small towns. The diversification of formats and the penetration of the retail market by a combination of large stores outside city centers and chains of small stores inside city centers and in smaller cities and towns challenged the fundamental image of the “big box” of the earlier analysts.

Third, the new literature on retail in developing countries identified retail (and processing) procurement system modernization as a key retail supply-side factor. Earlier analysts had observed and predicted that supermarket chains could never gain a price advantage over traditional retailers because, like traditional stores, supermarkets had to source from long and inefficient supply chains, with little room for quality improvement over the traditional offer (because of the supposed impossibility of imposing standards) or for cutting costs to win lower-middle-class and working-poor consumers. However, there has been a revolution in the past 15 years among supermarket chains in developing countries (with a bit of a lag in developed countries on retailers that have been pursuing this for the past three decades) in retail procurement logistics technology, in the organization of procurement, and in vertical coordination institutions in the supply chains to modern retail. A good part of this result seems to have been due to procurement system technology spillovers from FDI. Such changes allowed cost reductions, which in turn made supermarkets more competitive with traditional retail, earlier than had been supposed possible.

Here we briefly conceptualize the modernization of MFIF procurement systems as a key retail supply-side change. Then, in the next section we provide empirical evidence.

Procurement system modernization includes four sets of elements (Reardon & Berdegué 2002, Berdegué et al. 2005): (a) the use of distribution centers and warehouse networks to achieve economies of coordination and scale; (b) supply chain coordination via explicit and implicit contracts (Key & Runsten 1999, Dries et al. 2009); (c) private standards of quality and safety (Reardon et al. 1999, Farina et al. 2005, Swinnen 2007); and (d) the use of modern firms to coordinate intermediation, such as dedicated/specialized wholesalers (who contract with retail chains downstream and with farmers or traders upstream) (Farina & Machado 1999, Reardon & Berdegué 2002) and modern logistics firms, which were elements of a transformed wholesale and logistics sector.

The economics of these procurement system investments and practice changes in developing countries, in both the retail and processing segments, are heuristically conceptualized



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in Reardon et al. (2003), Stringer et al. (2009), and Barrett et al. (2012) for contract mechanism choices of MFIF. But study of the determinants of procurement system changes is still mainly descriptive. An example is the study in Central America by Berdegué et al. (2005), which classifies retail chains' procurement systems as ranging from the most traditional form (purchase from producers via traditional spot market and traditional wholesalers and brokers) to an intermediate form (purchase from farmers via specialized/dedicated wholesalers) to the most modern and "disintermediated" form (direct purchase from producers). Berdegué et al. note that the choice by the retail chain of the procurement method is conditioned by the characteristics of the product and its suppliers (whether it is highly perishable, a bulk commodity or a niche product, available all year or in one season, concentrated geographically or broadly distributed, or produced by several large producers or many small suppliers). In general, the more perishable and the more niche-like the product is and the more concentrated its suppliers are, the greater the likelihood is that the product is procured directly. In contrast, the more bulk commodity and the more produced by many small producers the product is, the more likely it is to be procured via the traditional wholesale market. The intermediate method, procurement via a specialized/dedicated wholesaler, is for the range of product and supplier characteristics in between these two poles.

The diffusion of a system of modern procurement, similar for modern processors and retailers, is a function of several elements (Reardon et al. 2003): (a) the ability of the traditional wholesale system to meet procurement officer objectives without the chain having to resort to costly investments in an alternative system [this varies considerably over countries; for example, this ability is strong in China (Wang et al. 2009) and weak in Indonesia (Natawidjaja et al. 2007) and in India (Fafchamps et al. 2008, Minten et al. 2010)]; (b) the need to reduce costs of procurement by saving on inputs, in this case purchased product costs and transaction costs with suppliers (with this need driven by competition on costs and by the price sensitivity of target consumers); (c) the need for consistent quality of intermediate inputs [to produce quality outputs or to produce commodity outputs at lower cost by having consistent quality inputs to reduce processing costs, as in dairy in Brazil and Argentina (Farina 2002, Farina et al. 2005)]; and (d) the financial and managerial capacity of the company to make these investments, favoring larger companies.

Fourth, a further retail supply-side determinant of MFIF diffusion is what appear to be economies of agglomeration and symbioses among the firms in the different segments of the food industry. (This important new finding from the descriptive work is included here as part of our heuristic conceptualization but should be included more formally in future empirical work and modeling.) In one example, Farina et al. (2005) show how large milk processors and supermarkets in Brazil co-transform, adjusting their supply chains and procurement to work directly with each other; each needs the other (for economies of scope and scale in both directions). In another example, processors and wholesale and logistics companies follow source, that is, migrate/multinationalize with the downstream client and invest in upgrading supply chains in the recipient market. This phenomenon is illustrated with the case of fresh-cuts giant Baakavor moving with Tesco from the UK market to the China market (see Reardon et al. 2007b).

Fifth, a final factor driving MFIF diffusion is highlighted in new work in the 2000s that brings in the role of public economics and specifically the parts played by domestic regulations and investments (direct or complementary) in speeding or slowing transformation of the food industry in developing countries. On the one hand, public investments in processing, wholesale, and retail parastatals before the 1990s kick started the transformation of



the food system from a solely traditional one. In many cases, the privatized versions of the parastatals were the initial base for the new large-scale firms in the next round. In some cases (such as India and China), the state-owned firms continue to be major players.

On the other hand, domestic regulations that are positive for supermarkets (such as zoning laws limiting wetmarket location and even direct subsidies to supermarket chains) appear to have played a part in helping supermarket diffusion. But there are also regulations, such as those in Thailand, that limit the location of hypermarkets that can compete with small domestic retailers. Yet there is reason to believe that domestic regulation in developing countries now tilts somewhat more in favor of modern retail than was the case historically in the United States when supermarket chains were struggling to spread from the 1930s to 1950s (see Reardon & Hopkins 2006).

### Empirical Findings Concerning Consolidation and Procurement System Change in the Developing Countries' Food Industry

**The food industry transformation's waves over countries and regions.** Here we briefly review the key phases and waves of food industry transformation as revealed especially in descriptive studies over the past two decades.

Reardon & Timmer (2007) emphasize that there have been two broad phases of agrifood industry transformation over the past 50 years: (a) preliberalization and preglobalization (mainly the 1960s to mid-1980s) and (b) liberalization and globalization (mainly the mid-1980s to now). Contained within those two stages are the successive transformations of the three segments of the agrifood industry. The timing of the transformation of each segment is approximate, as the timing differs by region and country: (a) the transformation of wholesaling, in two waves, with a public-sector-driven stage mainly in the 1960s to 1990s and a private-sector-driven stage mainly in the 2000s; (b) the transformation of processing, with a colonial (in some countries) and public-sector phase mainly up through the 1970s and then a private-sector stage mainly in the 1980s to now; and (c) the transformation of retailing, with a small public-sector stage in the 1960s to 1980s and then a private-sector stage mainly in the 1990s to 2000s.

Given the heterogeneity of distribution of these conditioners of transformation—over products, over firms, over countries, over regions, over time—one expects some unevenness in the diffusion of transformation. Still, there is a surprising regularity and timing of waves of diffusion, which occurred geographically (over countries and within countries, over income classes, and over products) for all three agrifood industry segments.

The first wave tended to involve the countries that were earlier in starting their post-World War II growth spurt, in urbanizing, and in industrializing—in particular, the larger South American countries, East Asia outside China, South Africa, and northern Central Europe. The start of processing transformation occurred with FDI liberalization and the start of privatization in the mid-1980s to early 1990s, and retail transformation took off in the early 1990s.

The second wave tended to involve the countries that had their growth and urbanization spurts later and/or had strong internal pressure to limit FDI; these limits were often more for retail FDI than for processing FDI. Hence in Mexico, Central America, Southeast Asia, and southern Central Europe, processing transformation took off in the 1980s, but retail transformation did not start until the mid- to late 1990s.

The third wave tended to involve countries that had their growth and urbanization spurts mainly in the 1990s and 2000s and/or had lagged liberalization into the 1990s.

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This was the case of Russia, China, India, and Vietnam, among others. The processing transformation then occurred somewhat before the retail transformation, with the latter mainly in the late 1990s and into the 2000s. As we show below, the retail revolution took off in earnest only in the mid-2000s in India and Vietnam and then grew rapidly. In India, although FDI liberalization in retail has not yet occurred, the sales of modern retail's leading food-selling chains leapt from 200 million USD in 2001 to 5 billion USD in 2010, with a 49% annual sales growth for modern food retail (Reardon & Minten 2011). Such growth was driven mainly by domestic conglomerates, themselves creatures of the economic boom. This pattern also appeared in Russia and South Korea. There was also, as a late part of the third wave, a relatively weak emergence of processing and retail transformation in a few countries in eastern and southern Africa.

However, there were some striking anomalies in the waves, in particular in the third wave. For example, India had as early a public-sector transformation of the three segments as any first-wave country, and this public-sector apparatus not only remains intact but has enlarged. In contrast, transition countries like China, Russia, and Vietnam moved to privatize state processing, wholesale, and retailing in the 1990s and 2000s.

Finally, diffusion of the transformation (in all three segments) tended to occur earlier in more urban areas and later in more rural areas. Moreover, such diffusion occurred earliest and fastest in processed products, followed by that of semiprocessed products and finally by that of fresh products.

Below we lay out key findings for each of the three segments. We briefly discuss the public-sector-driven phase, as that is better known in the literature, and focus on the more recent private-sector developments.

**Transformation of the wholesale and logistics segment.** There are several key findings in empirical studies concerning the two-stage transformation of the wholesale and logistics segment. We discuss each in turn below.

First, there has been a trend of rapid growth, then transformation, and then in some cases decline of the public wholesale market sector. State wholesale markets were substantial investments by cities or provinces and were put in place in waves mainly from the 1960s on, starting with main cities, then secondary cities, and so on. A typical pattern was a hub-and-spokes model, with a set of primary wholesale markets in big cities and then feeder or secondary wholesale markets in smaller cities and rural areas, such as those in Brazil, China, Indonesia, Mexico, and India. The growth of public markets was spectacular. For example, China's wholesale market volume increased 11,000% from 1990 to 2000 (Ahmadi-Esfahani & Locke 1998, Huang et al. 2007), and India's regulated wholesale markets went from 450 in 1948 to 5,500 in 2008. A similar rapid growth occurred in the first- and second-wave countries in the 1960s and 1970s.

The massive investments in public wholesale markets partially transformed this segment—substantially defragmenting and integrating markets—by providing economies of agglomeration and channeling wholesale from field brokers into a network of covered markets with in situ wholesalers and thus also altering wholesale's technology and organization. Imposing regulations changed the institutions of the wholesale segment, at least for the portion that passed via the regulated markets.

In some countries, domestic regulations have held back the transformation of the wholesale market sector. For example, in parts of India (Minten et al. 2010) and in Turkey



(Bignebat et al. 2009), there has been a limitation (through licensing) of the number of wholesalers in markets.

But there is emerging evidence that the public-sector wholesale market segment, after establishment and proliferation, is undergoing (a) consolidation, as in Mexico (Echánove & Reardon 2006), South Africa (Louw et al. 2008), and Peru (Escobal & Agreda 1997), and (b) privatization and deregulation, as in Brazil (Farina & Machado 1999), South Africa (Louw et al. 2008), and China.

The latter liberalization, combined with improvements in rural infrastructure, opened the door to progressive disintermediation in food systems in two ways. On the one hand, MFIF are increasingly getting around wholesalers and buying directly from farmers, such as contract farming by processors and collection centers by supermarkets. Various researchers (e.g., Farina & Machado 1999 in Brazil, Echánove & Reardon 2006 in Mexico, and Louw et al. 2008 in South Africa) show that disintermediation combined with the decline of traditional clients have led to a decline in volumes of wholesale markets. For example, wholesale markets declined in volume by 11% from 1995 to 1999 in São Paulo and by 30% over the first half of the 2000s in Mexico City.

On the other hand, wholesale market traders are increasingly getting around traditional village traders, who used to be the main market interface with farmers, and are buying directly from farmers. This has led to a substantial decline in the role of village traders in systems as diverse as rice and potatoes in Bangladesh, China, and India (Reardon et al. 2012b) and tomatoes in China (Huang et al. 2007) and Indonesia (Natawidjaja et al. 2007).

This organizational change in the market appears to have increased competition among traders and options for farmers in the market and to have contributed to what recent surveys have shown as a sharp decline in tied output-credit market arrangements (whereby a trader advances cash to a farmer and then expects that farmer to deliver his crop to the trader at harvest). Other factors, such as rural nonfarm employment and other sources of credit, improved roads, and the diffusion of cell phones, also appear to have contributed to the reduction of the tied-credit arrangements that were once dominant and ubiquitous (such as in India; see Lele 1971).

In a second finding regarding the transformation of the wholesale segment, the counterpart of disintermediation has been the rise in the 1990s and 2000s of various off-market (i.e., outside the wholesale market) actors specializing in meeting the sourcing requirements of modern processors and supermarkets. The first of the modern actors are the specialized/dedicated wholesalers (such as Hortifruti in Central America, Bimandiri in Indonesia, and Pedraza in Mexico). These wholesalers are dedicated to either one company or a segment [such as modern retail, processing, HORECA (hotels, restaurants, catering), or exports], tend to be specialized in a category, and handle the procurement relation with suppliers. They may have a contract for this intermediation with the MFIF and a contract (written or unwritten) with the suppliers or their local agents such as a village head. These wholesalers add value (relative to the simple spot market of the traditional wholesale segment) by managing the relation, collecting, sorting, grading, packing or processing, and delivering.

The second of these modern actors are modern logistics companies. They commonly undertake a variety of logistics tasks: wholesaling (intermediation), warehouse management, integration of information and communication technology systems into distribution systems of companies, cold-chain development, and packaging. Such companies may also forward integrate into retail management of specific divisions [such as Radhakrishna

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Foodland in India becoming an external “channel captain” managing fresh produce for Indian supermarket chains (Reardon and Minten 2011)].

FDI has been an important driver of the rise of these firms. FDI inflow was spurred with the liberalization of FDI in distribution (logistics and wholesale) as part of general liberalization in the 1990s and 2000s. In China, this liberalization occurred in the mid-1990s through the 2000s, and in India it occurred in the mid-2000s. In both cases the liberalization of FDI to the wholesale sector was followed by a rush of foreign companies investing. For example, Snowman, a Japanese company in India, has become in a few years one of the leading logistics companies in South Asia. Some (such as Penske and TNT) followed global retailers and processors in their spread into developing countries (Reardon et al. 2007b) as another example of follow sourcing.

For MFIF, follow sourcing reduces the time it takes for local logistics capacity to build and adapt to the company’s needs and quickly puts in place the needed global state-of-the-art techniques. These give the MFIF an advantage over traditional firms that rely on traditional wholesale and transport. In some cases, a large retailer seeks a multinational logistics company that can integrate its operations over a whole region, such as Central Europe (see Dries et al. 2004), and that can also set up an export platform from the host country back to the home region, such as Western Europe.

A third element of the modernizing wholesale sector is the cash-and-carry chain. These wholesale chains are in direct competition with the traditional wholesalers and stockist networks, supplying traditional retail and traditional HORECA. Global chains operating in this segment include Metro, Walmart (Sam’s Club), Makro, and others. But domestic modern retail chains also tend to open (or start as) cash-and-carries, as they operate in markets still dominated by small shops. The cash-and-carries use bulk buying and supply chain efficiencies to lower costs and then add services like bundling, delivery, and retail consulting to compete with traditional wholesalers.

**Transformation of the food processing segment.** There are several key findings in the recent empirical literature on the two-stage transformation of agrifood processing. First, a substantial and rising share of food in developing countries undergoes some processing. The share of packaged food (a subset of all processed food) in food expenditures is roughly 7% in low-income countries, 30% in lower-middle-income countries, and 45% in upper-middle-income countries. Total packaged food sales are growing at only 2–3% annually in developed countries versus 13%, 28%, and 7% in low-income, lower-middle-income, and upper-middle-income developing countries, respectively, with the growth rate of packaged food sales much faster than GDP growth rates (Gehlhar & Regmi 2005, Wilkinson & Rocha 2009).

The international data presented above on packaged food may understate the full extent of food that has undergone some processing, of which packaged food is a subset. For example, Morisset & Kumar (2012) show for Indian urban areas that only 16.8% of food undergoes no processing (like fresh whole fruit); that share is 15.3% in rural areas. In India that means that approximately 85% of all food undergoes some processing: Grain is milled and then made into bread or polished rice; milk is churned, fermented, and made into cheese; and so on. Of course, a high share of processed foods can be classed as first processing with low value added (also up to 5% as the share of value added); in India 35% of urban food and 44% of rural food fall in this category. First-processing high value added (from 5–15% value added) is some 38% of urban processed food and 35% of rural



processed food, respectively. Second-processing food reaches only 10% and 6% of processed food in urban areas and rural areas, respectively.

Second, the processed food<sup>2</sup> sector has grown quickly in the past several decades. This growth is mainly in the first-stage high-value-added and the second-stage processed food subsectors. This pattern has occurred in the context of a westernization of diets, with shifts to rice and wheat (Senauer et al. 1986) and to processed meats and dairy (Pingali 2006). These trends are driven by increases in income; by urbanization; by increased participation in labor markets outside the home by women who thus want to save time cooking; by improvements in packaging and processing technologies; and by diversification of the variety of processed foods, abetted by modern retail (Gehlhar & Regmi 2005).

The composition of the food processing sector also changes with income. The share of grains in processed food sector value added is approximately 20% in lower-income countries and drops to 15% in upper-middle-income countries and lower-middle-income countries. The share of dairy climbs from 7% to 10–13% over the three sets of countries. Processed meats, fish, fruits, vegetables, fats, and baked goods/noodles compose the rest of the processed food sector value added (Wilkinson & Rocha 2009).

Third, the great majority of processed food output and growth has occurred domestically in developing countries (as is the case globally). Although processed food trade grew quickly up to the mid-1990s, it has slowed since. At present only 10% of global processed food output is traded across national borders (Gehlhar & Regmi 2005). In general, little of the food produced or consumed is imported or exported: Approximately 3% of produce, approximately 4% of meat, and approximately 10% of grain output or consumption of developing countries are exported or imported (Reardon & Timmer 2007).

Fourth, the public-sector role in food processing has always been limited (more so than is suggested by the large role it had in public policy debates). Although the parastatal grain processing sector has been important in urban food security debates for decades, the government's direct role in inducing the food processing transformation has been limited in most countries, even in its heyday in the 1960s and 1970s. It was confined mainly to grain sold to urban markets. In that period, the urban population share and the marketed share of grain were lower than they are today. The local small-scale (and thus not parastatal) share of grain processing was higher. And the parallel market (not via parastatals) was often larger than the government channels. There was then rapid privatization of grain parastatals in most countries in the late 1980s or 1990s. Only a few countries' governments had substantial food processing operations into the 2000s. For example, in Asia, only India maintains a substantial presence via its grain parastatal, and parastatal buys 20% of India's grain output (and 40% of the market, which is even higher than in the 1970s). The numbers are far lower in other Asian countries (Rashid et al. 2007) and far lower yet in other regions of the world.

Fifth, since the late 1980s (a bit earlier than the supermarket revolution in most cases), there has been rapid growth in the private-sector food processing sector in developing countries. This growth has been accompanied by rapid consolidation; multinationalization; and technological, institutional, and organizational change.

In many countries, with structural adjustment in the 1980s and 1990s, state grain mills and slaughterhouses were privatized or eliminated, and import licenses were disbanded.

<sup>2</sup>Processed foods are from cereals and pulses, tubers, fish, meat, dairy and eggs, edible oils, and condiments. These are either minimally (semi)processed or fully processed. They are sold both packaged (bagged, boxed, wrapped, bottled) and nonpackaged (like loose flour).



The private sector has made significant investment in processing. Privatization led to not only domestic private-sector bids but, due to widespread liberalization of processing FDI, an avalanche of FDI, as well as domestic private and domestic state investments in large-scale plants. The FDI came first mainly from Western Europe and the United States [with global firms, like Nestlé, Kraft, and Danone, that sought less saturated markets with higher profit rates (Gehlhar & Regmi 2005)]; then from Japan; and eventually from regional multinationals such as Mexico's Bimbo into Central America, Thailand's CP into China and other Southeast Asian countries (last year CP created the largest shrimp processing firm in the world in Indonesia), the Philippines' San Miguel into Vietnam, and Del Monte Asia into the Philippines.

This led to two competing lines of consequences for the structure of the processing segment. On the one hand, and apparently as a first stage, there was a proliferation of SME grain mills and dairy, meat, fish, and produce processing, encouraged by market deregulation. SMEs competed for the gap left by the demise of public-sector operations and the delicensing of processing and helped diversify products for growing urban and rural markets. An example of such proliferation was observed in diverse settings: from dairy, wheat, and horticultural product processing SMEs in Brazil (Farina 2002, 1997) to maize, vegetable, and fruit processing in Africa (Jaffee & Morton 1995, Rubey 1995, Jayne & Jones 1997, Broutin & Bricas 2006) to investments in rice mills and potato cold stores in India, Bangladesh, and China (Reardon et al. 2012b). This flowering of SMEs was indeed a goal of liberalization. The evidence is mixed on whether processing liberalization and privatization and the proliferation of SMEs reduced processing and marketing margins. On the other hand, and apparently as a second stage, the domestic and foreign investment encouraged by liberalization and privatization tended to concentrate (and, where parastatals had dominated, reconcentrate) the processing segment. This occurred through mergers and acquisitions of the SMEs that had proliferated in the first flush of liberalization. In India, the processing sector was reserved to SMEs to protect employment. In 1998, as part of overall liberalization, the sector was dereserved, and a flood of investment quickly increased the concentration indices and deepened capital (Bhavani et al. 2006). In Brazil, liberalization and privatization of parastatals at first brought a diffusion of small and medium processing firms and then concentration as large domestic and foreign firms acquired smaller firms. Farina (1997) illustrates this process in Brazil's wheat milling sector, as do Farina (2002) and Farina et al. (2005) in Brazil's dairy sector. Traub & Jayne (2008) note hypotheses in the literature that there is similar reconcentration in maize processing in southern and eastern Africa. This may be linked to a trend in margins, which at first declined during liberalization and privatization of government maize milling parastatals in the mid 1990s and then rose again substantially in the mid 2000s (Jayne & Jones 1997).

The massive investments by domestic and foreign firms, creating or enlarging large-scale processors, have resulted in large firms outcompeting many small firms. The large processing firms have several advantages. Through private standards and resource provision contracts (RPCs) with suppliers, they can increase the quality and consistency of their intermediate inputs from farmers, allowing them to drive down costs and control for plant size. There is recent research on this in Brazil and Argentina (Farina et al. 2005) and in Poland (Dries & Swinnen 2004, 2010; Fałkowski 2012). Also, large firms can borrow more cheaply than can small, and foreign firms can borrow more cheaply than can domestic (such as in Mexico; see Shwedel 2003). Furthermore, in many categories of processing, larger plants have economies of scale. Moreover, a critical mass of output is needed to



defend a brand, and the brand provides a competitive attribute over nonbranded products, especially where credence goods like food safety are involved. Larger processors also enjoy economies of scope, as more lines can be added, and thus the company can create a one-stop shop for retailers to source the diversity they require.

However, competition from large processing firms is not the only force reducing market share of small processing firms. Regulations affecting the segment appeared to accelerate the pressures on SMEs. For example, rezoning of cities to reduce congestion, application of business registration laws to increase municipal revenues, and application of food safety and hygiene regulations to food businesses have been important examples imposing special burdens on small firms that lacked the investment surplus and access to bank loans to shift location, register their firm, and adopt all the measures (such as hygiene facilities and cement floors) needed to conform to new laws. This has occurred in food service in Brazil with restaurant food safety regulations and in poultry and egg companies in Vietnam with avian flu regulations. There is mounting evidence that consumers are drawn to supermarkets as a result of food safety concerns about small processors and traditional markets (for discussion of this trend in Thailand, see Posri & Chadbunchachai 2006). We also expect that the new generation of food safety laws emerging in developing countries, such as the ones in China and India, may further accelerate consolidation in the processing sector. There is evidence that this occurred in the United States, with the impact of the food law of 1908 on food SMEs seen through the 1910s; for example, 90% of dairy SMEs went bankrupt in the main eastern cities in the 1910s alone (Levenstein 1988).

The consolidation that the above processes produced is striking. For example, by the early 2000s, Nestlé had a market share of 61% in Latin America for key packaged foods (namely confections, soups, pet food, baby food, dairy, and baked goods) and a market share of 26% in Eastern Europe; in Brazil that share was 83%, in the Philippines 37%, and so on. Unilever had similar dominance: Its market share in a set of key packaged goods was 38% in Poland, 43% in Argentina, 37% in Indonesia, 47% in South Africa, and so on (Bolling & Gehlhar 2005).

Moreover, the importance of processing FDI gave rise to consolidation being accompanied by multinationalization: Foreign firms formed a major share of the large processing sector in a number of first- and second-wave countries by the 2000s. In the 2000s that process reached third-wave countries like China and India. The great majority of FDI in processing is done by multinationals based in the United States and Western Europe. However, the country composition of the FDI senders may change over time with the importance of regional multinationals (such as Bimbo in Mexico, JBS and Sadia in Brazil, Charoen Pokphand in Thailand, and San Miguel in the Philippines) in south-south FDI, which is FDI from developing countries into other developing countries (Reardon et al. 2007b, Wilkinson & Rocha 2009).

**Transformation of food retail.** There are several key findings in the empirical literature regarding the two-stage transformation of food retail in developing countries. First, as with processing, many governments had several types of public-sector-cum-cooperative retail chains mainly in the 1970s and 1980s. At the end of that period, with structural adjustment or liberalization, most such chains were dismantled or privatized, although some continued into the 1990s and 2000s and morphed into competitors with modern private chains.

The main types of public retail in the 1970s and 1980s were as follows. (a) Governments developed food security-focused state retail chains dedicated to the subsidized

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distribution mainly of staples. Examples of these include Fair Price Shops in India, Grain Stores in China, and SAM in Mexico. These chains were generally in forward integration from grain parastatals. In most countries, these retail chains were privatized or dismantled along with the processing parastatals in the early 1990s. Some survived into the liberalization era, such as in India, where the Fair Price Shops chain forms approximately 15% of urban food staples retail and has approximately \$600 million USD of sales, ranking it among the leading chains in India (Reardon & Minten 2011). (b) Closely related to the above chains were chain stores in forward integration from state-supported or state-subsidized cooperatives. This structure was common in, for example, Central and Eastern Europe and India. The most common application of this structure was in dairy, but the structure was also applied in meat and other processed goods (Dries et al. 2004). In many cases these chains were dismantled or privatized when traditional state cooperatives declined in the 1990s. (c) In some countries state-owned enterprises (SOEs) transitioned from staples stores or coop chains to SOE supermarkets. Such is the case of the current number-two chains in Vietnam (Saigon Coop) and China (Lianhua, with \$10 billion USD in sales in 2009) (the sales and the rankings were calculated from data from the leading retail data source, Planet Retail; see <http://www.planetretil.net>). These chains were modernized, capitalized, and relaunched to compete in this segment. This indicated the importance of public sector modern retail as a retail modernization mechanism in the transition countries. Some of these chains have been privatized.

In sum, the sheer size and the early incidence of the state and cooperative-cum-state sectors in initiating retail transformation have been neglected in the literature. However, this transformation has been significant and continues in some countries today as a significant impetus to modernization.

Second, in the 1990s and 2000s private-sector modern retail took off in the supermarket revolution. This surprising takeoff in the 1990s is documented by a body of literature that emerged mainly in the 2000s (e.g., Reardon et al. 2003, Traill 2006).

The diffusion of modern food retail rolled out in broadly three waves in different regions. (a) The first wave, with takeoff in the early 1990s, was in East Asia (outside Japan and China), South America, South Africa, and Central Europe. The share of modern retail in food retail went from roughly 5–10% in 1990 to some 50–60% by the late 1990s. (b) The second wave, in the mid- to late 1990s, was in Southeast Asia (outside transition countries like Vietnam), Central America, and Mexico. The share of modern retail in food retail reached some 20–50% by the late 1990s. (c) The third wave, in the late 1990s and 2000s, was mainly in China, Vietnam, India, and Russia. The share of modern retail in food retail climbed to some 5–20% by the end-2000s in a rapid rise. In Africa outside South Africa, mainly in eastern and southern Africa, modern retail is just starting in some countries.

There was a steep crescendo in modern retail growth in the third-wave countries in the 2000s. For example, Reardon et al. (2010), using raw data from Planet Retail, calculated growth rates in leading modern retail sales (for chains selling food) in representative Asian countries in the three waves. The rates of growth vary over the waves as follows. The East Asian first-wave countries (South Korea and Taiwan) indeed show slower modern retail sales growth rates (a compound growth rate of 11.2% from 2001 to 2009), the second-wave countries (Indonesia, Malaysia, Philippines, and Thailand) show growth rates in the middle (a compound growth rate of 17.9% annually), and the third-wave countries (China, India, and Vietnam) show the highest growth rates (a 40.9% compound growth rate).



The growth rates are fastest in the third-wave countries as chains quickly win share from traditional retailers, but the growth is slower in first-wave and second-wave countries, where the supermarket revolution has been going for some time and chains now face a relatively saturated market. These rates can be compared with approximately 5% annual growth in real GDP from 2000 to 2008 in the first- and second-wave countries and 7.5–10% GDP annual growth in the third-wave countries. Even at these rapid GDP growth rates, modern retail sales grew two to three times faster than GDP in the first and second waves and four to five times faster than GDP in the third wave. Thus, modern retail's share of the retail pie continues to expand.

Inside a country, typically the diffusion has rolled out in the following two sets of paths: (a) from large cities to small cities and finally into rural towns in adapted formats and from upper to middle to poorer classes and (b) from processed foods to semiprocessed foods to fresh produce.<sup>3</sup> These paths are essentially the same as occurred historically (in the twentieth century) in developed countries.

Third, the descriptive work on these trends has also found the gradual diffusion of modernization in retail procurement systems, mainly in semiprocessed and processed foods (which form 85% of supermarkets' sales, reflecting, as we note above, the consumption basket) and recently in fresh produce procurement. Such modernization provides a cost advantage to the large processors and an acceleration of consolidation inside the modern retail segment, even in the early stages. This cost advantage resulted in price decreases for consumers (which we return to in the section below on impacts on consumers).

Fourth, modern food retail spread beyond the upper-income niche, and beyond even the middle class, into the food markets of the poor and into small cities and rural towns. That spread was accomplished both by lowering prices and by adopting new formats and marketing strategies.

On the one hand, from an initial march from small to large supermarkets (which usually stand alone but are sometimes in malls), modern food retail bifurcated into hypermarkets and a welter of small formats: pushcart chains in India; hard discount stores in Argentina, South Africa, and China; neighborhood stores in India, Mexico, and Thailand; fresh produce store chains in India, South Africa, and Indonesia; and the convenience stores familiar in most countries (7-Eleven is almost as widely recognized as Coke). This diversification of formats into smaller formats allowed modern retailers the following advantages: penetration of dense urban spaces (allowing frequent visits close to home), smaller scale to suit small towns, rapid rollout where real estate markets are tight, a means of targeting and adapting to a variety of consumer types, a means of franchising (and thus coopting small retailers), and a means of getting under regulations limiting store sizes.

On the other hand, the penetration of rural towns and of poor areas in cities is facilitated by the small formats, cheap pricing, and flexible inventories. The latter becomes most innovative when modern retail sets up one-stop shopping for rural consumers. Examples of

<sup>3</sup>For example, in third-wave China, Goldman & Vanhoner (2006) find that in big cities modern retailers already have retail market shares of 79% in packaged and processed goods, 55% in baked goods, 46% in meat, 37% in fruit, 35% in poultry, 33% in fish, and 22% in vegetables. Compare that with the more advanced (first-wave) Hong Kong case, which may represent the average Asian consumer scenario sometime in the medium-term future (i.e., in 10–20 years). Hong Kong supermarkets have a 59% share in fruit retail and a 55% share in vegetables (a share similar to supermarkets' share of produce retail in Brazil), as well as a 52% share in meat, a 39% share in poultry, and a 33% share in fish (Coca-Cola Retailing Research Council Asia 2005). See Ho (2005) regarding modern retail penetration of rice retail in Hong Kong.



this include the rural business hubs in India that are combinations of small supermarkets and farm input stores with joint venture banks and even health units, such as Choupal Saagar or Hariyali Kisaan Bazaar (Bell et al. 2007). In China, the government has started chains of rural supermarkets. These forays appear to be driven by increasing rural incomes, the dearth of services available locally, and the recognition that modern retail brings cheaper staple foodstuffs and nonfood goods (Chakravarty et al. 2007).

### Assessment of the Economics Literature on Food Industry Consolidation in Developing Countries

This section focuses on conceptualization of the transformation of the food industry segments in developing countries and on the empirical, descriptive literature generated over the past decade. Several gaps in this literature are apparent.

First, the depth of information on the basic trends in the food industry in developing countries is very uneven over segments. It is still not adequate even as descriptive material of the patterns, in particular of procurement system change, but there is a basic dearth of information on structure and conduct change in the wholesale/distribution segment and in the food processing segment. There are some exceptions, such as a cluster of work on dairy processing (in this section we do not focus on impacts on farmers or consumers) in Central Europe such as work by Swinnen, Dries, and Fałkowski and in South America such as work by Farina, Gutman, and Dirven. But there is little systematic, survey-based, or even descriptive work on processing sector transformation in the past 10 to 15 years. The same can be said for the wholesale sector in general and for the modern logistics sector in particular.

Second, we identify the emerging phenomena of symbiotic coevolution of segments of the food industry and of follow sourcing that fast tracked the food industry transformation. Yet there has been little work on this phenomenon (it is much better known and studied in, for example, the auto industry; see Humphrey 2003).

Third, the descriptive work on these trends that was so important and basic in the United States in the 1950s and 1960s is severely hampered in developing countries due to a lack of government statistics or even trade association statistics. The estimates are thus rough and sometimes not easily comparable over countries. Formal statistical description, much less econometric hypothesis testing, is still nearly impossible. Finally, the most obvious gap in the literature is the failure to formalize analysis of the choices of MFIF in procurement system modernization.

### THE IMPACT OF CONSOLIDATION IN THE FOOD SYSTEM: UPSTREAM ON FARMERS AND SMALL AND MICRO ENTERPRISES

In this section we focus on the impact of the consolidation of the food industry on small farmers and SMEs supplying intermediate inputs to segments of the food industry. Above we note that the food industry in the United States underwent consolidation and technological, institutional, and organizational change beginning in the 1870s. This change induced a burgeoning food system economic literature from the 1950s to the 1970s, focusing on the nature of the food system change (especially on issues of efficiency and market power) and thus on the effects of the transformation on consumers.

We note (from Sexton 2000) that from the 1970s to the 1990s and into the 2000s, there was an increase in consolidation, contract use, and technological change in the US



food system. By the mid-1990s, concern was reaching a high point in the policy debate concerning the impacts of this rapid change. The number of farms in the United States had dropped from 6.7 million in the 1930s to 2.1 million in the mid-1990s, farm consolidation had occurred (with a rise in average farm size with the rapid emergence of large commercial farms), and a large number of smaller part-time farmers persisted in the sector. The USDA and the National Planning Association convened a conference that gave rise to a volume poignantly titled “Food and Agricultural Markets: The Quiet Revolution” (Schertz & Daft 1994). They ask, “Will a more concentrated food industry—in both production and marketing—have adverse effects on producers. . . .?” (pp. 4–5).

A decade later, that question has come to an important place in policy debate in developing countries (even if it remains unanswered in the US context). It is the focus of this section. In the next subsection, we conceptualize these effects (whether modern firms buy from small suppliers, and if so with what impact on the small suppliers) and review empirical evidence from the literature. In the last subsection we assess gaps in research on this theme.

### Conceptualizing the Determinants of Impacts of Consolidation in the Food Industry Upstream on Small and Micro Enterprises and Small Farms

The impacts of food industry consolidation on small farmers in developing countries can be thought of as two issues. (a) The first issue, typically termed the inclusion issue, is whether MFIF—large-scale, modern firms—buy intermediate inputs from small-scale suppliers (SSS), whether they are small farms or SMEs in the processing or distribution sectors. (b) The second issue is whether MFIF buying from SSS leads to the latter improving (in income, risk reduction, or both) relative to the traditional market. This latter issue is typically termed the income impact issue but should be the income-and-risk-impact issue.

To inform those issues, we combine two discussions. (a) The first part is a heuristic conceptualization of the decision tree of the modern MFIF in terms of procurement choices of the modern firm (first of the procurement system and then of types of suppliers) and marketing choices of small suppliers (whether to sell to MFIF if they have that option). (b) Second, we review the empirical evidence concerning those choices and their impacts.

Our simplified heuristic conceptualization is fashioned from the grist of the recent literature that has addressed these questions conceptually: (a) directly, in particular Austin (1981), Key & Runsten (1999), Gow & Swinnen (2001), Reardon et al. (2003, 2009), Stokke (2009), Swinnen & Vandeplas (2010), Barrett et al. (2012), and Vandemoortele et al. (2012), and (b) indirectly, in particular Bardhan (1980), Eswaran & Kotwal (1985), and Barrett & Swallow (2006). Our empirical review is mainly from the agricultural economics literature (which we cite below in the section as needed), as the business management literature, although relatively strong in analysis of market and growth strategies of modern firms, has only rarely treated the issue of impacts on small suppliers.

We begin with a sketch of stylized facts (drawn from the empirical literature about the actors) about the objectives, options, and assets of the MFIF and SSS and then present the decision trees of the MFIF in procurement and of the SSS in supply.

As noted above, the MFIF are (by definition and in their polar form) large firms. The MFIF seek to maximize profits within a constraint of a maximum level of risk (imposed by their shareholders or their own sense of prudent management). To maximize profit, they must control costs while emphasizing quality. That is because they are in the



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market context emphasized by Gorton et al. (2011) of the so-called big middle (straddling the two strategic position options noted by Porter 1985). In this context, MFIF compete in cost competition with other MFIF and with traditional firms for the commodity market, mainly of the middle, lower-middle, and working-poor strata. At the same time, they compete with other MFIF in quality competition for the differentiated products niche market, mainly of the upper-middle and middle consumer income strata. Some papers on our theme here focus on the quality objective, and others focus on the cost objective. We include both objectives because most large firms (like CP, Nestlé, or Carrefour) operating in the developing country food industry pursue both due to the heterogeneity of consumers and the need to manage market risk. There are exceptions, of course. Moreover, although MFIF import some of their intermediate inputs, on average they source the great majority from domestic supply chains and thus rely on these chains. Within the domestic supply chain, MFIF can buy from SSS or LSS (large-scale suppliers). Accurately analyzing the objective function of MFIF is a complicated task.

As discussed above, the SSS are (by definition) small-scale farms or firms, supplying intermediate outputs to the MFIF, the traditional market, or both. The intermediate inputs may be raw (such as milk sold to processors) or processed (such as cheese sold to retailers). We include both farms and processors under SSS because the impacts of MFIF on both are relevant (for example, 85% of what supermarkets sell is to some extent processed). Moreover, there is heterogeneity of land and nonland assets over the SSS. The SSS have a high marketed surplus rate (we are excluding from the analysis subsistence or mainly subsistence farms or SMEs that are by definition not affected directly by MFIF decisions). The SSS are commercial in the sense that they strive to maximize profit, with a constraint of maximum acceptable risk and uncertainty. Importantly, the SSS face “idiosyncratic market failures” (Hoff et al. 1993). For example, the credit market may exist in a given area, but the SSS cannot access it (whereas the LSS usually can) for a variety of possible reasons, such as especially high transaction costs or asset constraints.

The two nodes of procurement decisions facing the MFIF (that together condition their choice of SSS as suppliers) are as follows.

The first decision node of the MFIF is whether to use a modernized procurement system, as discussed in the previous section. Such a system includes use of distribution centers, private standards of quality (and perhaps safety), vertical coordination mechanisms (in particular, contracts), and either direct purchase from suppliers or use of specialized wholesalers as agents to procure per their standards and other specific needs. If the MFIF choose to use contracts, then they must also choose whether to augment a standard contract that specifies price, quantity, timing, and product attributes, with assistance to the farmer to meet the contract specifications. Austin (1981) terms this an RPC. For flow of argument, we discuss the choice of the MFIF to use an RPC as a simultaneous part of the second decision node below: whether the MFIF chooses to procure from small suppliers.

If the MFIF do not adopt a modernized procurement system, then by definition they are sourcing using a traditional system, i.e., merely buying from the spot wholesale market or from general line stockists. As the impact of choices of the traditional sector does not concern us here, we take as given in this node that the MFIF choose a modernized procurement system, and we move to the next decision node.

The second decision node of the MFIF is whether, given their procurement system choice above, to source from SSS for a particular product and market. All else equal, profit maximization under a constraint of not exceeding a certain level of risk would imply the



following. The MFIF will, at least in theory, have a greater tendency to source from the SSS as a function of the following.

On the one hand, there are a set of variables reflecting incentives for MFIF to source from SSS. Such sourcing is more likely

- (1) the lower is the transaction cost of buying from the SSS [in turn a function of local infrastructure and transport services, of the dispersion of production of the SSS (in time and/or space), and of aggregation (such as use of cooperatives by the SSS)];
- (2) the greater is the nonland asset base (farm capital, social capital, and human capital) of the SSS and the asset base's degree of asset specificity relative to the timing, quality, and volume requirements of the MFIF (this also includes access to financing for upgrading by the SSS and hence flexibility to meet changing MFIF needs);
- (3) the lower are the risks and uncertainty of sourcing from SSS (these are in turn a function of nonland assets such as irrigation and greenhouse holdings of the SSS);
- (4) the higher are the relative transaction costs—and thus the lower the required skills or use of practices (such as labor intensive hand picking) and the higher the risks (due to possible market power of the LSS and other options they might have to side sell) of sourcing from LSS in the area—and
- (5) the more favorable the overall location or supply zone. This meso factor combines the preceding four micro factors. That is, an MFIF seeking lower transaction costs and higher and more consistent volumes and quality will tend to choose supply zones that have better agroclimates and/or more irrigation, better soils, better infrastructure, and so on; the MFIF would, all else equal, tend to eschew zones with poor and risky agroclimates and poor infrastructure. As asset-poor small farmers tend to be found disproportionately in the poorer zones, the the choice of better zones by MFIF would de facto exclude many asset-poor farmers as suppliers. Barrett et al. (2012) note that the above often leads researchers to exclude poor zones from surveys examining participation in modern supply chains because the geographic fixed effects would overwhelm the interhousehold differences.

On the other hand, there is a key variable related to the capacity of the MFIF to source from SSS. Such sourcing is more likely the higher is the capacity of the MFIF to handle the aggregation of small lots supplied by many SSS; to reduce coordination and transaction costs of buying from dispersed small suppliers; and to redress capacity constraints of SSS to meet quantity and quality requirements, such as via provision of RPCs to the SSS to redress gaps in SSS assets.

RPCs require further attention here. RPCs here denote a combination of a contract (with specification of standards, quantities, and prices) with a bundle of inputs and services potentially supplied to SSS to resolve their idiosyncratic market constraints, which in turn may constrain SSS from supplying to the MFIF. The RPCs are germane to the economics literature on market interlinkages, such as tied output-credit markets and other provision of management services, inputs, or credit by the output or labor buyer. In such arrangements, access to credit or inputs is constrained for the supplier, and the provision is made either via an exchange contract or in sharecropping arrangements (see, for example, Bardhan 1980, Eswaran & Kotwal 1985, Hoff et al. 1993, Gow & Swinnen 2001).

Because of the importance of RPCs as to whether MFIF source from asset-constrained SSS, we further conceptualize the investment in RPCs if, for other reasons noted above, the MFIF choose to buy from SSS. The MFIF will have a greater tendency to supply RPCs to the SSS as a function of the following.



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On the one hand, there is a set of variables reflecting the incentives for MFIF to supply RPCs. Such supply is more likely

- (1) the greater is the share of agriculture dominated by SSS and thus the less available are LSS as suppliers alternative to SSS;
- (2) the more labor intensive is the crop's production and thus the greater is the need for abundant labor and intense labor supervision, both of which SSS tend to have and do more than do the LSS (Minten et al. 2009 discuss the case of vegetable exports in Madagascar in this regard);
- (3) the less available are intermediaries, who for a fee direct from the farmers can resolve idiosyncratic market failures faced by individual farmers [these intermediaries can be NGOs, cooperatives, input companies (such as Syngenta in Indonesia; see Reardon et al. 2007b), or agribusinesses that buy from input companies or interface with banks for SSS for a fee (for an example from Peru, see Escobal et al. 2000)];
- (4) the lower is the asset base of the SSS and thus the greater is the tendency of the SSS to lack collateral for loans or funding sources (such as rural nonfarm employment) alternative to reliance on RPCs;
- (5) the greater is the sociocultural constraint (e.g., gender, caste, or ethnicity) faced by SSS to access needed inputs or credit; and
- (6) the greater is the incentive of the FIF to undertake corporate social responsibility programs for commercial, political, or humanitarian objectives.

On the other hand, there is a key variable reflecting the capacity of the MFIF to respond to the above incentives. Such capacity is more likely the greater is the capacity of the FIF (and or government or NGO assistance) to finance and staff the services required by the RPCs (in turn usually a function of FIF size).

The empirical literature on this second node (choices by MFIF of SSS as well as RPCs to accompany that choice) is at an early stage. For this second node, there are two strands of empirical literature: the first studying MFIF choice as revealed by the MFIF themselves (in case studies or surveys) and the second studying MFIF choice as revealed by farm surveys.

The first strand explores MFIF choices in the first and second nodes through the use of case studies or small-sample surveys of MFIF. These studies are part of the early descriptive phase of study of the food system revolution. There are several substrands.

The first substrand of the first strand focuses on case studies and small-sample surveys of MFIF on procurement differences across product categories within a broad category. The goal is to see whether MFIF source only or mainly from LSS for some kinds of products and situations and source from SSS for other products and situations.

Examples of this first substrand are Berdegué et al. (2005), based on a survey of supermarket chains in Central America, and Reardon et al. (2007a) for a similar study in Mexico. These studies asked the chain procurement officers, for each major type of fruit and vegetable, whether they used a modern or traditional procurement system and, if they used a modern system, whether they procured from large farms/agribusinesses, small farms, or both. The findings, of importance to our discussion here, were as follows.

- (1) For products that large farms did not sell mainly to the domestic market and for products that are commodities (with little quality differentiation), like cabbages or onions, the supermarket chains noted that they used mainly traditional sourcing from spot wholesale markets (that in turn source mainly from small farmers).



- (2) Where some large farms grew these commodities, the supermarkets sourced both from these farms (directly) and from the wholesale market for periods when the large farms did not sell and to diversify the supplier base for leverage in bargaining with the large suppliers. This was the case of tomatoes in Mexico and for bananas in Mexico and Central America.
- (3) Where there were large farms/agribusinesses that dominated production and that could easily meet the volume needs of the supermarkets year round, even where there were small farms producing the product, the supermarket chains sourced only from the large suppliers (from pineapple and banana plantations).
- (4) Where agribusinesses produced high-quality perishable products such as lettuces, the supermarkets tried to maximize sourcing direct from them but also bought from small farmers (especially for commodity types of those products).
- (5) Where there were niche products and small farmers formed into effective cooperatives (considered rare by the chains), supermarkets bought part of their supply from these cooperatives, such as in the case of carrots in Mexico.

In sum, these studies show that supermarket chains sourced a large amount of their produce from wholesale markets (and thus mainly from small suppliers) but—depending on transaction costs, seasonality, and availability of large suppliers—tended to source either from both large suppliers and wholesale markets or from large suppliers alone. Rarely did supermarket chains source directly from small farmers, except in the rare cases of effective cooperatives. The chains supplied no RPCs to the farmers, large or small.

A third study (Stringer et al. 2009) similar to the above, for Shandong, China, relying on a sample of vegetable processing firms, used conjoint analysis to discern factors leading to the firms procuring from small farmers, agribusiness companies, or wholesale markets. Again, as above, transaction costs were a paramount factor, and an additional factor emerged that did not come out in the Latin American studies: probability of assuring food safety for specific products exported to Japan.

A second substrand of this first strand focuses on retailers' choices of small versus large processing firms as suppliers. This literature is based mainly on case studies of retailers. It tends to show that supermarket chains seek to source the bulk of their processed products from three to four large suppliers per category (not one, to avoid market power, or many, to avoid transaction costs) and sometimes from a half-dozen medium firms in the market region, such as chains in India sourcing most of their dairy products from Amul, Mother Dairy, and Nestlé or their wheat flour from ITC and a few others (Reardon & Minten 2011). Similar results for, e.g., dairy products were found in Russia by Dries & Reardon (2005) and in Brazil and Argentina by Farina et al. (2005). These results reflect a concurrent or prior process of consolidation in processing, a concern with reducing transaction costs, symbiotic logistical interfaces (for example, Nestlé's distribution centers in India stocking supermarket chains' distribution centers and/or stores with truck fleets), and the attraction of emerging branding for consumers.

Moreover, there is case study evidence that the transaction terms of supermarket chains are difficult for small processors to meet. For example, slotting fees charged to processors (from meat to dairy to dry goods), as well as volumes, consistency, standards, and delivery, are difficult for small firms to meet (for a Chilean example, see Faiguenbaum et al. 2002). Researchers report that supermarket chains reduce the rolls of their processed food suppliers, cutting small firms and retaining large and medium firms (for example, for dairy in



Russia, see Dries & Reardon 2005, and for dry foods in China, see Hu et al. 2004). Although the literature lacks systematic surveys on this theme, there appears to be a lot of case evidence.

Even in an incipient literature, there is a strong imbalance (relative to the shares of processed and semiprocessed products in total sales of supermarkets) between the number of studies on sourcing patterns of retailers from fresh produce suppliers versus the number of such studies from processors, with far fewer studies of the latter. This pattern is partly because research has so far come mainly from economists focused on direct impacts on small farmers. If one studies the impact of Walmart on the processing sector, one ends up studying a chain rule of Walmart on the processing sector and induced (and independent) changes in the processing sector in turn on farmers. However, from the viewpoint of overall societal welfare, it is important to understand impacts on employment and food costs of retailers' procurement choices of large versus small processors.

A third substrand of the first strand is MFIF case study research on contract schemes that employ RPCs. There have been two main findings of these case research studies.

First, a number of these studies (reviewed in Schejtman 1996, Key & Runsten 1999, and Minten et al. 2009) demonstrate the point made by the first substrand above (such as in Berdegué et al. 2005 or Reardon et al. 2007a): There are a number of instances in which MFIF procure from small farms, at least via contract farming schemes. This finding does not contradict the findings from the first substrand (and second substrand) that in a number of instances the MFIF source at least some of a given product from LSS.

Second, a number of these studies demonstrate, via MFIF case studies, that MFIF sometimes provide RPCs for the farmers in the schemes. Important examples include Bivings & Runsten (1992) for Latin America and Gow & Swinnen (1998) for Central Europe. This literature is important because it connects the earlier literature on interlinked markets that was focused on the traditional food system (Bardhan 1980 and Eswaran & Kotwal 1985) with agroindustrialization and the attendant need for FIF to resolve supply-side constraints for farmers to expand their supply base.

The second strand of literature on this second node (the decision on whether the MFIF source from SSS) uses farm surveys (and, rarely, SME surveys). This literature occurred as a wave after the initial strand of descriptive work using case studies. (In this way it echoes the earlier sequence in empirical research in the United States.)

This farm survey literature is focused on (a) contract farming schemes of processing MFIF (most common in this strand), (b) retail MFIF sourcing fresh produce via collection centers (uncommon in this strand), and (c) retail MFIF sourcing fresh produce via specialized/dedicated wholesalers cum agents (also uncommon in this strand). The following reasons may explain why most of the studies are on processing contract schemes. (a) These are the most common direct interface of MFIF with SSS. (b) The studies are often of internationally visible export schemes (such as the work of von Braun et al. 1989 on Cuatro Pinos). (c) There are still relatively few instances of retailers in developing countries buying fresh produce directly from small farmers (and such an arrangement is a minor share of their sourcing so far). (d) Processing contract farming schemes have a long history, having arisen first in colonial times and then in the nontraditional export booms of the 1980s in Latin America.

Most of the literature in this strand presents three research questions. (a) Do small-scale farmers (in land size) participate in modern food systems (and thus sell to MFIF, from which one can infer that MFIF procure from them)? (b) Are certain strata of SSS—in



particular, those poorer in nonland assets (among the general set of small farmers)—excluded from participation? (c) Does participation increase the SSS net incomes (relative to just selling to traditional markets)?

We first present a general conceptualization of the economics of that participation. We then use these three questions to structure our presentation of key findings from this emerging literature.

All else equal, the SSS will have a greater tendency to supply to MFIF and to demand RPCs of the MFIF in the following situations. On the one hand, there is a set of incentive variables inducing SSS to supply to modern market channels. Such supply is more likely

- (1) the greater is the specificity of the product and/or quality grade for the market dominated by or represented by the MFIF as buyer. An extreme case is where the SSS grow a vegetable that is not consumed locally but is consumed only in export markets or in luxury segments of the urban market (see von Braun et al. 1989 for a Guatemala example or Minten et al. 2009 for a Madagascar example; for an example of domestic tomatoes of high grade, see Natawidjaja et al. 2007). In this sense, the output price is realized only if the SSS sell to the MFIF;
- (2) the greater is the price premium (controlling for quality) for selling to the MFIF (compared with the traditional market);
- (3) the lower is the risk of selling to the MFIF (compared with the risk of selling to the traditional market). Michelson et al. (2012) show for Nicaragua that farmers get a lower average price when selling to Walmart but lower price variance than in the traditional market so that the Walmart contract represents a market insurance substitute;
- (4) the greater is the chance the RPC supplies some service or asset that the SSS are not already accessing. For example, Hariyali Kisaan Bazaar in India provides farmers with some extension help (of the availability and quality that they lack locally) (Bell et al. 2007); and
- (5) the more constrained is the supply of (and the more constrained is the access of SSS to) services and inputs locally, thus increasing the need for the resource provision. Gow & Swinnen (1998) provide the example of constraints to credit access locally drawing farmers into links (that featured provision of credit) with a multinational sugar company in Slovakia.

On the other hand, there is a set of variables reflecting the capacity of the SSS to respond to the incentives for supplying to the modern market channel. The adequacy of the capacity of the SSS is relative to the requirements posed by the MFIF. Reardon et al. (1999) note that the requirements of the SSS include private standards of quality and safety; delivery specifications in terms of volumes and consistency; and occasionally other demands such as slotting fees (paid by the supplier to a retail for shelf space), promotion such as advertising or personnel posted to the retail aisle, formal sector registration, and various forms of certification. They note that the modern channel's requirements are, relative to the traditional markets, often more demanding of flows of labor or capital or both and thus assets to generate those outlays. One can translate the requirements into the minimal vector, say  $K^*$ , of needed assets that are a threshold investment to supply the modern channel by meeting its requirements. For example, a supermarket chain could require that tomatoes be supplied all year, not just in the rainy season. This translates into a requirement of irrigation; the SSS without irrigation then are excluded because of asset inadequacy.

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The literature's findings appear to be consonant with the theory of choice by MFIF of SSS and vice versa. First, a number of farm surveys indeed show that small farmers (not just large farmers) sell to supermarket chains (and other MFIF).<sup>4</sup> This supports the earlier case study research (such as Berdegué et al. 2005 noted above) that, although in some product categories the supermarket chains source from large agribusinesses, they also source from small farmers, sometimes in those same product categories and sometimes in others. The farm survey results for tomato farmers reported in Hernández et al. (2007) provide a poignant example of this pattern. These researchers find that small farmers sell tomatoes to supermarkets via specialized wholesalers. This finding corroborates the earlier finding (but from the case studies of procurement in the supermarket chains) found earlier that supermarkets use a combination of specialized wholesalers and traditional wholesale for tomato. Several other studies show that small farmers sell to supermarket chains (for example, Hernandez et al. 2007 for tomatoes to domestic supermarket chains as clients in Guatemala and Minten et al. 2009 in Madagascar for vegetables to foreign supermarket chains as clients) and to processing firms (for example, Dries & Swinnen 2004 in Poland for dairy).

Typically, survey studies do not include in their samples large agribusinesses and so a priori exclude the latter from consideration in their results. But some survey studies that sample both small and medium farmers show that medium farmers are the main suppliers of supermarkets. Examples include studies in Kenya by Neven et al. (2009) and Rao & Qaim (2011).

Second, evidence tends to point to supermarkets or their specialized/dedicated wholesalers or agents sourcing from small farmers with more nonland assets or threshold investments requisites for consistent and quality supply, such as irrigation, road access, and education [such as in Guatemala (Hernández et al. 2007), with similar results in Indonesia (Natawidjaja et al. 2007), China (Huang et al. 2007, Wang et al. 2009), and other countries].

Third, in terms of impact on incomes, many studies report moderate to substantial gains in incomes comparing participants in modern supply chains versus traditional supply chains, comparing treatment and control groups or before and after. But relatively few studies control fully for the asset and liquidity situations of farmers so as to isolate the effect of the relation with modern channels per se (Barrett et al. 2012). Controlling for the asset and liquidity situation of farmers before and after participation in modern market channels is somewhat difficult in a cross section, as that process relies on recall; it is ideal (but rare) to have a panel data set to test this.

Moreover, Michelson et al. (2012) show for Nicaragua that the impact (and sought result) may be a premium not on the farm price but rather on a reduction in the market risk

<sup>4</sup>Finding that in a given area few or no small farmers sell to supermarkets does not demonstrate that supermarket chains source from large farmers either in that area or in other areas. We emphasize this point, as some researchers attempt to infer MFIF procurement choices by using only household survey data. If household survey data represent the universe of all the suppliers from which the MFIF can source, then this method is valid, but it is not valid if the survey data do not cover the full potential supply base. Moreover, if there is large heterogeneity in the supplier population, and one randomly samples that population, one cannot necessarily infer what procurement choices (of suppliers) MFIF are using. For example, if the tomato sector contains thousands of small tomato farms and a few very large plantation operations, one can randomly sample from the farm universe, probably not sample the plantations, and find that none of the small tomato farms sell to MFIF. However, the MFIF may still be buying (some or all) of their tomatoes from the large plantations (this is an actual case from Louw et al. 2008 for South Africa). But with random-sample survey data of just households, one can explore other questions such as the marketing choices of a representative sample of farmers.



facing the farmer. The study shows that the average returns from a contract with Walmart are lower but more stable than those in the traditional market. The contract thus acts as a de facto market insurance mechanism. The contract farming literature also makes this point about the benefit from lower price variability from contracts (see Minot 1986), but the study by Michelson et al. (2012) is the first to do so in the retail and development literature.

### Assessment of the Economics Literature on the Theme of Impacts on Farmers and Small and Micro Enterprises

Above we note several gaps in the nascent literature on impacts of food industry transformation on farms and processing SMEs in developing countries. Here we provide suggestions on how these gaps might be addressed.

First, as in the United States in the mid-twentieth century, in developing countries there has been since the 1990s an initial wave of description of food industry consolidation and technological, institutional, and organizational change in how the food industry interacts with farms and SMEs. That wave of description has not proceeded far or systematically enough. This is partly because government and industry data systems on the food industry and farming are less developed than they were in the United States, and much basic information has been painstakingly developed from primary surveys done by the researchers themselves. There needs to be much more on the midstream segments and on the market channels used by farms and SMEs.

Second, description has only started to be complemented by rigorous econometric analysis of the impact of the food system revolution. Some studies have been done, but still only in a handful of countries and on a few product lines and areas. The evidence is still patchy, inconsistent (because of the limited sample), and emerging.

Third, even in the econometrics that have been done, there is much to improve in the modeling in terms of sampling methods and use of panel data, among other things. It is not just the statistical modeling that needs upgrading, but also the theoretical conceptualization of the decision processes and dynamics of the actors' behavioral choices and investments under uncertainty. This conceptualization needs to incorporate the thresholds and poverty traps facing SSS seeking to market to the changing food system.

## CONCLUSIONS

### Summary

This article tells of the giant strides taken in a rapid food system revolution in developing countries in the past three decades and compares this revolution with the longer and slower transformation of the US and Western European food systems. We choose the food system as the conceptual framework because of the following reasons. (a) Consolidation and technological change are occurring in all segments of the supply chain. (b) The changes in any segment occur in tandem with and affect the changes in other segments. (c) The system's changes affect farmers, consumers, and the food security and well-being of society. (d) The food system, studied first with industrial organization economics and later with the new institutional and organizational economics, has been the conceptual framework for analyzing this transformation used by our discipline for the past 50 years.

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This article has three parts. First, we briefly describe the transformation of the US food system beginning in roughly 1880 and lasting a century. This transformation started gradually and then from the mid-twentieth century accelerated, with stunning increases in consolidation, contracting, technology change in all segments, and eventually impacts on farm structure and technology.

Second, we describe and highlight economic approaches that have been taken to analyze a similar transformation in the developing countries' food systems starting roughly in 1980, 100 years after the US one. There are several differences between the US transformation and that of developing countries. The latter transformation is occurring in contexts more heterogeneous at the consumer and farm levels; is happening faster; and is driven not only by domestic, private forces but also by FDI (by firms who "cut their teeth" and grew to be giants in the US and Western European transformation) and by government engagement at various stages.

Interestingly, the rapid transformation of developing country food systems was vigorously predicted beforehand by economists to be impossible. The reasoning was that developing countries were thought to have specific food cultures resistant to systemic change— notwithstanding that the US and Western Europe also had cultures of traditional food systems.

As with the US food system revolution, the revolution in developing countries was first analyzed descriptively by economists. The big differences in these revolutions are that in the developing country context, the government and industry association information sources are far less developed, and progress requires economists to do their own primary field surveys, one effort after another.

These descriptive studies show, with differing rates of diffusion over countries and product categories, the rapid rise of supermarkets, large food processors, and large and modern logistics and wholesale firms, as well as specialized/dedicated wholesalers serving as agents for the modern food industry. The studies show the gradual but uneven diffusion of modern procurement systems by the food industry. Such procurement systems are the channel for impact on farms and are different from business as usual for them in the traditional markets.

Second, we outline the findings and the analytical approaches used by economists for the most recent wave of research on the impacts of this transformation on farmers and SME processors. The nascent econometric analysis of determinants of farmer participation in transformed food systems and of the impacts of that participation has yielded valuable initial insights. The emerging evidence highlights farm size and nonland assets (such as education and irrigation) as determinants of inclusion and participation. Regarding farm size, the empirical findings are mixed: Some work finds that farm size is a factor constraining participation, whereas other studies show that farm size is no constraint and that small farmers participate. More generalized is the finding that nonland assets determine inclusion or exclusion, regardless of farm size. Also fairly generalized is the finding that inclusion spells a net income gain, risk reduction, or both by farmers who participate in transformed food systems, relative to those in only traditional markets. The effect can be from reward for quality differentiation, from a premium controlling for quality, or from both. But the econometric studies are still few and are constrained by technical limitations such as a dearth of data for panel analyses.

### Agenda for Future Research

This field is still in its infancy even in descriptive empirical terms, and theoretical structuring is premature. Here we outline the research needed.



First, much more needs to be done to describe the patterns and dynamics of the revolution in the food system. Although recent descriptive work on food system transformation in developing countries has quickly provided the discipline with an information base, that base is still very small compared with what coverage is needed. The gap is especially large in the postfarmgate segments. Very few descriptive studies have been done on the patterns in and evolution of structure, conduct, and performance in the wholesale and processing and retail segments in the period of most transformation (the 1980s to 2000s). For example, Reardon et al.'s (2012b) review of literature on rice milling in Asia shows that the field has been nearly bereft of survey-based empirical studies since the prior wave of literature on rice milling in the 1970s. The same is true for rice wholesale and rice retail—and rice is the main staple of Asia. This is but one illustration of the many basic information gaps that need to be filled.

Second, the emerging evidence suggests that the dynamics of the different postfarmgate segments are interrelated, but this hypothesis needs testing. Specifically, does transformation of one segment such as processing induce transformation in the other segments? Is the supermarket revolution causing modernization of processing and wholesale (or vice versa)? Does transformation of wholesale and logistics accelerate consolidation in retail and processing? And so on. The concept of intersegment supermodularity discussed above suggests such relationships, but such coevolution has not been analyzed in detail.

Third, and closely related to the second gap, is the question of whether retail consolidation (and other shocks such as food safety crises, new regulations, and competition from large processors) leads to the exit of small processing and food manufacturing firms, as well as of small-scale food service such as street vendors. This issue is especially timely. On the one hand, governments pin great hope that SME employment will add value to agriculture and will provide jobs for the poor. But on the other hand, there is a worry that transformation of the food system, combined with food safety crises and new regulations such as the Food Safety Law enacted in China in 2008, will lead to the bankruptcy of many small firms (as similar forces did in the United States historically; see Levenstein 1988). Yet there has been little empirical work on this theme, as most transformation impacts research has focused on farms and even on fresh fruit and vegetable farms (despite that category forming only approximately 10–15% of supermarket sales).

Fourth, much more work needs to be done to understand the impacts of transformation of the food industry on farmers. More analysis is needed on the patterns in and determinants of retail and processing firms' procurement system modernization and the extent and conditioners of their behavioral choices to source from small farmers and SMEs. Of the handful of studies on this issue, most are descriptive, and none undertakes formal statistical interfirm analyses.

From the other direction, more work is needed on the patterns of, determinants of, and impacts on small farmers' participation in modern food supply channels. There are a small number of initial econometric studies, in particular cross-section regressions. There need to be more studies of the dynamics of this participation, such as with duration analysis. As Barrett et al. (2012) emphasize, there need to be more panel survey studies to overcome the technical constraints in the earlier studies.

Fifth, there has been a great deal of rhetoric connected with the question, what are the patterns of and performance in collective action by small farmers to access modern food supply chains? However, the survey-based literature on this question is very thin. There are a number of case studies but only few surveys with treatment and control samples and few

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panel data. Given the large amount of hope pinned (and government and donor money spent) on cooperatives and producer companies to this end, survey work in this domain needs to multiply.

Sixth, there has been little empirical research on how the structure, institutions, and marketing and technology behavior of a particular product system influence price levels and volatility, food safety outcomes for consumers, and price risk for farmers. This full-system-performance question requires both longitudinal and cross-section studies of value chains to compare their outcomes, how those outcomes differ between traditional and transformed value chains, how the outcomes differ before and after natural experiment shocks (such as food safety crises or infrastructure programs), and how the outcomes differ before and after economic experiments and policy changes such as provision of subsidies. The broad performance of food systems on food prices and food safety has soared in interest among developing country governments after the food price and food safety crises of the first decade of the 2000s. There is, for example, still little understanding of the causes of, and impacts from, increased food price volatility on poor households.

Seventh, in the 2000s, developing countries experienced a double crisis of energy prices and food prices. There has been some research on energy costs on agricultural technology but no or little research on the links between energy costs and food supply chain transformation. Reardon et al. (2012a) argue that these links can operate in two ways, with supply chain transformation potentially increasing or decreasing energy intensity of a food economy and energy cost shocks potentially speeding or slowing that transformation. Climate change may have similar impacts: It may condition the extent of local sourcing as well as food price levels and variability. This is a key emerging issue in discussions over global food security (Timmer 2009).

Finally, preliminary evidence shows that the procurement system change that accompanies food industry transformation tends to extend from local sourcing to national networks to international regional networks to global sourcing. There has been little research on how procurement system modernization affects the international trade patterns in developing regions and in particular whether such modernization foments south-south food trade. Case study evidence of the links between food system transformation and changes in trade patterns points toward important links (Reardon et al. 2007b), but such links have not been tested. Research could focus on the link between food system transformation and trade in a way analogous to the way the links between industrial organization and trade were explored in the new trade economics (Evans 1989). Such research examined how, for example, trade among subsidiaries of large firms had rendered much of manufactures trade internal to firms, thus changing predictions of trade theory.

## DISCLOSURE STATEMENT

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## LITERATURE CITED

- Ahmadi-Esfahani FZ, Locke CG. 1998. Wholesale food markets with “Chinese characteristics.” *Food Policy* 23(1):89–103
- Austin JE. 1981. *Agroindustrial Project Analysis*. Baltimore, MD: Johns Hopkins Univ. Press
- Bardhan PK. 1980. Interlocking factor markets and agrarian development: a review of issues. *Oxf. Econ. Pap.* 32(1):79–98
- Barrett CB, Bachke ME, Bellemare MF, Michelson HC, Narayanan S, Walker TF. 2012. Smallholder participation in contract farming: comparative evidence from five countries. *World Dev.* 40(4):715–30
- Barrett CB, Swallow BM. 2006. Fractal poverty traps. *World Dev.* 34(1):1–15
- Becker G. 1965. A theory of the allocation of time. *Econ. J.* 75(Sept.):493–517
- Bell DE, Sanghavi N, Fuller V, Shelman M. 2007. *Hariyali Kisaan Bazaar: a rural business initiative*. Case N2-508-012, Nov. 15, Harvard Bus. Sch., Cambridge, Mass.
- Bennett MK. 1954. *The World's Food*. New York: Harper
- Berdegúe JA, Balsevich F, Flores L, Reardon T. 2005. Central American supermarkets' private standards of quality and safety in procurement of fresh fruits and vegetables. *Food Policy* 30(3):254–69
- Betancourt R, Gautschi DA. 1986. The evolution of retailing: a suggested economic interpretation. *Int. J. Res. Mark.* 3(4):217–32
- Bhavani TA, Gulati A, Roy D. 2006. *Structure of the Indian food processing industry: Have reforms made a difference?* Presented at the workshop, “From Plate to Plough: Agricultural Diversification and its Implications for the Smallholders,” New Delhi
- Bignebat C, Koç AA, Lemeilleur S. 2009. Small producers, supermarkets, and the role of intermediaries in Turkey's fresh fruit and vegetable market. *Agric. Econ.* 40(Suppl. 1):807–16
- Bivings L, Runsten D. 1992. Potential competitiveness of the Mexican processed vegetable and strawberry markets. *Rep. to Minist. Agric. Fish. Food, B. C.*
- Bolling C, Gehlhar M. 2005. Global food manufacturing reorientations to meet new demands. See Gehlhar & Regmi 2005, pp. 62–73
- Braudel F. 1979. *The Wheels of Commerce*. New York: Harper and Row
- Bressler RG. 1964. Research on the structure of agricultural markets. In *Market Structure Research*, ed. PL Farris, pp. 1–7. Ames, IA: Iowa State Univ. Press
- Bressler RG. 1965. Agricultural economics in the decade ahead. *J. Farm Econ.* 47(3):521–28
- Broutin C, Bricas N. 2006. *Agroalimentaire et Lutte Contre la Pauvreté en Afrique Subsaharienne: Le Rôle des Micro et Petites Entreprises*. Paris: Gret
- Bucklin LP. 1966. *A Theory of Distribution Channel Structure*. Berkeley, CA: Inst. Bus. Econ. Res.
- Cassels JM. 1933. Monopoly influences. In *Research in Prices of Farm Products*, ed. JM Cassels, pp. 154–64. New York: Soc. Sci. Res. Council.
- Caswell JA, Bredahl ME, Hooker NH. 1998. How quality management metasystems are affecting the food industry. *Rev. Agric. Econ.* 20(2):547–57
- Chakravarty K, Sridhar V, Bhardwaj P, Bhattacharjee N. 2007. Rural retailing—the next phase in retailing. *YES BANK Knowl. Rep.*, Confed. Indian Ind., New Delhi
- Clodius RL, Mueller WF. 1961. Market structure analysis as an orientation for research in agricultural economics. *J. Farm Econ.* 49(August):515–53
- Coase RH. 1937. The nature of the firm. *Economica* 4(16):386–405
- Coca-Cola Retail. Res. Council. Asia. 2005. *The fresh imperative: creating excellence in Asian fresh food retailing*. Study by Accenture commissioned by Coca-Cola Retail. Res. Council.
- Coca-Cola Retail. Res. Council. Asia. 2007. *Food retail formats in Asia: understanding format success*. Study by IBM Glob. Bus. Serv. for the CCRRC
- Coe NM, Wrigley N, eds. 2009. *The Globalization of Retailing*. Vols. 1–2. Cheltenham, UK: Edward Elgar
- Davis JH, Goldberg RA. 1957. *A Concept of Agribusiness*. Boston: Div. Res., Grad. Sch. Bus. Admin., Harv. Univ.

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- Dries L, Germeji E, Noev N, Swinnen JFM. 2009. Farmers, vertical coordination, and the restructuring of dairy supply chains in Central and Eastern Europe. *World Dev.* 37(11):1742–58
- Dries L, Reardon T. 2005. Central and Eastern Europe: impact of food retail investments on the food chain. *Rep. Ser. 6*, FAO Invest. Cent., EBRD Coop. Program, London
- Dries L, Reardon T, Swinnen J. 2004. The rapid rise of supermarkets in Central and Eastern Europe: implications for the agrifood sector and rural development. *Dev. Policy Rev.* 22(5):525–56
- Dries L, Swinnen J. 2004. Foreign direct investment, vertical integration and local suppliers: evidence from the Polish dairy sector. *World Dev.* 32(9):1525–44
- Dries L, Swinnen JFM. 2010. The impact of interfirm relationships on investment: evidence from the Polish dairy sector. *Food Policy* 35:121–29
- Echánove F, Reardon T. 2006. *Wholesale markets, horticulture products, and supermarkets in Mexico*. Staff Pap. 2006-17, Mich. State Univ., East Lansing: Mich.
- Escobal J, Agreda V. 1997. *Análisis de la competitividad y la eficiencia en el Mercado mayorista de productos agropecuarios en Lima*. GRADE, Lima
- Escobal J, Agreda V, Reardon T. 2000. Institutional change and agroindustrialization on the Peruvian coast: innovations, impacts, and implications. *Agric. Econ.* 23(3):267–78
- Eswaran M, Kotwal A. 1985. A theory of contractual structure in agriculture. *Am. Econ. Rev.* 75: 353–67
- Evans D. 1989. Alternative perspectives on trade and development. In *Handbook of Development Economics*, Vol. 2, ed. HB Chenery, TN Srinivasan, pp. 1241–304. Amsterdam: North-Holland
- Fafchamps M, Vargas-Hill R, Minten B. 2008. Quality control in nonstaple food markets: evidence from India. *Agric. Econ.* 38(3):251–66
- Faiguenbaum S, Berdegú JA, Reardon T. 2002. The rise of supermarkets in Chile: effects on producers in the horticulture, dairy, and beef chains. *Dev. Policy Rev.* 20(4):459–71
- Fałkowski J. 2012. Vertical coordination, access to capital, and producer loyalty in the Polish dairy sector. *Agric. Econ.* 43:155–64
- Farina EMMQ. 2002. Consolidation, multinationalization, and competition in Brazil: impacts on horticulture and dairy product systems. *Dev. Policy Rev.* 20(4):441–57
- Farina EMMQ, ed. 1997. *Estudos de Caso em Agribusiness, Focalizando as Seguintes Empresas: Moinho Pacífico, Illycaffè, Cocamar, Sadia, Iochpe-Maxion, Norpac*. São Paulo: Pioneira
- Farina EMMQ, Gutman GE, Lavarello PJ, Nunes R, Reardon T. 2005. Private and public milk standards in Argentina and Brazil. *Food Policy* 30(3):302–15
- Farina EMMQ, Machado EL. 1999. *Government regulation and business strategies in the Brazilian fresh fruit and vegetable market*. Presented at Bras. Gest. Sist. Agroaliment., 2nd, organized by PENZA/FEA/USP, Ribeirão Preto
- Gehlhar M, Regmi A, eds. 2005. *New directions in global food markets*. *Agric. Inf. Bull.* 794, Econ. Res. Serv., US Dep. Agric., Washington, DC
- Gereffi G. 1999. International trade and industrial upgrading in the apparel commodity chain. *J. Int. Econ.* 48:37–70
- Goldberg RA. 1965. Marketing costs and margins: current use in agribusiness market-structure analysis. *J. Farm Econ.* 47(5):1352–65
- Goldman A. 1974. Outreach of consumers and the modernization of urban food retailing in developing countries. *J. Mark.* 38(4):8–16
- Goldman A. 1982. Adoption of supermarket shopping in a developing country: a selective adoption phenomenon. *Eur. J. Mark.* 16(1):17–26
- Goldman A, Ramaswami S, Krider RE. 2002. Barriers to the advancement of modern food retail formats: theory and measurement. *J. Retail.* 78:281–95
- Goldman A, Vanhonacker W. 2006. *The food retail system in China: strategic dilemmas and lessons for retail internationalization/modernization*. Presented at Glob. Retail Conf., Univ. Surrey, Guildford, UK
- Gómez MI, Barrett CB, Buck LE, De Groot H, Ferris S, et al. 2011. Research principles for developing country food value chains. *Science* 332(6034):1154–55
- Goodhue RE. 2011. Food quality: the design of incentive contracts. *Annu. Rev. Resour. Econ.* 3:119–40



- Goodhue RE, Rausser GC. 2003. Value differentiation. *J. Agric. Resour. Econ.* 28(3):375–95
- Gorton M, Sauer J, Supatpongkul P. 2011. Wet markets, supermarkets and the “big middle” for food retailing in developing countries: evidence from Thailand. *World Dev.* 39(9):1624–37
- Gow H, Swinnen J. 2001. Private enforcement capital and contract enforcement in transition economies. *Am. J. Agric. Econ.* 83(3):686–90
- Gow HR, Swinnen JFM. 1998. Up- and downstream restructuring, foreign direct investment, and hold-up problems in agricultural transition. *Eur. Rev. Agric. Econ.* 25(3):331–50
- Greif A. 1993. Contract enforceability and economic institutions in early trade: the Maghribi traders’ coalition. *Am. Econ. Rev.* 83(3):525–48
- Hagglblade S. 2007. Subsector supply chains: operational diagnostics for a complex rural economy. In *Transforming the Rural Nonfarm Economy: Opportunities and Threats in the Developing World*, ed. S Hagglblade, P Hazell, T Reardon, pp. 352–80. Baltimore, MD: Johns Hopkins Univ. Press
- Henderson V. 2002. Urbanization in developing countries. *World Bank Res. Obs.* 17(1):89–112
- Hennessy D, Roosen J, Miranowski J. 2001. Leadership and the provision of safe food. *Am. J. Agric. Econ.* 84(4):862–74
- Hernández R, Reardon T, Berdegue JA. 2007. Supermarkets, wholesalers, and tomato growers in Guatemala. *Agric. Econ.* 36(3):281–90
- Hirschman AO. 1958. *The Strategy of Economic Development*. New Haven, CT: Yale Univ. Press
- Ho SC. 2005. Evolution versus tradition in marketing systems: the Hong Kong food-retailing experience. *J. Public Policy Mark.* 24(1):90–99
- Hoff K, Braverman A, Stiglitz JE, eds. 1993. *The Economics of Rural Organization: Theory, Practice, and Policy*. New York: Oxford Univ. Press
- Hoffman AC. 1940. Changing organization of agricultural markets. *J. Farm Econ.* 22(Febr.):162–72
- Hu D, Reardon T, Rozelle S, Timmer P, Wang H. 2004. The emergence of supermarkets with Chinese characteristics: challenges and opportunities for China’s agricultural development. *Dev. Policy Rev.* 22(4):557–86
- Huang J, Dong X, Wu Y, Zhi H, Nui X, et al. 2007. Regoverning markets: the China micro-level study. *Rep.*, Cent. Chin. Agric. Policy, Chin. Acad. Sci., Beijing
- Humphrey J. 2003. Globalization and supply chain networks in the auto industry: Brazil and India. *Glob. Netw.* 3:121–41
- Jaffee S, Morton J, eds. 1995. *Marketing Africa’s High-Value Foods: Comparative Experiences of an Emergent Private Sector*. Dubuque, IA: Kendall Hunt
- Jayne TS, Jones S. 1997. Food marketing and pricing policy in eastern and southern Africa: a survey. *World Dev.* 25(9):1505–27
- Kaplinsky R, Morris M. 2000. *A Handbook for Value Chain Research*. Ottawa: Int. Dev. Res. Cent.
- Key N, Runsten D. 1999. Contract farming, smallholders, and rural development in Latin America: the organization of agroprocessing firms and the scale of outgrower production. *World Dev.* 27(Febr.):381–401
- Lazzarini SL, Chaddad FR, Cook ML. 2001. Integrating supply chain and network analysis: the study of netchains. *J. Chain Netw. Sci.* 1(1):7–22
- Lele U. 1971. *Grain Marketing in India: Private Performance and Public Policy*. New York: Cornell Univ. Press
- Leontief WW. 1936. Quantitative input and output relations in the economic Systems of the United States. *Rev. Econ. Stat.* 18(3):105–25
- Levenstein H. 1988. *Revolution at the Table*. New York: Oxford Univ. Press
- Loader R. 1997. Assessing transaction costs to describe supply chain relationships in agri-food systems. *Supply Chain Manag.* 2(1):23–35
- Louw A, Chikazunga D, Jordaan D, Bienabe E. 2008. Restructuring food markets in South Africa: dynamics in context of the tomato sub sector. *Meso Rep.*, Regov. Mark. Program, Univ. Pretoria
- Michelson H, Reardon T, Perez F. 2012. Small farmers and big retail: trade-offs of supplying supermarkets in Nicaragua. *World Dev.* 40(2):342–54

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- Milgrom P, Roberts J. 1990. The economics of modern manufacturing: technology, strategy, and organization. *Am. Econ. Rev.* 80(3):511–28
- Minot N. 1986. *Contract farming and its effect on small farmers in less developed countries*. Work. Pap. 31, Int. Dev. Pap., Mich. State Univ. East Lansing, Mich.
- Minten B, Randrianarison L, Swinnen JFM. 2009. Global retail chains and poor farmers: evidence from Madagascar. *World Dev.* 37(11):1728–41
- Minten B, Reardon T, Sutradhar R. 2010. Food prices and modern retail: the case of Delhi. *World Dev.* 38(12):1775–87
- Morisset M, Kumar P. 2012. Performance of food processing industry in India, 1989–2008. *J. Ind. Stat.* 1(1):17–28
- Natawidjaja R, Reardon T, Shetty S, Noor TI, Perdana T, et al. 2007. Horticultural producers and supermarket development in Indonesia. *World Bank Rep.* 38543, World Bank, Jakarta
- Nestle M. 2007. *Food Politics: How the Food Industry Influences Nutrition and Health*. Berkeley: Univ. Calif. Press
- Neven D, Odera M, Reardon T, Wang H. 2009. Kenyan supermarkets and emerging middle-class horticultural farmers, and employment impacts on rural poor. *World Dev.* 37(11):1802–11
- Nicholls WH. 1941. *A Theoretical Analysis of Imperfect Competition with Special Application to the Agricultural Industries*. Ames, IA: Iowa State Collage Press
- Pingali P. 2006. Westernization of Asian diets and the transformation of food systems: implications for research and policy. *Food Policy* 32:281–98
- Pollan M. 2006. *The Omnivore's Dilemma: A Natural History of Four Meals*. New York: Penguin
- Porter ME. 1985. *Competitive Advantage: Creating and Sustaining Superior Performance*. New York: Free Press
- Posri W, Chadbunchachai S. 2006. Consumer attitudes towards and willingness to pay for pesticide residue limit compliant “safe” vegetables in Northeast Thailand. *J. Int. Food Agribus. Mark.* 19(1): 81–101
- Rao EJO, Qaim M. 2011. Supermarkets, farm household income, and poverty: insights from Kenya. *World Dev.* 39(5):784–96
- Rashid S, Cummings R, Gulati A. 2007. Grain marketing parastatals in Asia: results from six case studies. *World Dev.* 35(11):1872–88
- Rasmussen PN. 1958. *Studies in Intersectorial Relations*. Amsterdam: North-Holland
- Rausser GC. 1971. *A dynamic econometric model of the California-Arizona orange industry*. PhD thesis. Univ. Calif., Davis
- Reardon T, Barrett CB, Berdegue JA, Swinnen JFM. 2009. Agrifood industry transformation and small farmers in developing countries. *World Dev.* 37(11):1717–27
- Reardon T, Berdegue JA. 2002. The rapid rise of supermarkets in Latin America: challenges and opportunities for development. *Dev. Policy Rev.* 20(4):317–34
- Reardon T, Berdegue JA, Echánove F, Cook R, Tucker N, et al. 2007a. Supermarkets and horticultural development in Mexico: synthesis of findings and recommendations to USAID and GOM. *Rep.* submitted by Mich. State Univ. to USAID (Mexico) and USDA (Washington, DC)
- Reardon T, Chen KZ, Song F, Liu X, Farina E, et al. 2012a. Energy efficiency and carbon footprint—two-way links with food supply chains and food security. *Glob. Food Secur.* 1(2):in press
- Reardon T, Codron J-M, Busch L, Bingen J, Harris C. 1999. Global change in agrifood grades and standards: agribusiness strategic responses in developing countries. *Int. Food Agribus. Manag. Rev.* 2(3):195–205
- Reardon T, Henson S, Berdegue J. 2007b. “Proactive fast-tracking” diffusion of supermarkets in developing countries: implications for market institutions and trade. *J. Econ. Geogr.* 7(4):1–33
- Reardon T, Hopkins R. 2006. The supermarket revolution in developing countries: policies to address emerging tensions among supermarkets, suppliers, and traditional retailers. *Eur. J. Dev. Res.* 18(4): 522–45
- Reardon T, Minten B. 2011. Surprised by supermarkets: diffusion of modern food retail in India. *J. Agribus. Dev. Emerg. Econ.* 1(2):134–61



- Reardon T, Minten B, Chen KZ. 2012b. *The Quiet Revolution in Staple Food Value Chains in Asia: Enter the Dragon, the Elephant, and the Tiger*. Manila: Asian Dev. Bank
- Reardon T, Timmer CP. 2007. Transformation of markets for agricultural output in developing countries since 1950: How has thinking changed? In *Handbook of Agricultural Economics 3: Agricultural Development: Farmers, Farm Production and Farm Markets*, ed. RE Evenson, P Pingali, 55:2808–55. Amsterdam: Elsevier
- Reardon T, Timmer CP, Barrett CB, Berdegue JA. 2003. The rise of supermarkets in Africa, Asia, and Latin America. *Am. J. Agric. Econ.* 85(5):1140–46
- Reardon T, Timmer CP, Minten B. 2010. The supermarket revolution in Asia and emerging development strategies to include small farmers. *Proc. Natl. Acad. Sci. USA*. doi: 10.1073/pnas.1003160108
- Rubey L. 1995. The impact of policy reform on small-scale agribusiness: a case study of maize processing in Zimbabwe. *Afr. Rural Urban Stud.* 2(2–3):93–119
- Samiee S. 1993. Retail and channel considerations in developing countries: a review and research propositions. *J. Bus. Res.* 27(2):103–29
- Schejtman A. 1996. Agroindustry and small-scale agriculture: conceptual guidelines for a policy to encourage linkage between them. *Rep. LC/R.1660*, Com. Econ. Am. Lat. Caribe (CEPAL), Santiago, Chile
- Schertz LP, Daft LM, eds. 1994. Food and agricultural markets: the quiet revolution. *Natl. Plan. Assoc. (NPA) Rep. 270*, NPA, Food Agric. Comm., Econ. Res. Serv., US Dep. Agric., Washington, DC
- Senauer B, Sahn D, Alderman H. 1986. The effect of the value of time on food consumption patterns in developing countries: evidence from Sri Lanka. *Am. J. Agric. Econ.* 68(4):920–27
- Sexton RJ. 2000. Industrialization and consolidation in the U.S. food sector: implications for competition and welfare. *Am. J. Agric. Econ.* 82(5):1087–104
- Sexton RJ, Lavoie N. 2001. Food processing and distribution: an industrial organization approach. In *Handbook of Agricultural Economics*, Vol. 1, ed. B Gardner, G Rausser, pp. 863–923. Amsterdam: Elsevier
- Shwedel K. 2003. *Sector agroalimentario en México*. Presented at Conglom. Empresas Transnac., CEPAL, Santiago de Chile
- Stokke HE. 2009. Multinational supermarket chains in developing countries: Does local agriculture benefit? *Agric. Econ.* 40:645–56
- Stringer R, Sang N, Croppenstedt A. 2009. Producers, processors, and procurement decisions: the case of vegetable supply chains in China. *World Dev.* 37(11):1773–80
- Swinnen JFM, ed. 2007. *Global Supply Chains, Standards and the Poor*. Wallingford, UK: CABI
- Swinnen JFM, Maertens M. 2007. Globalization, privatization, and vertical coordination in food value chains in developing and transition countries. *Agric. Econ.* 37(Suppl. 1):89–102
- Swinnen JFM, Vandeplas A. 2010. Market power and rents in global supply chains. *Agric. Econ.* 41(Suppl. 1):109–20
- Timmer CP. 2009. *A World without Agriculture: The Structural Transformation in Historical Perspective*. Henry Wendt Lecture, Am. Enterp. Inst.
- Traill WB. 2006. The rapid rise of supermarkets? *Dev. Policy Rev.* 24(2):163–74
- Traub LN, Jayne TS. 2008. The effects of price deregulation on maize marketing margins in South Africa. *Food Policy* 33(3):224–36
- Vandemoortele T, Rozelle S, Swinnen JFM, Xiang T. 2012. Quality and inclusion of producers in value chains: a theoretical note. *Rev. Dev. Econ.* 16(1):122–36
- von Braun J, Hotchkiss D, Immink M. 1989. Non-traditional export crops in Guatemala: effects on production, income, and nutrition. *Res. Rep. 73*, IFPRI, Washington, DC
- Wang H, Dong X, Rozelle S, Huang J, Reardon T. 2009. Producing and procuring horticultural crops with Chinese characteristics: the case of Northern China. *World Dev.* 37(11):1791–801
- Wilkinson J, Rocha R. 2009. Agro-industry trends, patterns and development impacts. In *Agro-Industries for Development*, ed. CA da Silva, D Baker, AW Shepherd, C Jenane, S Miranda-da-Cruz, pp. 46–92. New York: CABI
- Williamson OE. 1981. The economics of organization: the transaction cost approach. *Am. J. Sociol.* 87(3):548–77

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