Linking Urban Consumers and Rural Farmers in India
A Comparison of Traditional and Modern Food Supply Chains

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ABSTRACT

Food supply chains are being transformed in a number of developing countries due to widespread changes in urban food demand. To better anticipate the impact of this transformation and thus assist in the design of appropriate policies, it is important to understand the changes that are occurring in these supply chains. In a case study of India, we find that overall urban consumption is increasing; the urban food basket is shifting away from staples toward high-value products; and modern market channels (modern retail, food processing, and the food service industry) are on the rise. We document differing practices in traditional and modern food supply chains and identify an agenda for future research.

Keywords: agricultural marketing, market transformation, India, rural-urban linkages

1. INTRODUCTION

Food supply chains from rural producers to urban consumers are being transformed in a number of developing countries due to widespread changes in urban food demand: overall urban consumption is increasing; the food basket is shifting away from staples toward high-value products such as dairy products, meat, fish, fruits, and vegetables (e.g., Pingali 2007; Gulati et al. 2007); consumers require more variety and choice; they consume more processed and ready-to-eat food; and they are increasingly concerned about food quality and safety (e.g., Jaffee and Henson 2004; Swinnen 2007). These changes are in turn being driven by income growth; urbanization; changes in lifestyle, with more women working outside the home; access to technology such as refrigerators and microwave ovens; the development of better packaging technologies; and the entrance of modern marketing channels, including modern retail, the processing sector, and the food service industry (e.g., Reardon and Timmer 2007; Reardon et al. 2003). To better anticipate the impact of this transformation and thus assist in the design of appropriate policies, it is important to better understand the changes that are occurring in these supply chains.

Our objective in this paper is to conceptualize changes—and their impacts—in rural-urban food supply chains, to examine the evidence of changes in the rural-urban food supply chain in the case of India, and to indicate needed research in this area. We find that three important changes are taking place. First, there is significant growth in the rural-urban food supply chain. Based on a series of representative national household surveys—the National Sample Surveys (NSSs)—annual urban food expenditures were valued at about US$45 billion in total in 2006. Driven by increasing urbanization and population growth, this is a real threefold increase compared to 35 years earlier. Moreover, while urban food expenditures made up about one-quarter of total national food expenditures 35 years ago, this had increased to more than one-third by 2006. Given that this increasing food consumption has not been made up by imports—as India exports more than it imports (now and 35 years ago)—this implies that relatively and absolutely larger quantities of food are shipped from rural areas to urban areas. Second, the composition of the food shipped to urban areas has changed significantly, as the share of cereal consumption in the urban food basket has declined from 36percent in 1972 to 23percent in 2006. Third, all "modern" market channels—private-sector-led (modern retail, food processing, the food service industry) as well as public-sector-led (the parastatals)—show higher annual growth rates than do overall urban food expenditures.[1] The growth of modern retail in recent years has been estimated at 65 percent annually, the food service industry (restaurants, fast-food, takeaway, cafés/bars, food stalls / kiosks) overall at 9 percent, the processing sector at 7 percent, and parastatal marketing at 7 percent. As urban food expenditures grew more slowly (at 3.4 percent annually over the last 10 years, based on the NSSs), this indicates the increasing relative and absolute importance of modern channels in food supply chains. These growth and diversification trends in urban demand and the increasing importance of modern marketing channels are expected to continue in the future, and they might have important implications for all stakeholders in rural-urban food supply chains.

The structure of the paper is as follows. In the following section, we present a simplified conceptual framework for understanding the changes in the food supply chain between rural producers and urban consumers. In Section 3, we describe the rural-urban food supply chain and the changes in urban food demand that are occurring in India. In Section 4, we discuss the benefits and drawbacks of the traditional marketing channel based on the results of a small primary survey that we conducted with farmers and traders who use this traditional channel for the marketing of vegetables. We examine the modern marketing channels in India in Section 5. We provide our conclusions and suggestions for further research in Section 6.

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[1] The processing sector and the food service industry consist of an informal and a formal, modern sector. With the data available, it is difficult to obtain separate numbers on their growth rates. However, for both of these sectors, the formal sector is significantly more important than the informal sector in terms of the share of output (for more details, see Section 5).

2. CONCEPTUAL FRAMEWORK

Transformation of the Food Supply Chain

A simplified conceptual framework for understanding the changes in rural-urban food supply chains is shown in Figure 1. Various drivers are changing urban food demand in most developing countries. These drivers include, most importantly, (1) urbanization (a larger share of the population in developing countries is living in urban centers; given that population growth in these countries is often high, a rapid increase in the urban population overall is usually seen); (2) income growth (an important increase in average incomes and a reduction in poverty levels has been seen in a number of developing countries in recent years); (3) changing lifestyle and female participation in the workplace (women have traditionally taken care of agricultural production and/or food preparation, but as they are increasingly entering into the urban labor force, they often have less time to spend on these activities); and (4) increasing access to better technologies (these include, at the household level, the spread of refrigerators, microwave ovens, and gas stoves, which allow for the use of different foods and food preparation methods, and at the industry level, access to better food packaging technology—with the rise of Tetra Pak, for example, which has made packaged milk and juices available in mass markets).

These changes have led urban consumers in developing countries to demand a different food basket: (1) the quantity, per person and overall, that is demanded from urban food markets is increasing faster than in rural areas; (2) the composition of the food basket is different, as better-off consumers often shift away from grains and consume relatively more high-value products such as fruits and vegetables, dairy products, meat, and fish,[2] as well as more processed food for convenience; (3) there is a demand for more choices per product and a greater variety of food products in general; and (4) urban customers in developing countries are also increasingly concerned about quality and safety issues with regard to their food, especially as safety issues tend to be more correlated with nonstaple foods. Demand by urban customers is transmitted through the marketing sector or supply chain to the rural producer. This chain ensures that a primary agricultural product is delivered to the customer in the right form, at the right time, and in the right location.

Marketing margins, defined as the difference between the retail price and the producer price, are a reflection of the costs incurred in this process of delivering food from the rural producer to the urban consumer. Marketing costs reflect physical handling costs, transaction costs, and potentially rents. They differ per product, as physical handling costs (transport, handling, processing, storage, traceability, etc.) vary by product. The degree of perishability often affects the physical costs, as higher losses, as well as higher risks, are expected to be reflected in the final price of more perishable goods. On top of the physical marketing costs such as transport and handling, marketing margins also reflect costs incurred in the process of conducting transactions between different agents that have imperfect information. Williamson (1979) refers to these costs as transaction costs. Transaction costs are incurred in second-best contractual arrangements, as the first-best solutions are reached only in competitive markets with perfect information. These transaction costs include information costs, bargaining costs, enforcement costs, search costs, externality costs, and the costs of nonoptimal risk sharing. These costs might be substantial, especially in developing-country settings (Fafchamps 2004). A third potential component of marketing costs that are reflected in higher food prices (and partially borne by farmers) is oligopsonistic or monopsonistic profits extracted where middlemen have market power.

The changing requirements of urban consumers lead to a restructuring of food supply chains. The final food supply chain arrangements are, however, shaped not only by these demand factors. Conditioning factors such as geography,[3] the population structure,[4] the structure of the financial sector,

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[2] This shift is more commonly known as Bennett's law (Bennett 1941).
[3] For example, Reardon, Stamoulis, and Pingali (2007) show how changes might be strongly related to geographical locations.

and the reliability of the justice system, among others, are important in shaping the final outcome of the chain. Policy factors also play an important role, be it regulation, hard infrastructure, institutions, international trade, or foreign direct investment (FDI) rules.[5]

Changes in the supply chain are ultimately transmitted to the rural producer. His or her production environment and livelihood might change due to the different crops that he or she is required to grow and due to changes in input as well as output prices. Moreover, other types of labor, land, inputs and technologies may be used, and new requirements of the market, including transaction requirements (such as postharvest handling) might translate into additional investments. The producer's behavior is, however, influenced not only by market forces but by nonpolicy conditioning factors and policy factors as well. The rural nonfarm economy will often strongly condition the ability of the farmer to make the requisite investments to respond to the requirements of the transformed supply chain (Reardon, Stamoulis, and Pingali 2007).

The differential pull and push factors lead to a difference in food supply chains across countries and products—as reflected in different types of institutional arrangements, which range from spot market exchanges to full vertical integration, in which the stages of marketing, transaction, and production are linked through ownership rather than through market exchanges (Swinnen 2007). These factors will also lead to a different growth path for the modern sector within the food supply chain. Better vertical coordination mechanisms might result in significant cost savings for the firms involved in the modern sector, and economies of scale could potentially lead to lower prices to the consumer, higher prices for the producer, and/or more quantity traded in the sector. However, growth might be constrained by policy factors and conditioning factors, as well as the specific structure of rural supply and urban demand (Swinnen et al. 2008).

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[4] Increasing urbanization leads to an increasing scarcity of labor in rural areas and might, through induced innovation, force the adoption of new, less labor-intensive technologies.
 [5] For a more detailed discussion, see Reardon and Timmer (2007).

Figure 1. Conceptual framework for understanding changes in food supply chains between rural producers and urban consumers

Policy factors

- Regulation
- Infrastructure
- Institutions
- International trade
- Foreign direct investment

Drivers for change

- Urbanization
- Income growth
- Lifestyle change
- Access to different technologies

Changes in urban demand

- Quantity
- Quality
- Variety
- Composition
- Food safety
- Presentation

Changes in marketing sector

- Transportation
- Storage
- Processing
- Packing/grading
- Certification
- Traceability
- Transacting

Changes for rural producers

- Crops planted
- Quantity
- Input/output price
- Labor use
- Land use
- Input use
- Technology use

Conditioning factors

- Geography
- Land tenure
- Population structure
- Financial sector
- Justice system

4

Impact on Poverty

The effects of changes in food supply chains on poverty are strongly debated in the literature. Minot and Roy (2007) distinguish four pathways by which they might affect poverty: through a direct effect on farm income, through backward linkages to agricultural input suppliers, by changing wages and employment, and by affecting the food prices faced by consumers. Using this distinction, we briefly review below some of the relevant literature.

First, significant research has examined the effects of these changes on farm income. Higher standards might lead to higher technical requirements, which in turn translate into physical investments, human capital investments, more coordination costs, and practice changes at the farm level (Reardon et al. 1999). Minot and Roy (2007) argue that the effects on smallholders in particular depend on five factors, including the relative costs of production, the relative costs of marketing, the agrarian structure, the nature of consumer demand, and the nature of marketing institutions. This theoretical differential effect is reflected in the empirical research (for a detailed overview, see Reardon et al., forthcoming). While some authors find that smallholders are left out of modern supply chains (e.g., Danielou and Ravry 2005; Key and Runsten 1999; Weatherspoon and Reardon 2003), others find that smallholders can also benefit significantly from the changes, often through better access to inputs, reduced production and marketing risks, improved technology use, and higher agricultural productivity (e.g., Natawidjaja et al. 2007; Hernández, Reardon, and Berdegué 2007; Maertens and Swinnen 2009; Swinnen 2007). Farmers involved in high-value agriculture are usually found to perform better than other farmers. However, Minot and Roy (2007) find that most of the reported research is plagued by a lack of controls for confounding factors and selection bias.

Second, a few studies have investigated the impact of changes in backward linkages. For example, Kimenye (2002) finds that high-standard green bean production has significantly higher backward linkages with input markets through the increased demand for chemical inputs, irrigation services, and so on. Hernández, Reardon, and Berdegué (2007) and Natawidjaja et al. (2007) find similar results in the cases of Guatemala and Indonesia, respectively. Minot and Roy (2007) argue that changes in backward linkages should become more prevalent due to the growth of high-value agriculture. Due to the increased demand, the organization of supply chains for inputs might improve, as urban-produced equipment and variable inputs might become cheaper because of economies of scale (e.g., von Braun and Kennedy 1994).

Third, some research has studied the effect of changing food supply chains on labor markets and employment in the food supply chains or in the agricultural sector itself. Researchers have hypothesized that poverty might be reduced because of the intensive use of unskilled labor in these new supply chains. Some recent studies have found that this impact pathway can be very important in developing countries (e.g., Barron and Rello 2000; Maertens and Swinnen 2009; McCulloh and Ota 2002; Neven et al., forthcoming; Jarvis and Vera-Toscano 2004).

Fourth, food prices in rural as well as urban areas might be affected due to the transformation of the urban economy. This might be partly due to changes in demand for quality as prices for products of the same quality go up due to higher demand, or higher qualities are delivered that fetch a higher price overall. Food prices might be different in the modern sector compared to traditional ones. For example, in a cross-country comparison, Minten and Reardon (2008) find that the prices offered in modern retail are significantly lower for almost all types of products in developing countries where modern retail has achieved significant market share. However, when the share is small, as is the case in the poorest countries, prices are found to be equal or even higher, especially for fruits and vegetables (Minten 2008). The increase in high-value agriculture might further lead to substitution away from grain production, potentially leading to price increases for basic staples. Preliminary evidence suggests that rapid growth in high-value agriculture might not imply higher food prices for staples (Minot and Roy 2007). More in-depth analysis is called for, however.

Some researchers have further tried to understand how prices are transmitted from urban consumers to producers by examining in detail the restructuring of the value chains. For example, by relying on detailed data from actors within the value chain, Natawidjaja et al. (2007) and Dawe et al. (2008) document the different costs within value chains. Fafchamps and Hill (2008) show how prices are poorly transmitted in traditional markets in Uganda. In theoretical work, Swinnen and Vandeplas (2007), Stokke (2008), and Roe and Diao (2004) model the structure of value chains, analyze the emergence of modern marketing channels, and predict, among other things, the price effect for those connected and not connected to the modern channel.

The spatial dimension has also been used explicitly to explore the effect of urban-rural linkages on agricultural marketing patterns and poverty. For example, a number of studies have analyzed how agricultural productivity and marketing patterns among rural households change with distance to urban areas (e.g., Fafchamps and Shilpi 2003; Stifel and Minten 2008; Minten and Kyle 1999). Other studies have examined the relationship between rural poverty and proximity to urban areas (Minot 2008; Minot, Baulch, and Epprecht 2006; Jacoby and Minten, forthcoming).

3. RURAL-URBAN FOOD SUPPLY CHAINS IN INDIA

Structure of the Food Supply Chain

Figure 2 presents a simplified diagram of the food supply chain from rural producers to urban consumers in India. While there might be large differences by product, producers are linked to urban consumers through a variety of channels. As exact numbers on the sizes of the different channels differ by product, and are often hard to obtain, we will limit ourselves to a generic discussion.[6] The most important channel from rural producers to urban consumers is the traditional channel that passes through agricultural wholesale markets and traditional urban retail. Four alternative marketing channels are distinguished in our diagram: modern retail/cooperatives, the processing sector, the food service sector, and parastatal marketing.

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[6] Not all channels are relevant for all products—for example, only a limited number of products are procured and distributed by the parastatals, and some products are not being processed.

Figure 2. Simplified diagram of the agricultural product flow from rural producers to urban consumers in India
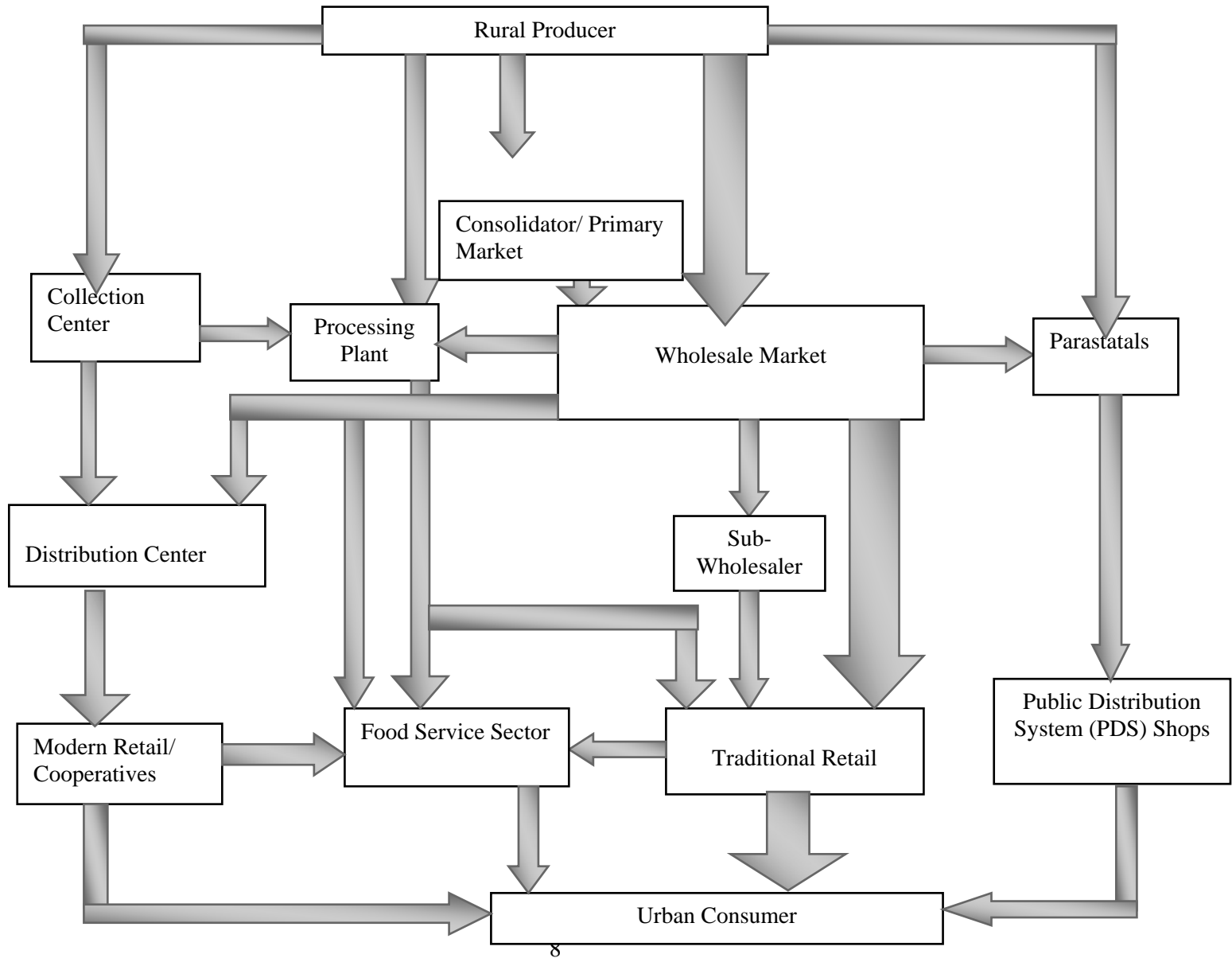
The alternative marketing channels might not or might partly rely on traditional marketing channels (Figure 1). It seems that the majority of the produce in the alternative market channels originates from the traditional wholesale markets (Reardon et al., forthcoming). However, the alternative channels also develop supply chains that are independent of the traditional sector. For example, some of the modern retailers and cooperatives have set up their own collection centers in rural areas, where they procure directly from the producers (Reardon et al., forthcoming). However, this direct procurement is still relatively less important for modern retail as well as in the rural-urban food supply chains overall, often due to prohibitions by law.

The Indian government has also set up its own food procurement and distribution systems, often not relying on the traditional channels. These public intervention programs, however, focus on only a limited number of crops (most notably rice and wheat, but also some others). Even if the government is not directly involved in the food supply chain, it still heavily regulates private agricultural trade, for staples as well as non-staples. Regulation has been deemed important by successive governments as a means to protect vulnerable households, to allow smallholders to receive the best prices, and to prevent exploitation by unscrupulous traders (Shiva 2007; Acharya 2004). These regulations include the Essential Commodity Act (restricting movement and storage of agricultural products), the Agricultural Produce Marketing Act (under which agricultural marketing takes places through a licensed trader system), the Small Scale Industry Reservation (under which most food processing was reserved for small firms, until 1997), and more general policies that also affect other sectors, such as tax policy, border and commercial policies, food laws, and labor policies. However, a number of these laws have been relaxed over time, allowing for a potentially more important role and better investment opportunities for the private sector.

Changes in Urban Food Demand

Drivers for Change

As discussed in Section 2, at least four drivers are contributing to a change in rural-urban food supply chains. They include urbanization, income growth, changes in lifestyle (with more women working outside the home), and access to technology such as refrigerators and microwave ovens. First, the number of people living in cities is increasing, requiring more food to be shipped from rural to urban areas.[7] The share of the urban population in India increased from 18 percent in 1961 to 28 percent in 2001, based on the official definition of urban centers used by the Census of India (Table 1).

Table 1. Urbanization in India

Census Year	Urban Population (million)	% Urban Population
1961	78.93	17.97
1971	109.11	19.91
1981	159.46	23.34
1991	217.17	25.72
2001	286.20	28.54
2010 (P)	354.94	29.92
2020 (P)	429.61	32.20

Source: Population Census of India, various years; P = projections by Census of India

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[7] In the Census of India 2001, an urban area is defined as (1) any statutory place with a municipality, corporation, cantonment board, or notified town area committee, etc., or (2) a place satisfying the following three criteria simultaneously: (a) a minimum population of 5,000; (b) at least 75 percent of the male working population engaged in nonagricultural pursuits; and (c) a population density of at least 400 per km² (1,000 per sq. mile).

This share is projected to increase further, to 30 percent in 2010 and 32 percent in 2020 (Census of India). In absolute numbers, the urban population in India increased by 69 million between 1991 and 2001 and is expected to increase by another 143 million between 2001 and 2020—equivalent to about half the current population of the United States (Census of India).[8]

Second, India has been characterized by strong gross domestic product (GDP) and income growth over the past years. While GDP growth was only slightly higher than population growth from the '60s into the '80s, it has shown strong per capita growth since the liberalization of the economy in the '90s. This high economic growth is reflected in household expenditure levels. Table 2 illustrates how per capita expenditure has evolved in the last decades in urban areas, based on the results of the NSSs, the official source for the calculation of national consumption expenditures in India.[9] Application of the commonly used consumer price index (CPI) for industrial workers as a deflator shows that real total consumption expenditures increased by almost 50 percent in 2006 compared to 1972.

Table 2. Average value of expenditures per person per 30 days in urban India

	Current Expenditures (Rs)		Real Expenditures (Rs)*	
	Food	Total	Food	Total
1972/73	40.83	63.33	525.97	879.80
1977/78	57.72	96.15	468.26	820.94
1983	96.92	164.0	478.20	865.50
1987/88	140.94	249.92	522.92	975.82
1993/94	250.53	458.00	528.24	1035.03
1997	320.26	645.44	470.92	1026.74
2000/01	402.04	932.80	486.24	1159.87
2006/07	517.00	1312.00	517.00	1312.00

Source: National Sample Survey (NSS) data, various surveys
* deflated by the average consumer price index (CPI) for industrial workers, Indiastat (100 = 2006/07)

Surprisingly, food expenditures changed little over that period and remained almost stable in real terms.[10] Annual per capita urban food expenditures were equivalent to US$139, indicating that total urban food consumption amounted to about US$45 billion in 2006. Using the real expenditure levels from Table 2 and the urbanization rates for 1971 from Table 1, we can estimate that this represents a real threefold increase—driven by the increasing urban population—in the value of urban food expenditures in about 35 years.

   Third, changes in lifestyle, with more women working outside the home, also lead to different consumption patterns, as women have less time to spend on food preparation. While attempts to gain a clear picture of the issue are plagued by definitional problems, it is estimated that the participation of women in the urban labor force in India increased from 13.4 percent in 1972 to 16.6 percent in 2004 (Indiastat), a very low number compared to other countries such as China and the United States, for example.[11]

        Fourth, access to microwave ovens and refrigerators has increased over the years. Access to these technologies often leads to different food purchase behaviors, as household are able to buy food

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[8] In the development literature for countries such as India, urbanization is prone to serious measurement error. For a discussion on the topic, see Sivaramakrishnan, Kundu, and Singh (2005).

[9] There is, however, an active debate in the literature on the differential results of the National Sample Surveys (NSSs) and the National Account Statistics (NAS). For an overview, see Deaton and Kozel (2005a; 2005b).

[10] In comparing calorie consumption between 1934–84 and 2004–05, Deaton and Drèze (2009) find that average calorie consumption decreased by about 10 percent in rural areas and remained constant in urban areas over that period. Given the relative small price changes for commodities in that period, the numbers presented here are consistent with their findings, which are based on the same data set.

[11] The changing age composition of the population—India is one of the youngest nations and could become still younger over time—might also be an important determinant of changes in food consumption. The impact of this change should provide fertile ground for future research. For a discussion on this topic, see Birdsall, Kelley, and Sinding (2001).

and store it for longer periods at home. Based on a nationwide National Council of Applied Economic Research (NCAER) survey conducted in 2007, it is estimated that approximately one-third of the Indian urban population had access to a refrigerator in 2007.

Changes in Consumption Baskets

The changes in these drivers are leading to a different urban—as well as rural—consumption basket. First, the importance of cereals in overall food expenditures is declining, and the importance of high-value products such as fruits and vegetables, meat, dairy products, and fish is on the rise. This trend is illustrated in Figure 3. The share of cereals in total food expenditures in urban areas declined from 36 percent in 1972/73 to 24 percent in 2005/06 (Indiastat). The same trend is seen in rural areas, where the share of cereals declined from 56 percent to 32 percent.

Figure 3. Share of cereals in monthly per capita expenditure for total food items in India
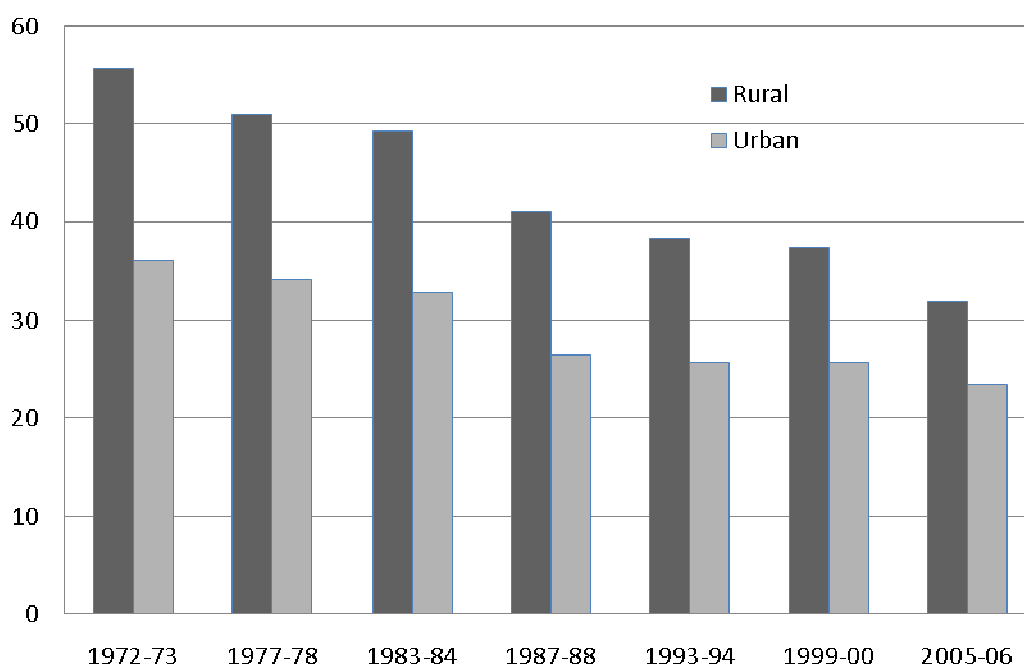
Source: Indiastat

A second trend is the increasing consumption of processed food in richer households in urban areas. Morisset and Kumar (2008a) divide the food consumption basket into different levels of processed food: Primary products are products consumed without processing; these products include fruits and vegetables, eggs, and fluid milk at the farm. First-processing products with low value added are defined as products that undergo minimal processing such as dehusking, milling, drying, and grinding. Examples are rice, flour, pulses, spices, and dried fruits. Value addition is estimated at 0 percent–5 percent. First-processing products with high value added undergo more complicated processing and have a larger value added, of between 5 percent and 15 percent. There is no adding of ingredients, and products are not mixed. Examples are dairy products such as butter and curd, but also meat, fish, and sugar. Second-processing products are products that have as an input a first-processed product and to which another product (a flavor, a preservative, or another ingredient) is added. These include biscuits, bread, ghee, ice cream, and jam. Third-processing food is associated with ready-to-eat food, prepared and packaged meals, and takeout meals (Morisset and Kumar 2008a).

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Morisset and Kumar (2008a) find that primary products that are not subject to any processing represent only about 17 percent of the value of the urban food consumption basket in India (Table 3). The majority of the consumed foods thus undergo some sort of processing. However, the value added is low (Table 3). Morisset and Kumar (2008a) further compare the level of consumption of processed food to income level in urban areas. When they divide the urban population into 12 income categories, they find that the poorest and richest groups spend about 30 percent and 58 percent, respectively, of their food budget on a relatively highly processed food category (high-value first-processing and second-processing products).

Table 3. Indian food consumption expenditures according to the level of processing (in %), 2004/05

	Urban	Rural
Primary products	16.8	15.3
First processing—low value added (0%–5%)	34.8	43.9
First processing— high value added (5%–15%)	38.2	35.1
Second processing	10.2	5.7
Total	100.0	100.0

Source: Morisset and Kumar (2008a)

This result implies that when incomes rise, the consumption of processed food increases in importance. Unfortunately, no analysis has been performed on the significance of this trend over a longer period.

4. TRADITIONAL FOOD SUPPLY CHAINS

Background

At the time of India's independence, agricultural marketing was perceived to be badly organized, leading to low prices for the producer, large physical losses, and high marketing costs. A large number of regulations were thus put in place—including controls on private storage, transport, processing, exports, imports, credit access, and market infrastructure development, as well as small-scale reservation of selected enterprises—to ensure a reasonable income for farmers as well as affordable prices for consumers (World Bank 2007).

One of the government's interventions was to regulate agricultural markets through Agricultural Produce Marketing Committees (APMCs) and to establish a large number of market yards (Acharya 2004). While some have argued that the regulated marketing system has served farmers well over time (Acharya 2004), this view is now increasingly questioned due to several problems with the regulated system. These include farmers being prohibited from buying outside the market yard, the large area served per market yard, the increased importance of bureaucrats in the management of the APMCs, the creation of barriers to entry for newcomers, and the use of market fees as a source of income for the government (Archarya 2004).

Wholesale markets (*mandis*) numbered 268 at Independence. It is estimated that there were around 6,300 wholesale markets in India in 2007 (Chauhan 2008). Acharya (2004) estimates that 98 percent of these markets were in some way "regulated" in 2004. There are also a large number of rural primary/temporary markets (20,870), which might supply wholesale markets located in urban centers. While farmers might have the option—depending on regulation and on the enforcement of this regulation—to go through local village traders, who might be independent or who might work for specific commission agents in the wholesale markets, Fafchamps, Vargas-Hill, and Minten (2008) find that the majority of nonstaple foods is sold directly to brokers or traders on the wholesale markets by the rural producers themselves, even in cases where the law does not require them to do so. Sub-wholesalers, who buy on the wholesale markets but do not sell to consumers themselves, or retailers, who do sell directly to consumers, buy produce on these wholesale markets. The latter then distribute these products by pushcarts, in kirana stores, or at wet markets to urban consumers.

Typically, farmers bring their produce to the wholesale market and to the shop of the broker with whom they would like to work. Buyers then pick the produce up from there. Transactions take place mostly by means of an open-outcry auction, managed by a broker who does not take possession but rather just takes commission (therefore called a "commission agent").[12] As lots are auctioned, new prices are set. The scant recent research on these traditional marketing systems indicates that these markets (1) are not efficient (Matoo, Mishra, and Narain 2007; Ramaswami and Balakrishnan 2002; Umali-Deininger and Deininger 2001; Thomas 2003), (2) lack integration (Palaskas and Harriss-White 1996), (3) are plagued by trader collusion (Banerji and Meenakshi 2004), and (4) are characterized by a high level of physical wastage (Matoo, Mishra, and Narain 2007). It has also been found that the wholesale market infrastructure for staple as well as nonstaple crops is not very developed (Fafchamps, Vargas-Hill, and Minten 2008). The majority of wholesale markets are not paved, and there are few grading or cold storage facilities. Sanitation facilities are largely deficient, with few public toilets, inadequate drainage, and little or no coordinated pest control. As can be expected, postharvest losses are rather large in this trading environment.

Agricultural marketing within a particular state is regulated by the Agricultural Produce Marketing (APM) Act, and variation exists between the states in terms of the extent to which the act is implemented. If it is implemented, an APMC is responsible for enforcing the act for each market area. Although more than half the members of this committee were representing the farmers of the market

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[12] Unfortunately, no statistics exist on either their geographic coverage or the percentage of crops they handle compared to the wholesaler who takes possession.

area at the start of the regulated market system, elections have not been held regularly, and committees are now often administrated by bureaucrats (Acharya 2004). The committee is empowered to establish markets, control and regulate the admission of traders to the market, charge fees (market, license, and rental fees), issue and renew licenses, and suspend or cancel licenses. Over time, APMCs have emerged as a government-sponsored marketing-services monopoly that prohibits innovations such as contract farming and does not allow traders to buy outside the specified market yards (Acharya 2004). While the APMC also collects significant revenues from market fees, the infrastructure in most markets is largely deficient, as revenues are often directed toward other ends by the government (Umali-Deininger and Sur 2007; Fafchamps, Vargas-Hill, and Minten 2008).

Under the APMC marketing system, it seems that the bulk of trade in agricultural commodities takes place at the wholesale market, run and operated by the APMC. The committee allots shops to desirous agents who meet basic eligibility criteria (based on nationality, solvency, and other not particularly restrictive criteria) upon payment of a (rather small) license fee. Typically, the number of license holders greatly exceeds the number of shops available in the yard of the typical wholesale market. Legally, such license holders have equal right to transact business, but effectively the lack of space for trading often severely curtails their business. Licenses once awarded can be easily renewed annually. Invariably, members of the same family transact business at the same shop, which is passed from one generation to the next. Since the number of physical shops is practically fixed and holders rarely return licenses, the advantage enjoyed by license holders who have secured a shop at a given rate is often only reinforced over time.

The government has realized that regulation of agricultural markets is less needed in today's environment and has thus made several agricultural marketing policy reforms in the last decade (see Appendix). Given the perceived problems with the existing regulated agricultural market system in particular, the central government, in consultation with state governments and the private sector, formulated an Amended Act, which was circulated to the states in 2003. The Amended Act proposes removal of the restriction of farmer direct marketing (under the regulated system, notified products can be sold only at markets, to licensed traders), the opening of market infrastructure development to other agencies (especially the private sector), and the establishment of a framework for contract farming. However, this act has not yet been amended by a large number of states; as of the beginning of 2007, of the 28 states in India, 11 states had amended the original act and 14 had not, while 2 had never had the original act in place and 1 (Bihar) repealed it (Chauhan 2008).

Data and Methodology for Our Case Study

As shown in Figure 2, a nodal point in the traditional food supply chain is the wholesale market, as the majority of marketed produce passes through it (Fafchamps, Vargas-Hill, and Minten 2008). To better understand the functioning of the wholesale market and how it fulfills its role in the chain between rural producers and urban consumers, we rely on a small but unique primary survey that was conducted in the state of Uttarakhand in northern India.[13] In this state, the APMC Act had not yet been amended at the time of the survey. The aim of the survey was to better understand the activities on these wholesale markets. After initial assessments, it seemed that wholesalers and brokers were not reliable sources of information, as their statements contrasted sharply with statements by the persons with whom they interacted. For this reason, buyers and sellers were interviewed who had just completed a transaction on these wholesale markets and piece together the functioning of brokers and wholesalers based on the interviewees' declarations.

The survey was conducted in December 2007 at the two main wholesale markets of Uttarakhand: the wholesale market of Dehradun and the wholesale market of Haldwani. Dehradun, the

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[13] To understand the marketing activities of all agricultural households and to better understand the reasons for selling on wholesale markets (which presumably only a subgroup would do), we would have had to field a representative agricultural household survey. This survey focuses exclusively on marketing on the wholesale market.

state capital, is the most important market for the Garhwal hills and the surrounding plains areas.[14] The Haldwani wholesale market is the main center of trade for fruit and vegetable produce from the Kumaon hills, as well as much of the Terai plains.[15] The survey focused on cauliflower and green peas. At the time of the survey, these were two vegetables that were being marketed in large quantities in the areas around Haldwani and Dehradun. A total of 480 persons were interviewed, 240 at the Haldwani wholesale market and 240 at the Dehradun wholesale *mandi*. Half of the surveys were conducted with farmers and half with retailers. Half of the surveyed agents were involved in green peas and half in cauliflower. Farmers and traders were both randomly selected after an enumeration procedure. Farmers were interviewed at the wholesale market, while retailers were visited at the major retail markets in the city.[16]

The survey contained detailed questions on the demographic background of the interviewee, the reasons for the choice of marketing channel and broker, and linkages with the wholesale market broker used in the last transaction involving cauliflower or green peas. Then, questions were asked on the last transaction, regarding prices and costs, the quality characteristics of the product, quality and quantity assessments by buyers, and the transaction costs that were faced during the transaction. The survey ended with questions on wholesale market practices in general.

We will first provide descriptive statistics on the farmers and retailers who participated in the survey (Table 4). There is little demographic difference between the farmers and retailers. While farmers are slightly older (47 years, versus 37 years for retailers), levels of education and sizes of households are similar. About 40 percent of each group are member of a scheduled caste, tribe, or other backward caste. Farmers seem slightly poorer: 29 percent of them carry a BPL (Below the Poverty Line) and 65 percent an APL (Above the Poverty Line) card.[17] This compares to 30 percent and 51 percent, respectively, for retailers. However, while 47 percent of the farmers own mobile phones, only 25 percent of the retailers do.

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[14] The chief crops traded here include tomato, cauliflower, bottle gourd, radish, and green peas, as well as a large number of fruits. In 2007, the Dehradun market had 13 category A shops, 34 category B shops, 78 category C shops, 56 category D shops, 10 category E shops, and a number of traders and commission agents operating out of tin sheds.

[15] The main crops traded here are potato, cauliflower, French beans, capsicum, green peas, and tomato, along with apple, peach, apricot, plum, and mango. The market has about 230 designated shops categorized as A, B, or C, given out to license-holding commission agents, and another 20-odd commission agents operate out of tin sheds (about 250 commission agent licenses have been given out).

[16] The three or four largest retail markets were selected in every city. Twenty or fewer retailers of each crop were interviewed at each of these retail markets. They could not be interviewed at the wholesale market, as they were often under time pressure to leave the wholesale market to start their retail activities.

[17] Both BPL and APL cards are ration cards distributed by the government to poorer households, to allow them cheaper access to basic necessities.

Table 4. Descriptives of farmers and retailers

		Unit	Farmers		Retailers	
			Average or %	Standard Deviation	Average or %	Standard Deviation
Demographics						
Age		years	47.2	10.4	37.3	9.8
Level of education		years	5.3	4.1	4.8	3.4
Household size		number	8.0	3.0	7.0	2.3
Member of scheduled or backward caste/tribe		%	37		39	
Wealth						
Has BPL (Below the Poverty Line) card		%	29		30	
Has APL (Above the Poverty Line) card		%	65		51	
Owns mobile phone		%	47		25	
Owns land		begha (≈ 1/15 ha)	19.0	23.0		
Owns tractor		%	29			
Owns cattle		%	88			
Product characteristics (cauliflower, green peas)						
Average sales	Both products	kg per day			36.2	31.7
	Cauliflower	kg per day			28.3	16.1
	Green peas	kg per day			44.2	40.3
Average production	Both products	tons per season	15.4	18.1		
	Cauliflower	tons per season	25.4	18.9		
	Green peas	tons per season	5.5	10.0		
Sells other products	Both products	% yes			85	
Importance in monetary income	Both products	avg %	75.2	23.9	41.3	30.3
Experience with:	Both products	years	12.6	10.9	11.6	8.3
Land cultivated with:	Both products	begha (≈ 1/15 ha)	21.5	23.5		
	Cauliflower	begha (≈ 1/15 ha)	23.1	20.8		
	Green peas	begha (≈ 1/15 ha)	20.0	25.9		
Marketing behavior						
Distance to wholesale market		km	42.1	34.8	3.5	2.1
Visits to this market		visits last 2 weeks			10.0	3.4
		visits this year	23.5	18.7		
Time spent at market		hours	3.5	2.2	2.3	1.0
Visits to other *mandi*		%	16		2	

The majority of farmers and retailers depend on other agricultural products in their business. Eighty-three percent of the farmers sold other products during the year, and 85 percent of the retailers had sold another product in the last two weeks. Both green peas and cauliflower do, however, have a

large importance for these agents: these products make up 75 percent of the annual monetary income of the interviewed farmers and represented 41 percent of the turnover of the retailers over the two weeks prior to the interviews. Both groups have similar experiences in dealing with the products under study. As could be expected, farmers and retailers have different visiting habits with regard to the wholesale markets. Retailers visit almost every day, while farmers come on average 23 times a year. Few farmers (16 percent) or retailers (2 percent) visit other markets.

In our further analysis, we first turn to the question of what the major problems are in the current marketing system based on the results of this survey. We will discuss, consecutively, the effect of regulations, the role of brokers and wholesalers, information transmission, service delivery, and competition. In the next section, we will then discuss reasons for the resilience of the traditional system.

Problems in Traditional Markets

Ineffective Regulations

An important rule of the APM Act in effect in Uttarakhand states that the broker rates are 3 percent and that a 2.5 percent tax on each transaction is to be paid to the market officials. The act states that neither of these charges is to be paid by the farmer. Using the data that were collected from interviews with farmers and retailers, we test to what extent these rules are respected. We do so by asking about the costs that farmers and retailers faced during their last transaction on the wholesale market as well as by looking at the effective net prices realized by farmers and retailers (Table 5).[18] Table 5 first presents the different rates paid by farmers and retailers to brokers.[19] We find that the average broker rate, presumably including the tax fee,[20] paid by farmers and retailers is 6 percent and 4 percent, respectively. Fifty percent of the farmers pay 8 percent, while 15 percent state that they pay 0 percent (Table 5). Broker rates differ significantly from the prescribed ones, and regulations by the APMC are not respected in two ways. First, broker rates are charged to farmers, contrary to regulations.[21] Second, the combined rates of farmers and retailers are higher than the prescribed 5.5 percent.[22]

Table 5 further documents the other costs that farmers and retailers face on the wholesale market. The total reported costs faced by the farmer (7.4 percent) and by the retailer (4.6 percent) amount to 12 percent of the value of the lot. Labor costs (for loading and off-loading) represent 1.8 percent of the total value of the transaction, while phone and weighing costs are negligible. A number of farmers also face "sampling costs" representing 0.3 percent of the value of the transaction. This broker practice implies that brokers take a head of cauliflower or a quarter kilogram of peas and set it apart for themselves, in the name of sampling.

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[18] It is noteworthy to first look at the sizes of these transactions. The average transaction size is small—for the retailer around 50 kilograms of produce, and representing between US$5 and US$15, depending on the crop. Transactions are significantly larger for farmers, indicating that brokers split up the farmers' lots.

[19] While taxes are in principle paid by the brokers, it is unclear whether they effectively do so for every transaction. In Haldwani, farmers receive slips when they enter the market, on which they indicate how much they are bringing in and which broker they will deal with. This gives the broker seemingly less room for maneuvering.

[20] As we interviewed farmers and retailers only, and not the brokers, we could not test to what extent the charged rates were used to pay for the mandated tax.

[21] We do not discuss the sense of this regulation. One would expect that in competitive markets, it should not matter for price formation at the farm level to whom the broker rates would be charged.

[22] It is also interesting to note the different practices between the various wholesale markets. While at the Haldwani market most of the brokers charge only the farmers, both farmers and retailers are charged (but thus with higher rates in total) at the Dehradun market. It is unclear why rate setting evolved differently for these two markets, despite being governed by the same APMC laws.

Table 5. Characteristics of the most recent transaction of farmers and retailers

	Unit	Farmers		Retailers	
		Average or %	Standard Deviation	Average or %	Standard Deviation
Values and quantities					
Cauliflower					
Quantity traded, mean	kg	915	579	56	55
Quantity traded, median	kg	800		40	
Value of transaction, mean	Rs	4,241	2,793	282	250
Value of transaction, median	Rs	1,400		200	
Green peas					
Quantity traded, mean	kg	220	190	52	40
Quantity traded, median	kg	150		50	
Value of transaction, mean	Rs	1,933	1,549	514	461
Value of transaction, median	Rs	3,600		355	
Commission rates charged					
Average	%	5.8	2.8	2.6	3.0
Median	%	7.0		0.0	
Percentage of brokers who charge:					
0%	%	15.4		56.7	
4%	%	7.9		0.0	
5%–5.5%	%	8.3		1.2	
6%–6.5%	%	18.3		41.2	
8%	%	49.6		0.4	
10%	%	0.4		0.4	
Costs on wholesale market					
Commission rates*	% of gross price	5.8	2.8	4.0	2.2
Labor costs	% of gross price	1.3	1.6	0.5	0.7
Phone costs	% of gross price	0.0	0.0	0.0	0.0
Weighing costs	% of gross price	0.0	0.0	0.0	0.0
Sampling costs	% of gross price	0.3	0.3	0.0	0.0
Total	% of gross price	7.4	3.8	4.6	2.4

* includes mandi taxes

     While statements on costs are informative, the real benchmarks are the net payments that farmers receive and that retailers pay when they leave the wholesale market. To formally test for the size of the differences in these net payments, we run a regression in which we regress the log of the price per kilogram paid by the buyer and received by the seller on a dummy of the retailer and the location of the market. The results are shown in Table 6. They indicate that the price that the retailer pays is significantly higher than the price received by the farmer for the transaction on the wholesale market. The difference is as high as 13 percent in the case of green peas and 26 percent in the case of cauliflower. As price differences could be explained by other potential determinants, such as the quality of the product as well as the day of the transaction, we add these additional controls to the regression (bottom of Table 6).[23] The coefficients remain largely significant, and the size of the coefficient is robust. For both specifications we use a formal F-test to verify that the price difference between retailer and producer is higher than the prescribed 5.5 percent. The results indicate that the

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[23] Quality is self-reported by farmers and retailers. Enumerators were trained in setting objective standards for these indicators. No correction has been performed for potential bias from systematic measurement error from self-reporting.

margin is significantly higher than the prescribed rates and that marketing regulations on margins are thus not respected.

Table 6. Determinants of vegetable prices (dependent variable = log [price per kg])

		Cauliflower		Green Peas	
	Unit	Coefficient	t-value	Coefficient	t-value
Parsimonious specification					
Retailer	yes = 1	0.263	**9.23**	0.127	**4.12**
Dehradun market	yes = 1	0.282	**9.91**	-0.405	**-13.10**
Intercept		1.296	**52.47**	2.345	**87.54**
Number of observations		240		240	
F(2, 237)		91.69		94.25	
Prob > F		0		0	
R-squared		0.436		0.443	
Adj R-square		0.432		0.438	
F-test:					
Price difference between farmer and retailer is higher than prescribed 5.5%					
F(1, 239)		53.37		5.48	
Prob > F		**0.00**		**0.02**	
Including controls for quality and the day of transaction					
Retailer		0.244	**8.37**	0.128	**4.53**
Medium size	yes = 1	-0.128	**-3.68**		
Small size	yes = 1	-0.272	**-4.67**		
Mixed size	yes = 1	-0.119	**-3.13**		
Number of peas per shell	number			-0.023	-1.48
Presence of spots	yes = 1	0.067	**1.90**	-0.015	-0.37
Rotten material	yes = 1	0.054	1.37	-0.128	**-3.05**
Less bright color	yes = 1	0.029	0.68	-0.098	**-2.41**
Dehradun market		0.308	**7.99**	-0.469	**-14.11**
		day of transaction included but not reported			
Intercept		1.713	**12.39**	2.506	**20.05**
Number of observations		239		236	
F(x, 220)		19.38		24.15	
Prob > F		0		0	
R-squared		0.613		0.622	
Adj R-square		0.582		0.596	
F-test:					
Price difference between farmer and retailer is higher than prescribed 5.5%					
F(1, 239)		42.06		6.66	
Prob > F		**0.00**		**0.01**	

The Confusing Role of Wholesalers versus Brokers

Two different licenses are given out by APMC market officials for the wholesale market: a broker (a commission agent or a wholesaler who does not take possession) and a trader (a wholesaler who takes possession) license.[24] While a commission agent license allows the holder to organize an auction and to help sellers and buyers find each other, a trader license allows the wholesaler to take possession of

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[24] The marketing system also features other licenses. Anybody involved in food and agricultural trade (except farmers) needs a license from the APMC.

agricultural produce and to sell that produce, but not necessarily through an auction. We find in our surveys that the same persons often hold both licenses for the same products. While 95 percent of the farmers stated that they sold their produce through a formal auction, this might be less in practice (Table 7), as a quarter of the farmers stated that the buyer was the wholesaler. Two-thirds of the retailers stated that the wholesaler (and not the farmer) was the seller, indicating that the wholesaler took possession of the goods.

Table 7. Role of wholesalers and brokers

	Unit	Farmers		Retailers	
		Average or %	Standard Deviation	Average or %	Standard Deviation
Transactions through auctions	%	95		88	
Number of buyers in auction	number	7.7	5.5	6.5	3.3
Type of buyer					
Broker	%	26			
Retailer in town	%	29			
Reseller at *mandi*	%	18			
Trader outside town	%	19			
Don't know	%	9			
Type of seller					
Broker	%			65	
Farmer	%			25	
Trader	%			9	
Other	%			1	

Confusion with regard to the exact role of the broker might lead to a conflict of interest. As a broker is paid through a percentage of the final price, he or she has an incentive to obtain a high price for the seller. A wholesale trader, in contrast, profits from the difference between the buyer's and seller's prices, and thus has an incentive to lower the price that is paid to the farmer. If an agent acts as a wholesaler and a commission agent at the same time, this might lead to some perverse incentives.[25] First, it might lead to opportunistic behavior in which, if the farmer is not present at the auction, he or she is charged a commission rate for an auction that never took place. Second, traders would have an incentive to reduce the price information they provide to farmers to a minimum, in contrast with brokers which are supposed to organize transparent auctions**.**

Imperfect Information Transmission

Fruit and vegetable lots are characterized by significant variation in quantity and quality, both observable and unobservable. For buyers to make correct valuation decisions, they need to obtain adequate information on the lot, and mechanisms are thus ideally in place to address the asymmetric information problem. As shown above, the majority of the transactions at wholesale markets take place through auctions. Given that often no personal relationships exist between farmers and the final retailers, and given that there are no repeated transactions between them, which might be an effective way of dealing with information asymmetries (e.g., Kranton 1996), information transmission is even more important. We discuss what practices are used in these markets to assess the quality, the quantity, and wastage, as well as unobservable characteristics related to production practices that might influence food quality.

The large majority of retailers believe there are quality differences between the different lots (Table 8).

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[25] This practice is called "frontrunning" and is prohibited in modern exchange markets (e.g., Chicago Board of Trade).

Table 8. Information transmission on quality

	Unit	Farmers	Retailers
Overall			
There are quality differences between lots			
A lot	%	1	3
A bit	%	93	92
None	%	6	5
Buyer/seller receives/delivers lower quality than paid for			
Regularly	%	0	0
Sometimes	%	25	68
Never	%	74	32
Buyer/seller receives/delivers higher quality than paid for			
Regularly	%	5	3
Sometimes	%	68	52
Never	%	27	45
Last transaction			
Buyer had enough information before transaction	% yes		83
Buyer checked quality himself	% yes		85
If not:			
How was quality assured?			
No assurance on quality	%		66
Assurance is based on trust with broker	%		34
If yes:			
Time used for checking quality	minutes		4.4
Means of quality checking			
By looks	%		100
By touch	%		62
By smell	%		7
By taste	%		34
Buyer was able to check whole lot	% yes		34
If only part of the lot, was it representative?	% yes		90
Buyer knew about production activities (pesticide use, etc.)	% yes		22

Eighty-three percent of traditional retailers report having enough information on quality before placing their bid or completing the transaction. To assess product quality, traders rely exclusively on inspection themselves. In their most recent transaction, 85 percent of the traders checked the quality, spending an average of four minutes doing so. Quality was checked mostly by looking and touching the produce. One-third of the retailers reported even having tasted the produce. While only part of the produce could be checked in most transactions, almost all retailers believed that the checked sample was representative.

While modern markets and especially international markets place a high premium on food safety, this is seemingly less the case in these traditional horticulture markets. The use of modern inputs is high in horticultural production in India, but in the current marketing system there is little or no transmission of information on the use of inputs (Fafchamps, Vargas-Hill, and Minten 2008). However, there might be important public health issues related to the lack of proper attention to and control of these issues (Umali-Deininger and Sur 2007; Athukorala and Jayasuriya 2003).[26] In our

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[26] For example, Marshall et al. (2003) tested fresh vegetables at various production sites and at the main wholesale market in Delhi. They found that 72 percent of the spinach samples exceeded the Indian maximum residue levels (MRL) and 100 percent exceeded the Codex MRL. Kumari et al. (2004) found that 26 percent of their samples of seasonal vegetables contained residues above the MRL.

sample, only one-fifth of the retailers stated that they were aware of the production activities relating to pesticide, fertilizer, and irrigation water use by the farmers. However, even if they are aware, this does not imply that they do not sell unsafe food, as recent research in India shows that there is no premium in traditional retail markets for these unobservable quality characteristics (Fafchamps, Vargas-Hill, and Minten 2008).

To correctly assess quantities, lots should be weighed. Eighty percent of the farmers and 73 percent of the retailers say that they know the exact weight of the lot (Table 9).

Table 9. Information transmission on quantity

	Unit	Farmers	Retailers
Overall			
There are quantity differences between lots			
A lot	%	1	3
A bit	%	94	90
None	%	5	6
Buyer/seller receives/delivers lower quantity than paid for			
Regularly	%	0	0
Sometimes	%	19	62
Never	%	80	38
Buyer/seller receives/delivers higher quantity than paid for			
Regularly	%	5	3
Sometimes	%	64	29
Never	%	31	58
Last transaction			
Buyer had enough information on quantity	% yes		78
Buyer/seller knew exact weight of lot	%	80	73
If weighed:			
Weighed in front of buyer/seller?	%	80	93
Type of scale used was			
Mechanical	%	67	73
Electronic	%	33	27
Rounding off of weights	%	88	86
Rounding off of weight to seller's advantage	%	16	11
Rounding off of weight to buyer's advantage	%	84	89
If not weighed:			
Differences between standard units?			
A lot of variation	%	0	8
A bit of variation	%	88	83
No differences	%	12	8
Wastage			
Buyer knows quantity of wastage at purchase			
Exactly	%		9
Approximately	%		57
Not very well	%		34
Is there less wastage than expected?			
Regularly	%		46
Sometimes	%		41
Never	%		13

Table 9. Information transmission on quantity (continued)

	Unit	Farmers	Retailers
Is there more wastage than expected?			
Regularly	%		24
Sometimes	%		28
Never	%		48
Reported level of wastage*	%	0.3	1.4

* Wastage level reported by farmer is during transport; wastage level reported by seller is after purchase.

Weighing methods are still old-fashioned, as only about one-third of the weighing transactions were done on an electronic scale. When produce is weighed, farmers and retailers still complain about "rounding-off effects," that is, where only whole kilograms are paid for. This practice was mentioned by 88 percent of the farmers and 86 percent of the retailers. In most cases, the rounding off was to the advantage of the broker or the buyer. Even when no weighing takes place, farmers and retailers might still feel comfortable with traditional units that are in use—that is, 78 percent of the retailers reported that they were satisfied with the assessment of the quantity.

Wastage levels in horticultural marketing are often said to be high in India (Mattoo, Mishra, and Narain 2007), although few good empirical studies are available. Farmers estimated the percentage of the produce that could not be sold at 0.3 percent of all their transported produce.[27] Retailers evaluated the percentage of wastage because of bad quality at 1.4 percent of the purchased lot. For buyers to correctly value lots, their expectations on wastage level must be well informed. If buyers are not able to ascertain wastage correctly, they may charge uncertainty premiums that are passed on to the farmers. About one-third of buyers state that they do not know very well the wastage of the lot that they will purchase. Nine percent say that they do know exactly, while the majority (57 percent) know the approximate level.

Although a large majority of traders seem to have enough information to make a reliable assessment of the quality and quantity of the lot, there is some distrust of the existing system, as illustrated by the asymmetric responses by farmers and retailers to rewards and payments for quality and quantity. More than two-thirds of the farmers believe that they sometimes deliver higher quality and quantity than they are paid for, while one-quarter or less believe that they deliver lower quality and quantity than paid for. The complaints are similar, but in the opposite direction, for retailers.

Limited Service Delivery by Brokers

Two types of transaction and marketing costs, for retailers as well as farmers, can be distinguished: monetary costs and the opportunity costs of performing the transaction. The average farmer spends almost two hours to travel to the market. The large majority of farmers (94 percent) use motorized transport to do so (Table 10).

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[27] Wastage is often not very well defined. Here we refer to wastage as produce that disintegrates and is unsellable as any grade or for any use.

Table10. Service delivery

	Unit	Farmers		Retailers	
		Average or %	Standard Deviation	Average or %	Standard Deviation
Transaction costs					
Auction					
Waiting time before auction	minutes	68.5	96.3	18.8	15.0
Time that auction took	minutes	11.2	9.5	5.6	3.8
Transportation					
Time to travel	minutes	110.5	97.0	23.8	28.4
Time spent at *mandi*	hours	3.5	2.2	2.3	1.0
Means of transport:					
Motorized transport	%	94		53	
Animal	%	5		0	
Bicycle	%			4	
On foot / with cart	%			43	
Payment for transport	% yes	91		52	
How much?	Rs per kg	0.4	0.3	0.3	0.2
Payments for transaction					
When paid normally?					
Within 3 hours	%	82		78	
Between 4 hours and 1 day	%	12		5	
Between 2 and 5 days	%	0		2	
After 6 days or more	%	6		15	
Paid in cash	% yes	99		100	
Information					
In contact with broker before transaction	% yes	5		2	
If yes:					
Number of brokers in contact with	number	1.1	0.3	1.4	0.6
Means of contact:					
By mobile phone	%	77		100	
By landline	%	15		0	
Through representatives in person	%	8		0	
Discussed price level with broker	% yes	77		20	
Main source of price information					
Personal observation	%	26		40	
Speaking with regular customers	%			7	
Speaking with other farmers	%	36			
Speaking with other retailers	%			14	
Speaking with commission agents/traders	%	24		20	
Screen with price information	%			0	
Observing prices at auctions	%	14		19	

Thirty-eight percent of farmers also bring the produce of other farmers when they come to the market. The transport must usually be paid for, and the cost amounts to almost 10 percent of the value of the produce on the wholesale market. Farmers then spend on average 3.5 hours at the wholesale market.

Farmers report that they must wait for almost an hour before the auction can start and that the auction takes on average only 10 minutes. However, farmers often still must wait for a while before buyers have taken possession and payment is settled.

While a significant number of retailers and farmers own phones, they are still little used for their business. Market transactions are spot transactions in which farmers and retailers arrive without much prior contact (Table 10). Ninety-five percent and 98 percent of the farmers and retailers, respectively, reported that they had no contact with the broker before coming to the market. For those who had had contact, only a limited number had discussed prices with the broker. Most of the price information for retailers and farmers was obtained informally through personal observations or through contacts with fellow farmers or traders.[28]

Payments for the transactions are in most cases immediate for farmers as well as retailers. Eighty-two percent of farmers state that they are paid within three hours after the transaction. The majority of retailers also report paying immediately for the transaction. However, 17 percent of retailers do not pay immediately and are allowed late payments, often until after their produce has been sold (i.e., more than one day). Agricultural trading is largely a cash economy, as almost none of the transactions are settled by check or other more sophisticated means of payment. Similar results in studies on the importance of spot, unsophisticated, and cash transactions have also been found in other poor agricultural economies (Fafchamps 2004; Fafchamps and Minten 1999; McMillan 2002). Finally, while grading is said to be carried out on the lot, most of the grading is done by the farmer, and little by the broker.[29]

Lack of Outside Competition with the Broker System

Farmers and retailers were asked whether they had other potential outlets and procurement sources outside the wholesale market where they conducted their last transaction (Table 11).[30]

Table 11. Choices in outlets and in brokers

	Unit	Farmers		Retailers	
		Average or %	Standard Deviation	Average or %	Standard Deviation
Outlet options					
Consolidator	%	4			
Village market	%	26			
Broker	%	100		89	
Reseller at wholesale market	%			17	
Reseller delivering at shop	%			5	
Direct marketing at *mandi*	%	22		3	
Visit to other market	%	16		2	

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[28] There are currently no functioning commodity exchange markets for horticulture that allow farmers to hedge risks, and farmers must thus live with the uncertainty of price formation during the days of their sales.

[29] This practice seems to vary by state and product. Gabre-Madhin (2001) found that in Ethiopia most grading of grains was carried out by brokers themselves, while Berdegué et al. (2006) found that in Mexico, for guava, no grading was carried out by farmers in backward zones, in contrast with farmers in advanced zones.

[30] It is important to remember that the only farmers who were interviewed were those who came to the wholesale market. They thus do not reflect the farming community as a whole.

Table 11. Choices in outlets and in brokers (continued)

	Unit	Farmers		Retailers	
		Average or %	Standard Deviation	Average or %	Standard Deviation
Choice between brokers					
Perceived number of brokers who sell this product	number	62.3	42.5	46.7	21.0
Number of brokers you know who sell this product	number	5.3	4.8	6.1	5.0
Number of brokers you use	number	2.0	1.7	3.8	2.9
Number of brokers considered today	number	1.2	0.5	1.4	1.1
Number of auctions attended	number			4.0	3.2
Number of auctions in which this retailer placed a bid	number			2.1	1.3
Number of auctions in which this retailer won the bid	number			1.2	0.6
Frequency of transactions					
Number of transactions through brokers					
This season	number	9.6	9.7		
Last year	number	26.1	27.2		
Last two weeks	number			9.0	2.7
Number of brokers used for these transactions					
This season	number	1.6	0.9		
Last year	number	1.8	1.2		
Last two weeks	number			3.5	2.6
Number of brokers used last season (farmers) / last 2 weeks (retailers)					
One	%	57		17	
Two	%	33		19	
More than two	%	10		64	
Time dealt with the broker of last transaction	years	9.7	9.1	9.2	7.1

Twenty-six percent of the farmers reported that they could potentially sell their produce at a local village market, 4 percent to local consolidators, and 22 percent to retailers at retail markets in town. Farmers thus seem to have few marketing options outside the broker channel, a situation that is partly driven by the existing APMC legislation, as trade can in principle be conducted only by licensed traders. The same holds for retailers. Only 17 percent could go through a reseller (*masahari*) on the wholesale market, or sometimes they were able to have produce delivered to the shop itself by this type of reseller (5 percent). Few (3 percent) consider direct purchases from farmers to be an option.

Although there are few options for farmers and retailers outside the broker/wholesale channel, there are a large number of choices within this channel. Farmers say they could potentially choose from among 60 brokers who deal in the produce that they are selling. Of these brokers, they know five personally, on average. However, they would use only a limited number of them for their transactions, that is, fewer than two, on average (Table 11). Fifty-seven percent of the farmers had considered only one broker to deal with for all their transactions in the last year, and a significant number of farmers thus self-select a specific broker relationship. Often they have a long-term relationship with this

broker, as they have dealt with the broker used in the last transaction for almost 10 years, on average. Retailers report a similar large number of brokers to choose from, but they usually work with a larger number than farmers do. Retailers placed a bid in two auctions, on average, and they won in one, on average. It thus seems that they place bids only when they are almost sure that they will win them.

The research results indicate that there is little choice for farmers and retailers outside the broker system, but a lot within. Brokers as a group might thus have an incentive to keep the system as it is and try as much as possible to protect their interests from outside competition and potentially to collude inside the market (Olson 1965). They seem to effectively do this through the organization of broker unions that use their power—and money—to lobby with politicians as well as market authorities. This is evidenced by the noncompliance with the rules of the APMC. It is also reflected in the opposition that traders and brokers are able to successfully organize toward organizations that want to bypass them. For example, traders in the states of Uttarakhand and Uttar Pradesh succeeded in delaying modern retail investments in food markets by calling for large strikes. It is especially interesting that the modern retailer Reliance, which had a clear strategy of wanting to bypass brokers and buy directly from farmers, took most of the heat from these protesters.[31] However, large schemes such as the e-choupal model, which used brokers while bypassing the regular wholesale markets, were easily accepted (Goyal 2008).

We thus find that margins for transactions at wholesale markets between the seller and buyer are high (between 13 percent and 26 percent), regulations are not respected, the wholesale trader and broker roles are being confused or potentially manipulated, information transmission is incomplete, transaction times are long, and outside competition with the broker system is limited. This seems to lead to lower sales prices for the producer and higher purchase prices for the retailer. However, farmers and retailers do come to these markets; they must by law, but they do so even when the marketing laws have been relaxed, as seen in other states (Fafchamps, Vargas-Hill, Minten 2008). In the new institutional economics literature, various authors (e.g., North [1990] and Fafchamps [2004]) have shown that institutions are not passive entities and do adjust to the constraints of particular economic environments. In the next section, we will look in greater detail at the services that brokers provide and how the traditional institutions have been able to persist in agricultural markets.

Reasons for the Resilience of the Traditional System

Transaction Costs

Retailers and farmers were asked why they had chosen the specific broker used in their last transaction. While habit formation is part of the explanation for using a specific broker (50 percent and 29 percent of the farmers and retailers, respectively, state that this is very important), most of the decision is based on an effort to reduce search costs, obtain the best price possible, and speed up transactions (Table 12). Farmers would argue, for example, that even if they have the freedom to sell their produce at fresh markets directly to consumers at higher prices, every transaction would require much more time that way, and they would likely suffer high levels of wastage.

Interlinked market services provided by brokers are not terribly important for retailers. Only 15 percent and 4 percent of the retailers would choose a particular broker because they think it very important that the broker provide the option of late payments or access to credit, respectively. However, in the case of farmers, these numbers are 26 percent for the provision of input advances and 21 percent for the provision of credit (Table 12). Although the numbers are higher for farmers than for retailers, they are significantly lower than commonly believed. In the next sections, we turn to a more detailed discussion of these interlinked services.

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[31] Interestingly, farmers also staged protests to keep modern retail procurement there. They lost, however.

Table 12. Marketing options and advantages of the broker channel

	Unit	Farmers	Retailers
Advantages of brokers considered to be "very important"			
Last transaction			
"He finds lots of potential buyers/sellers"	%	46	34
"He offers better prices"	%	55	64
"He offers higher quality"	%		66
"He gives seasonal input advances"	%	26	
"He allows me to defer payment"	%		16
"He offers loans in case of need"	%	21	4
"I have the habit"	%	50	29
"He completes transactions quickly"	%	63	58
Regularity of supply/outlet			
Buyer/seller is unable to buy/sell this product			
Never	%	89	54
Occasionally	%		46
Often	%	11	0
If it happens, buyer/seller:			
Takes it home / sells it next day	%	91	
Leaves it at wholesale market	%	4	
Sells to a wholesaler	%	4	
Trades another product	%		75
Does no business that day	%		7
Performs wage labor that day	%		5

Access to Insurance and Credit

A common problem for rural agricultural economies is the prevalence of various types of shocks for which poorer households in particular are ill prepared. Given the lack of formal insurance mechanisms, households must often rely on social capital and the selling of assets to deal with these shocks, and only those households that have these informal insurance mechanisms are able to successfully smooth their consumption (e.g., Dercon 2005; Rosenzweig and Wolpin 1993; Townsend 1994).

Some farmers—and a limited number of retailers—use brokers as a source of insurance. Thirty-nine percent of the farmers report that in case of need, the broker would give loans to the farmer for sure (Table 13).

Table 1. Credit and insurance services provided by the broker

	Unit	Farmers		Retailers	
		Average or %	Standard Deviation	Average or %	Standard Deviation
Overall					
Number of brokers from whom farmer/retailer could obtain a loan	number	1.1	1.1	0.6	1.2
Broker used in last transaction					
Broker gives loans in case of need					
Yes, for sure	%	39		7	
Probably	%	18		22	
No	%	44		71	

Table 11. Choices in outlets and in brokers (continued)

	Unit	Farmers		Retailers	
		Average or %	Standard Deviation	Average or %	Standard Deviation
Buyer/seller ever received a loan from this broker	%	22		2	
Number of loans received in last five years	number	1.9	1.1	2.4	1.7
Value of loan, mean	Rs	8,263	9,429	21,500	38,464
Buyer/seller has other sources of loans	% yes	96		95	
If yes, from:					
Bank	%	46		17	
Friends/family	%	78		81	
Others	%	2		14	

Eighteen percent of the farmers think that the broker would "probably" do so. While more than half of the farmers think that they could rely on the broker in case of need, only 22 percent of the farmers have ever received a loan from the broker with whom they dealt in the last transaction. Twenty percent of the farmers have received a loan from this broker in the last five years. The average value of the loan was 8,263 Rs (more than US$200), or about two to four times the value of the last transaction. However, farmers seldom rely exclusively on brokers for access to credit, as 96 percent of the farmers report having alternative sources of credit. These include formal banks (46 percent of the farmers), but also, more importantly, friends and family (78 percent). Access to credit through brokers is less important for retailers. Only 7 percent of the retailers believe that the broker would give loans for sure in case of need, and only 2 percent of the retailers report ever having received a loan from a broker. Retailers also can rely on other options for access to credit, as stated by 95 percent of the retailers.

Access to Input Advances

A second advantage for farmers of working with specific brokers might be the access to input advances for their agricultural activities. This access proves problematic for some—and often the poorest—farmers all over the developing world, often due to seasonal liquidity constraints (Dercon and Christiaensen 2007). This year, 22 percent of the farmers had received an input advance from the broker they dealt with in the last transaction. For half the farmers, this advance was in kind—more specifically, seeds. No fertilizer or pesticides were given in kind to any farmer in our sample. The average value of the seed advances was calculated at 6,115 Rs, or US$155. The quality of the seeds was evaluated by most farmers to be good (68 percent), and almost half the farmers think they could not find the same quality themselves at the same price. However, they do not believe that the productivity of their vegetables was higher because of the use of these inputs. Almost none of the brokers (11 percent) monitored the use of these seeds. Only 4 percent of the farmers reported having to pay interest on this advance in kind.

The other half of the farmers who received input advances (i.e., 11 percent of all the farmers) received cash. The amount was, on average, almost 7,000 Rs (almost US$180). Only one farmer who received this advance in cash was asked to pay interest on it (Table 14).

Table 14. Input advances provided by the broker

	Unit	Farmers Average or percent	Standard Deviation
Overall			
Number of brokers from whom farmer received input advances this season			
None	%	78	
One	%	22	
Two	%	1	
Broker used in last transaction			
Farmers who received input advances	%	21	
Of those who received input advances:			
Input advances were partly in kind	% yes	55	
Details on input advances in kind			
Farmers who received seeds	%	96	
Value of seeds received, mean	Rs	6,115	7,769
"Quality of seeds"	% good	68	
"Could have access to market access for same quality"	% yes	56	
"Productivity of these seeds is higher than if bought myself"	% yes	22	
"Farmer can find inputs himself at a cheaper price"	% yes	15	
"Broker checks if inputs were used on farmer's fields"	% yes	11	
"Interest payments on this advance"	% yes	33	
Input advances were partly in cash	% yes	55	
Details on input advances in cash			
Amount of cash received, mean	Rs	6,982	9,546
"Interest payments on this advance"	% yes	4	
Farmer receives input advances every year	% yes	29	
What would happen if these input advances were not paid back?			
"Broker would not work with me anymore"	% yes	84	
"Broker would complain to the market authorities"	% yes	20	
"Broker would complain to the other brokers"	% yes	77	
"Broker would use social pressure in the village"	% yes	55	
"Broker would bring me to the police or court"	% yes	2	

Surprisingly, only 6 percent of the farmers state that they receive input advances from this broker every year. It thus seems that they must make the case every year for their need for this money. We also asked farmers what the broker would do if the farmer did not pay back the input advance. As is usually the case in this type of market, formal enforcement mechanisms are little relied upon (e.g., Fafchamps and Minten 2001; Bigsten et al. 2000; McMillan and Woodruff 1999). Farmers report that it is very unlikely that the broker would go to the market authorities, to the police, or to the court. In the case of default, however, the broker would not work anymore with that farmer, other brokers would hear about it, and some brokers might use peer pressure in the village.

This case study in Uttarakhand on horticultural wholesale markets thus illustrates how transactions are conducted in the traditional rural-urban food supply chain. The size of the transactions is small, and little aggregation takes place at the village. We further find that marketing regulations are ineffective, that there is confusion surrounding the function of brokers and wholesalers, that information transmission on quantity and quality between buyers and sellers is incomplete, and that the monetary costs of transactions on the wholesale market are significant. Despite these problems, the

broker system has remained prevalent in Indian agricultural markets, partly due to its ability to link credit and insurance markets for farmers to the agricultural output market. The interviewed farmers and retailers also state that they are still largely satisfied with the current system, seemingly because the wholesale market reduces search costs and allows for access to a marketplace with many sellers and buyers; however, in the case of Uttarakhand, there are no effective alternatives yet because of the APMC Act.[32]

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[32] An important policy question is whether the setup could be improved, and what the role of the brokers should be in these settings. Brokers in any market are rewarded for reducing the search costs of sellers and buyers (see, for example, Hsieh and Moretti [2003] and Gabre-Madhin [2001]). It is not evident to what extent agricultural brokers in India deliver these services, as buyers and sellers have few marketing options outside the wholesale markets, and both will be physically present (as required by law). As services for the reduction of search are thus limited, the broker system as currently practiced might then be just an expensive way to conduct auctions. Alternative, cheaper options could be explored to conduct such auctions.

5. MODERNIZING MARKETS IN INDIA

Background

Reardon et al. (forthcoming) distinguish two waves of modernization in food supply chains in developing countries. The first wave was led by the public sector, where governments intervened in agricultural markets and tried to streamline food supply chains. The second is more recent, is led by the private sector, and concerns the emergence in food supply chains of the private processing sector, the food service sector, and modern food retail. We follow the same distinction in our discussion below.[33]

Although modern marketing channels still make up only a minor part of rural-urban food supply chains, they are all growing in importance. Table 15 shows the different growth rates for the four "modern" marketing channels. While caution in the interpretation of the numbers is necessary (we do not separate formal from informal in the processing sector or in the food service sector; however, in both cases, it is estimated that the formal sector makes up the largest part of the sector),[34] real growth rates were 7 percent for parastatal procurement, 7 percent for the processing sector, 9 percent for the food service sector, and 65 percent for modern food retail. For each channel, these growth rates are significantly higher than growth rates for food expenditures overall (2.5 percent) and for urban food expenditures in particular (3.4 percent). They thus indicate the growing relative and absolute importance of these modern channels. We discuss each of these sectors in greater detail below.

Table 15. Growth in modern food marketing channels versus food consumption in India

	Annual Growth Rate	Unit	Period	Source
Modern public-sector-led				
Parastatal procurement	6.59%	tons	1996–2006	Reserve Bank of India (Indiastat)
Modern private-sector-led				
Modern food retail	65.5%	real $*	2001–2008	Reardon, Gulati, and Minten (2008)
Processing sector overall	6.75%	real Rs**	2002–2006	Ministry of Food Processing (2008)
Food service sector overall	9.20%	real Rs**	2001–2006	Euromonitor International (2007)
Food consumption				
Total urban food consumption	3.41%	real Rs#	1997–2006	National Sample Survey Organisation (NSSO), several years
Total food consumption (urban + rural)	2.47%	real Rs#	1997–2006	NSSO, several years

* Deflated by urban consumer price index (CPI) (U.S. Department of Labor)

** Deflated by the authors in the referenced document

\# Deflated by the CPI for industrial workers, India (Indiastat)

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[33] Following Reardon et al. (forthcoming), we use the term *modern* to refer to "recent" evolutions in the marketplace. If modernization is equated with improved efficiency, then public-sector-led supply chains such as cooperatives and parastatals might most likely fail that test.

[34] It is not always clear exactly which definitions were used to describe sectors. More details are provided in the Section Public-Sector-Led Food Supply Chains and the section, Modern Private-Sector-Led Food Supply Chains.

Public-Sector-Led Food Supply Chains

Parastatals

Parastatal marketing has in recent years become an increasingly important food distribution channel in India, in contrast with most other developing countries, which generally saw increasingly liberalized agricultural markets. Food procurement and distribution are organized by the parastatal Food Corporation of India (FCI) to ensure access to basic staples for the most vulnerable segments of the population. Rashid, Gulati, and Cummings (2008) argue that the Great Bengal Famine in 1943 was the event that provided the momentum for the Indian government to intervene in grain markets. At that time, it was believed that private markets had failed, as there was not a particular shortage of food in that year. The government has since intervened in grain markets with four objectives: (1) to maintain central reserves of food, (2) to import and produce foodgrains, (3) to regulate prices and control interstate movements of foodgrains, and (4) to construct and lease storage facilities (Rashid, Gulati, and Cummings 2008). To this end, the government has sold rice and wheat, as well as sugar and kerosene, at cheaper prices to ration-card holders through a public distribution system consisting of a network of fair-price shops.

The degree of intervention in foodgrain markets by the FCI has increased significantly over the years. Its market share in wheat markets increased from 4 percent in 1967/68 to 25 percent in 2004. Its share in rice markets increased from 9 percent to 22 percent over the same period. In 2006, it procured 15 million tons of wheat and 27 million tons of rice, representing 21 percent and 29 percent, respectively, of total production in that year (Table 16). The total number of fair-price shops was estimated at 476,000 in 2004. Despite the program's laudable objectives, Rashid, Gulati, and Cummings (2008) argue that the rationale for public interventions has mostly disappeared and that the public distribution system is considered to be an expensive and poorly targeted social safety net program.

Table 16. Public procurement, offtake, and stocks of foodgrains, 1995/96 to 2005/06

	Wheat (million tons)			Rice (million tons)		
	Procurement	Stocks	Targeted Public Distribution System (TPDS) Offtake	Procurement	Stocks	TPDS Offtake
1995/96	12.33	7.76	12.72	9.93	13.06	11.63
2000/01	16.36	21.50	7.79	18.93	32.19	15.32
2005/06	14.79	2.01	17.16	26.90	13.68	24.82

Source: Reserve Bank of India

In 1997/98, the government changed its public distribution system in an effort to make it more targeted and to reduce costs. Food items are now distributed at a highly subsidized rate for consumers certified as below the poverty line (BPL) and less subsidized for the less poor (above the poverty line, or APL). Jha, Srinivas, and Landes (2007) provide numbers on the share of the Targeted Public Distribution System (TPDS) in total consumption of wheat and rice, based on the data of the National Consumption Survey of 1999/2000. They find that TPDS rice made up about 9.5 percent of total rice consumption in 1999/2000, compared to only 3.7 percent for wheat. As the relative importance of TPDS in total consumption is only slightly less in urban areas, the majority of TPDS food is distributed in rural areas, where the majority of consumers live. As Table 17 shows, TPDS offtake has increased over time, and its relative importance has also increased. However, it is currently not clear to what extent urban or rural areas have benefited differently from this.

Table 17. Rice and wheat consumption in 1999/2000

		Rice			Wheat		
	Unit	Targeted Public Distribution System (TPDS)	Open Market	Total Consumption	TPDS	Open Market	Total Consumption
Rural	million tons	5.46	49.78	55.24	1.42	36.32	37.74
	%	9.88	90.12	100.00	3.76	96.24	100.00
Urban	million tons	1.35	14.88	16.23	0.52	13.54	14.06
	%	8.32	91.68	100.00	3.70	96.30	100.00
Total	million tons	6.82	64.66	71.47	1.94	49.87	51.80
	%	9.54	90.47	100.00	3.75	96.27	100.00

Source: Jha, Srinivas, and Landes (2007)

Cooperatives

The government has also established several public organizations to promote cooperatives, including the National Cooperative Development Cooperation and the National Dairy Development Board (NDDB) (Acharya 2004). Cooperatives play an important role in the marketing and processing of certain agricultural products. These cooperatives contribute not only to the marketing of agricultural output but also to the supply of inputs and possibly credit. Major commodities handled by cooperatives are foodgrains, jute, cotton, sugar, milk, and areca nuts. However, they are also active in other crops, such as in the marketing of fruits and vegetables.[35] Acharya (1994) estimated that cooperatives handled about 10 percent of all marketed surplus in the country in the early '90s. However, their importance seems to be declining. For example, in a review of the agribusiness sector in India, Anzec (2005) argues that there are a limited number of successful sustainable cooperatives outside the dairy sector.

The "Anand" model of dairy cooperatives has, in particular, received significant attention worldwide (Candler and Kumar 1998). In this model, milk producers joined together, with state support, to share the profits gained by selling their produce through a cooperative movement (Amul). This model has since been imitated in various parts of the country, and it is estimated that there are now about 110,000 dairy cooperatives nationwide (Rabobank 2006). Dairy-specialized modern retail chains (the NDDB dairy retail operations in the large cities, such as Mother Dairy milk stalls in Delhi, Nandini Milk Parlours in Bangalore, etc.), which source their milk from the cooperative member farmers in the region, process it in NDDB processing plants, and then market the bulk milk and dairy products (ghee, ice cream, yoghurt, and so on) through their own retail units to traditional retailers (hawkers, pushcarts, kiranas), as well as to supermarket chains.

However, not all these dairy cooperatives have been successful, and although they might still be growing in absolute numbers, they are increasingly losing market share compared to the private sector in the dairy value chains. For example, Sharma and Singh (2007) report that the share of the private sector in milk processing plants increased from 49 percent in 1996 to 66 percent in 2006, and while the private sector and the cooperative sector held about equal shares in milk procurement in the organized dairy value chain in 2006, the private sector is projected to be twice as important in procurement in 2011 (Gupta 2007).

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[35] For example, Safal Ltd., linked with Mother Dairy and the NDDB, is an important player in the supply of food and vegetables to New Delhi.

Modern Private-Sector-Led Food Supply Chains

Modern Retail

Reardon et al. (forthcoming) argue that in 2001, India's modern retail sector not only began a supermarket revolution but arguably experienced the fastest pace of supermarket diffusion in the world. They show that sales of food and groceries by modern retailers in India were a mere US$140 million in 2001 but had reached $US5.8 billion by 2008. That implies an average annual nominal growth rate of 74 percent, or a real growth rate of 65 percent (Reardon et al., forthcoming).[36] Given the massive investment plans, this growth is set to continue in the next years, driven by fierce competition between these modern retailers. In 2008, investment plans announced by the main retail companies totaled US$33 billion through 2010 (Reardon et al., forthcoming).

Although modern food retail shows high growth rates, it is currently still a small player in terms of total food retail in India. Joseph et al. (2008) report that the total value of food and grocery sales in Indian retail amounted to US$191.6 billion in 2006/07. Modern retail would then currently amount to about 3 percent of all food retail in India. The data of the NSS in 2005/06 showed that households had spent about US$120 billion in the previous year. If this number is used, the share of modern retail would be 5 percent of all food expenditures. However, its share in urban areas might be higher, given that the majority of modern retail shops are located in these areas. Moreover, the share of modern food retail in total food retail could increase rapidly. For example, using an arbitrary total growth rate of 7 percent in food retail overall (i.e., the historical nominal growth rate in the last five years [Joseph et al. 2008]), modern retail would capture half the market by 2020 if it could sustain a growth rate of about 36 percent over the same period—that is, the needed growth rate would be significantly lower than the growth rate that is projected for the next years.

The growing importance of modern retail might have important effects on the rural-urban food supply chain. First, supermarkets typically offer a large selection of processed and semiprocessed products in their stores, reflecting the larger emphasis on these types of products in urban areas. Reardon et al. (forthcoming) estimate that this share can be as high as 80 percent or more of the products on offer. The first influence, then, that the rise of supermarkets often has is an impact on the processing sector and the way it does business. Second, for their nonprocessed food needs, modern retailers in India, as elsewhere, currently rely on a mixture of procurement mechanisms, including sourcing from brokers on wholesale markets in spot transactions, from specialized and dedicated intermediaries on wholesale markets, from their own collection centers, and from their own farms. Given the current small scale of their operations, procurements from wholesale markets through brokers and through wholesale markets are seemingly the most important procurement method (Reardon et al., forthcoming). However, some large investors in the modern retail sector (e.g., Reliance and ITC) are betting heavily on the setup of collection centers where traditional market channels are bypassed. Farmers usually gain in these settings, as transaction costs are reduced due to lower transport costs (collection centers are set up close to producers), faster turnaround (no auctions take place and no waiting for buyers is necessary), reliable weighing, transparent pricing, and immediate payments (Minten et al. 2009). However, modern retail establishments often have strict requirements regarding the produce that they purchase, and they often procure only better-quality products.

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[36] This growth might even be an underestimation, as region-specific chains and "nontraditional" retail chains, such Mother Dairy with its 1,000 kiosks in Delhi, are not included.

The Processing Sector

The Indian food processing industry is, for statistical and regulatory reasons, split into two segments: the organized and the unorganized sectors.[37] Both of these segments are the subject of regular surveys. Five traditional sectors— oil and fats, grain, sugar, dairy, and tea and coffee—dominate the food processing industry (Table 18). It is estimated that they make up 80 percent to 85 percent of total output, employment, and factories. Of these five large industries, three (oils and fats, grain, and dairy) showed an annual growth rate in output that was larger than the average in recent years, and they are thus growing in relative importance. For other sectors, processing is relatively unimportant. For example, it is estimated that only 2 percent of fruits and vegetables are processed in India (India Brand Equity Foundation 2006). It is also estimated that the net value added is low in the processing industry overall. It was estimated in 2003 at 9.6 percent (Table 18).

Table 18. Output and net value added (NVA) of food industries in India

Food Industries	Output (billion ct**[??]** Rs)	NVA/Output (%)	Annual Growth in Output (%) 1989–2003
Oils and fats	288	4.2	6.17
Grain	232	5.1	6.11
Sugar	168	14.6	2.74
Dairy	134	10.9	6.36
Tea and coffee, others**[??]**	103	14.6	2.93
Animal feed	37	8.8	12.06
Fish	30	6.3	11.63
Bakery	28	14.1	6.94
Soft drink and syrups	26	17.1	13.73
Spirits and alcohol	25	18.7	5.96
Malt and liquors	18	18.1	9.17
Confectionary	12	26.9	8.56
Fruits and vegetables	11	19.7	7.58
Meat	8	9.4	15.47
Wine	8	24.4	12.07
All food	1,128	9.6	5.80

Source: Morisset and Kumar (2008b), based on Government of India, Annual Survey of Industries

Based on historical data from the organized and the unorganized sectors, Bhavani, Gulati, and Roy (2006) argue that there is clear consolidation taking place at the factory level, and there is evidence of scaling up (increase in output per factory) and capacity expansion (fixed capital per factory). The share of the organized sector in total output has been increasing over time, as measured by the value of the gross output. Table 19 shows how it increased from 64 percent in 1984/85 to more than 80 percent in 2000. Eighty-five percent of employment is in the unorganized sector, implying large labor productivity differences between the two sectors. Bhavani, Gulati, and Roy (2006) argue that although the organized segment is increasing its output share, it is expected that the unorganized sector will remain dominant in terms of the number of manufacturing units and employment.

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[37] The organized sector consists of units that employ more than 10 people and that use power, or units that employ at least 20 people and that use no power. Other units are categorized in the unorganized sector.

Table 19. Characteristics of food processing industry

	Year		
Item	1984/85	1994/95	2000/01
Gross output			
% share			
Unorganized sector	35.67	21.48	19.44
Organized sector	64.33	78.52	80.56
Total	100.00	100.00	100.00
Total value (billion Rs)	628.08	991.29	1214.80
Fixed assets			
% share			
Unorganized sector	73.80	36.27	38.62
Organized sector	26.20	63.73	61.38
Total	100.00	100.00	100.00
Total value (billion Rs)	191.56	234.32	469.23
Employment			
% share			
Unorganized sector	86.69	82.02	84.95
Organized sector	13.31	17.98	15.05
Total	100.00	100.00	100.00
Total number (millions)	10.39	10.16	12.06
Number of enterprises			
% share			
Unorganized sector	99.47	99.24	99.48
Organized sector	0.53	0.76	0.52
Total	100.00	100.00	100.00
Total number (millions)	4.66	3.85	5.14

Source: Bhavani, Gulati, and Roy (2006)

There are few studies on the procurement practices of processing firms, and more research is required. It seems that the processing firms rely to a large degree on brokers and traditional wholesale markets. Unless the processing industry has specific quality requirements,[38] the firms usually do not buy directly from farmers and seem to rely on dedicated brokers and wholesalers for the procurement of their produce (Singh 2007). There are, however, exceptions—for example, in grains and oilseed. In general, there are also few requirements for raw produce, and, especially with regard to fruits and vegetables, it is often lower-quality products that are procured at lower prices for processing (Fafchamps, Vargas-Hill, and Minten 2008).

The Food Service Industry

The food service industry encompasses street stalls and kiosks, cafés and bars, restaurants, fast food, home delivery, and takeaway. Table 20 shows the overall evolution in the food service industry in India in the period 2001–2006, as well as projected growth rates for the period 2006–2011 (Euromonitor International 2007). The value of sales in the food service industry in 2006 amounted to almost 240 billion rupees, or US$5.4 billion, representing 1.4 million outlets (Euromonitor International 2007). The number of outlets grew by 11.3 percent annually over the period 2001–2006.

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[38] As is the case for some dairy companies such as Reliance and Nestlé, or for suppliers of international companies. For example, Nijjer Agro Foods in Amritsar is supplying processed vegetables to international companies such as Unilever and Nestlé, and buys raw tomatoes and chilies directly from farmers. However, raw fruit for processing into pulp is sourced through independent contractors.

Table 20. Food service industry in India

	Year			Annual Growth Rates (%)	
	2001	2006	Forecast 2011	2001–06	2006–11
Number of outlets					
Cafés/bars	44,760	63,816	76,770	7.4	3.8
Full-service restaurants	362,338	503,890	709,855	6.8	7.1
Fast food	26,978	52,138	75,756	14.1	7.8
100% home delivery / takeaway	110	163	218	8.2	6.0
Street stalls / kiosks	382,940	773,838	1,043,300	15.1	6.2
Total	817,126	1,393,845	1,905,899	11.3	6.5
Value of sales (million Rs, current prices)					
Cafés/bars	209,963	356,510	489,010	11.2	6.5
Full-service restaurants	812,341	1,445,840	2,133,460	12.2	8.1
Fast food	123,499	332,561	561,164	21.9	11.0
100% home delivery / takeaway	311	551	824	12.1	8.4
Street stalls / kiosks	103,528	264,181	401,306	20.6	8.7
Total	1,249,642	2,399,643	3,585,764	13.9	
Value of sales (million Rs, constant prices)	1,249,642	1,938,530		9.2	8.4

Source: Euromonitor International (2007)

Sales increased over the same period by 9.2 percent. Euromonitor International (2007) expects the number of outlets and the total sales value to grow by 6.5 percent and 8.4 percent, respectively, over the period 2006–2011. It is projected that an additional 500,000 outlets will be added over that period, taking the total to about 2 million in 2011.

Street stalls and kiosks are the most important type of consumer food service outlets in India, representing 55 percent of all food service outlets. Second are full-service restaurants, representing 36 percent of all outlets. When we look at the value that these various outlets represent, however, we see that street stalls and kiosks account for only 11 percent of the total value of the food service outlets. This is an indication that these street stalls and kiosks have lower average sales than other outlets, as they often cater to the poorer segment of the population and deliver food at significantly lower prices (Euromonitor International 2007). The number of these stalls and kiosks is expected to grow at a rate of 6.2 percent per year in the next five years.

Full-service restaurants represent 36 percent of all food service outlets but a much greater share of value—about 60 percent—indicating the different kind of services that they provide to a better-off clientele.

Though starting from a low base (10 percent of the value of total sales in 2001), fast-food outlets saw the fastest growth in the Asia Pacific region during 2006 (22 percent annual growth in value). This segment is also expected to grow the fastest of all the outlet types in the next few years in India, and its number of outlets and value of sales are forecast to increase annually by 14 percent and 11 percent, respectively, between 2006 and 2011 (Euromonitor International 2007).

Unfortunately, the data of Euromonitor International do not allow a distinction to be made between formal and informal outlets. Assuming that street stalls and kiosks are mostly informal and that the other sectors are mostly formal, the formal and informal sectors are expected to grow at similar rates in the next five years. While it is estimated that independent outlets represent a large majority of the total value of sales of consumer food services, and chain food service outlets are still a minority, the latter show significantly higher growth rates and are rapidly increasing their market share (Euromonitor International 2007). This is important, as economies of scale could push some of these

larger food service outlets to start organizing alternative procurement operations in which they would not rely on traditional marketing channels, which they currently seem to do. However, given the overwhelming importance of independent outlets, this does not yet seem to be an important phenomenon in the food service industry in India.

6. CONCLUSIONS AND WAY FORWARD

Conclusions

In this discussion paper, we have examined the rural-urban food supply chain in India. We first presented a conceptual framework and speculated on the types of changes occurring in the food supply chain, the drivers for these changes, and the impacts of these changes on poverty. We find that three important changes are taking place. First, there is significant growth in the rural-urban food supply chain. Based on a series of representative national household surveys (NSSs), annual urban food expenditures were valued at about US$45 billion in total in 2006. Driven by increasing urbanization and population growth, this is a real threefold increase compared to 35 years earlier. Moreover, while urban food expenditures made up about one-quarter of total national food expenditures 35 years ago, this had in 2006 increased to more than one-third. Given that this increasing demand has not been made up by imports—as India exports more than it imports (now and 35 years ago)—this implies that relatively and absolutely larger quantities of food are being shipped from rural areas to urban areas. Second, the composition of the food shipped to urban areas has changed significantly, as the share of cereal consumption in the urban food basket has declined from 36 percent in 1972 to 23 percent in 2006. Third, all "modern" market channels—private-sector-led (modern retail, food processing, the food service industry) as well as public-sector-led (the parastatals)—show higher annual growth rates than do overall urban food expenditures. It is estimated that in recent years, modern retail has been growing at 74 percent annually, the food service industry (restaurants, fast food, takeaway, cafés/bars, food stalls / kiosks) overall at 9 percent, the processing sector at 7 percent, and parastatal marketing at 7 percent. Because urban food expenditures grew more slowly (at 3.4 percent annually over the last 10 years, based on the NSSs), this indicates the increasing relative and absolute importance of modern channels in food supply chains. These growth and diversification trends in urban demand and the increasing importance of modern marketing channels are expected to continue, and they might have important implications for all stakeholders in rural-urban food supply chains.

We further compared traditional and modern marketing channels in India. First, based on primary data from horticultural marketing in the northern state of Uttarakhand, we analyzed the functioning of the traditional marketing system. We find that average monetary costs for transactions on wholesale markets are high, on top of significant nonmonetary costs. A significant number of buyers complain of the difficulties in correctly assessing lot qualities and quantities before their purchases, possibly leading to price premiums for uncertainty that might further depress producer prices. Interestingly, some brokers influence farmers' choices through linkages with credit and insurance markets. It is interesting to find these linkages in traditional markets, as there is a trend in modern markets toward more vertical integration, that is, where companies contract with suppliers and supply inputs, often on credit, to ensure quality (e.g., Swinnen 2007; World Bank 2006). However, while the motive for these companies is to ensure quality in the marketplace, the incentive for traditional brokers and traders is different, as they seemingly want to prevent the farmers from selling their output through other brokers (Crow and Murshid 1994; Bell and Srinivasan 1989). There is little regard for food safety, monitoring of production practices, distribution of quality inputs, or extension of improved technologies, which are typical for these modern markets (Minten et al. 2009; Swinnen 2007).

We then examined the modern food marketing sector in India. While the emerging modern channels continue to use the traditional markets in some cases, we also see that they are putting in place direct procurement practices by which they try to overcome some of the coordination failures in traditional markets or by which they can economize on transaction costs. The extent to which these changes have an impact on food prices, labor markets, input markets, and farm production will determine their influence on rural poverty. It seems that emerging modern markets might increasingly challenge the traditional markets, which in their current form seem most attuned to dealing with small-scale producers as well as small-scale retailers. When more consolidation takes place on the demand

side, or when food quality and food safety become an overarching concern, there seems to be a move away from the use of brokers (i.e., in those states where the law allows private companies to do so). Only brokers who are able to adjust their service delivery are able to be part of these emerging value chains, but more often they might increasingly be bypassed. Given that these developments often benefit the small producer, through higher prices or lower transaction costs, this trend should be encouraged.

In its current form, the traditional system seems poorly adapted to deal with the food safety and traceability demands of modern local or export horticultural markets. Buyers obtain little information on the unobservable characteristics of the product, and the regulated broker system—through its anonymity—is seemingly a hindrance to the development of closer vertical coordination and better information transmission between producers and buyers, which is much needed in modern markets. Interestingly, this movement is the reverse of what the initial development of markets entailed, when the move away from personalized to anonymous transactions was a condition for success, specialization, and economies of scale (McMillan 2002; Fafchamps and Minten 1999; Fafchamps 2004).

The impact of the transformation in the supply chain is related to the strength of the linkages between urban and rural areas. For example, rural areas with good access to urban markets generally have better opportunities to take advantage of the growth in demand for high-value agricultural commodities. Thus, there are significant spatial patterns in the degree to which rural households are influenced by the market in general and by urban demand in particular.

Further Research

Research is urgently needed on how the changes taking place in the rural-urban food supply chain affect poverty, and on what the appropriate role can be for public policy to ensure positive impacts. Four questions should be examined:

1. What changes are occurring in these food supply chains in developing countries, and how much of this transformation is driven by changes in urban demand?
2. What are the patterns in the restructuring of food supply chains, and how are food supply chains (from farmer, to first-stage processor, to wholesaler, to second-stage processor, to retailer, to consumer) changing and differentiating into different marketing channels?
3. What are the impacts of these changes in the supply chains on agricultural production, on smallholders, and on rural poverty, and what are the patterns, determinants, and effects of the participation of farmers in restructured value chains compared to traditional market channels?
4. What explains the differences in these impacts (over products, countries, and institutional settings), and what policies, institutional changes, and programs would maximize the competitiveness and inclusiveness of the transformation of the new supply chains?

Given the dearth of information on these changes in food supply chains and their impact, primary data collection to document the dynamics is needed. Surveys will need to be conducted of various actors in the value chain, including farmers, brokers, wholesalers, retailers, and processors. The methods used in the research must be tailored to each of the four questions. To examine changes in consumer preferences, the research will rely on consumer surveys to examine food preferences related to commodity composition, quality, and retail outlet, and how preferences vary by income and location. The consumption study will need to cover a broad range of food products as context. The patterns in the restructuring of markets will be examined by carrying out small-sample case studies of particular companies and producer groups, and medium-sample interviews with traders and first-stage processors in each market chain segment in both traditional and modern marketing channels. The study of the patterns, determinants, and effects of farmer participation will be based on large-sample stratified random surveys of producers in traditional and modern supply chains. The identification of

policy recommendations will be based on the synthesis of the above results, as well as interviews with key stakeholders and informed observers.

The purpose of the research should be to document the importance of the various phenomena (the emergence of modern marketing channels; high-value agriculture; the demand for quality and food safety; and the structure of marketing costs, including transport) and describe the dynamics in the restructuring value chains (i.e., modern versus traditional). The impact of changes on agricultural production, on smallholders, and on rural poverty, as well as the importance of the determinants for a differential impact, should then be analyzed.

APPENDIX

Table A.1. Major agricultural marketing policy reforms, 1998/99 to 2006/07

Year	Policy Reform
1998/99	• Cold Storage Order 1964 repealed
2001/02	• Restrictions on domestic and foreign investment (FDI) (up to 100%) in bulk handling and storage removed
	• Inter-Ministerial Task Force and Committee of State Ministers on Agricultural Marketing Reforms implemented
2002/03	• Licensing requirements; stocking limits; movement restrictions on wheat, paddy/rice, coarse grains, edible oilseeds, and edible oils; and selective credit controls lifted
	• Milk and Milk Products Control Order (MMPO) amended to remove restrictions on new milk processing capacity while continuing to regulate health and safety conditions
	• Leather and leather and paper products removed from small-scale reservation list
2003/04	• Ban on futures trading of 54 commodities, including rice, wheat, oilseeds, and pulses, removed
	• Levy on sugar reduced from 15% to 10%
	• Model Act for State Agriculture Produce Marketing (Development and Regulation) formulated
	• Processed food items exempted from licensing under Industries (Development and Regulations) Act 1951, except those reserved for small-scale industries (SSI) and alcoholic beverages
	• Food processing included in priority list for bank lending
	• Automatic approval for FDI up to 100% for most processed foods, except alcohol and beer and those reserved for SSI
2004/05	• Group of Ministers established to formulate modern integrated food law
2005/06	• National Horticulture Mission initiated
	• Negotiability of Warehouse Receipt and Warehousing (Development and Regulation) Bill 2005 approved by Cabinet
2006/07	• Food Safety and Standards Act approved
	• Cess Act repealed
	• Forward Contracts (Regulation) Amendment Bill submitted to Parliament

Source: World Bank (2007)

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