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Using Evidence in Unraveling Food Supply Chains in Ethiopia: The Supply Chain of Teff from Major Production Areas to Addis Ababa

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ABSTRACT

Urbanization is quickly increasing in Africa, raising important questions on how food value chains to cities function and what the implications of urban growth are for the local food trade and farm sector. We study the rural–urban value chain of teff in Ethiopia, by value its most important staple value chain. Relying on unique large-scale surveys at different levels in this value chain, we find—in contrast to conventional wisdom—that value chains are relatively short and that average farmers obtain a high share, of about 80 percent, of the final consumer price in the major terminal market, Addis Ababa. We further find that producer prices decline the further farmers live from the city. Stock release by farmers is smooth over the year and the importance of distress sales after harvest is lower than commonly assumed. As these are all signs of well-functioning markets and as room for improvements toward higher producer prices are small, policy interventions aiming to increase market efficiency therefore seem to have little potential for the major teff production areas of Ethiopia.

Keywords: agricultural transformation, teff, value chains, Ethiopia

"…Africa could produce enough food to feed itself; alas, too few subsistence farmers get a chance to sell their produce (and usually get less than 20 percent of the market price)." *The Economist*, March 2nd- March 8th, 2013, p.9, in Leaders, "Aspiring Africa".

1. INTRODUCTION

The importance of cities is rapidly growing. It is estimated that more than half of the world population was living in cities in 2010, up from 30 percent in the 1950s (UN Population Division 2010). Given this rapid urbanization, especially so in developing countries, and the increasing importance of the manufacturing and service sectors in these countries' economies, more people are making a living outside agriculture, do not grow their own food, and rely on market purchases for their food needs. This leads to rapidly increasing agricultural market flows, especially from rural to urban areas, with a higher number of people on the production and consumption side depending on the functioning of these value chains. This dynamic has profound implications on people's food security in developing countries.

Urbanization is rapidly increasing in Africa as well: the urbanization rate is projected to be as high as 60 percent by 2050 (UN Population Division 2010) and there are increasing concerns by local policy makers on the increasing dependence of African cities on imported foods.[1] This increasing dependency is often blamed on uncompetitive local value chains (e.g. Rakotoarisoa, Iafrata, and Paschali 2011). However, few studies have looked in a scientific way at the functioning of domestic food value chains in developing countries, and especially so in Africa. This lack of research leads to a debate that might not be well informed. A number of common perceptions on food value chains in developing countries exist.

First, as shown in the quote above, it is often assumed that farmers only obtain a small share of the final retail prices. However, few systematic recent reviews based on solid surveys have been done on this issue. Ahmed and Rustagi (1987) compared producer shares in final retail prices in Asia and Africa in the 80s.[2] They show that producer shares in final consumer prices were as high as 75 to 90 percent in Asia but as low as 35 to 60 percent in Africa. Barker, Herdt, and Rose (1985) looked at the producer share in rice in Asia and found similar orders of magnitude. Gollin and Rogerson (2010) find in Uganda that farmgate prices for cassava and maize are often significantly less than half of wholesale prices, across many crops and regions. The World Bank (2008) estimates the share that farmers receive of the final retail price of maize in Ghana at 56 percent.

Second, another perception is that these value chains are characterized by many layers of traders between producers and consumers, leading to inefficiency (e.g. Masters 2008; Mondal 2010; World Bank, 2009). The World Bank states that "in agriculture-based and transforming countries … layers of intermediaries are common in the marketing of food staples and other agricultural commodities" (World Bank 2008, 119). Mattoo, Mishra, and Narain (2007) and Landes and Burfisher (2009) argue that in the case of India most agricultural trade is mediated by a large number of intermediaries which not only inflate prices but this system also takes time to move products from farmers to consumers, leading to large transit costs. Trienekens (2011) argues that local value chains in developing countries are long, in contrast with modern supermarket channels and export markets. Staple cereal chains are often found to be long and complex in Africa, as documented in Ghana (World Bank 2008) and Ethiopia (Rashid and Negassa 2011; Rashid and Minot 2010).

[1] Christiaensen and Devarajan (2013) find that since the mid-2000s, Africa converted from a net exporter of agricultural products to a net importer. Much of the growth in imports concerns staples for the rapidly expanding urban populations. They state that "except for wheat, which is a temperate-zone crop, these are all products in which Africa enjoys a comparative advantage" (Christiaensen and Devarajan 2013, 185).

[2] While producer shares are an imperfect indicator of marketing performance, we will use it throughout the paper given that it is commonly used in the debate and that there are no other easy indicators readily available.

Third, smallholder farmers are often driven to distress sales just after harvest when prices are low (Grootaert, Oh, and Swamy 2002; Prasad and Prasad 1995). This is linked to high seasonality in agriculture in developing countries, with important vulnerability implications (Dercon and Krishnan 2000; Devereux, Sabates-Wheeler, and Langhurst 2012). Given their dire situation, traders are believed to typically prey upon farmers by offering exploitative inter-linkage contracting (Crow and Murshid 1994; Bell 1988) or hoard agricultural products as to obtain high prices in the off-season. In some cases, it has been shown that, given imperfect credit markets and urgent liquidity needs, farmers are obliged to sell products at low prices and then they buy back the same product at high prices in the lean period (Barrett 1996; Barrett and Dorosh 1996; Stephens and Barrett 2011).

The impact of these common perceptions is not to be underestimated as government and other stakeholders often try to intervene in these markets assuming that they are not working well. Some examples illustrate this. First, cooperative marketing is often promoted on the assumption that it increases bargaining power of farmers, solves some of the economies of scale issues that farmers face in the market, and thereby will improve the prices smallholders receive for their produce (Bernard et al. 2010; CTA 2012; DFID 2004). Second, modern commodity exchanges are increasingly been established in Africa to improve objective grading, transparency, as well as competition in agricultural markets (Gabre-Madhin 2012). Third, credit schemes (e.g. warehouse receipt systems or communal storage schemes) are being promoted to reduce the impact of distress sales (World Bank 2012; DFID 2004; Alavi et al. 2012). In such schemes, farmers use their unsold produce as collateral to obtain credit to meet immediate expenditures, enabling them to hold onto their produce to sell later in off-season when they will benefit from higher prices.

There are, however, a number of problems with the evidence base on the functioning of these staple food markets. First, the common practice in food value chain analysis is that it does not rely on reliable and representative surveys and often only uses anecdotal or qualitative evidence (e.g. Webber and Labaste 2009; Nang'ole, Mithöfer, and Franzel 2011; World Bank 2009). Moreover, there is often a lack of reliable data at a larger scale in Africa (Jerven 2013) making it difficult to make credible inferences on the state of agricultural marketing. Second, most of the recent studies on food value chains are focused on emerging high-value products, while surveys that study staple crops are often outdated (Ahmed and Rustagi 1987). Third, in the case that studies were fielded, they typically focus on randomly selected farmers, with the disadvantage that the selected farmers might be of relative less importance in major food supply areas and might thus not present a representative picture of the farmers that effectively participate in value chains of specific crops (Alavi et al. 2012; World Bank 2009).

We contribute to this literature. Based on an innovative survey design involving detailed primary surveys at different levels in the value chain from major production areas to a major urban center, we analyze in this paper the value chain structure, price formation, and the importance of distress sales in rural–urban staple food value chains in Ethiopia. In particular, we study teff being marketed from the most important production zones (representing 42 percent of the commercial surplus nationally and more than 90 percent of the supply to Addis Ababa) to the biggest city in the country, Addis Ababa, estimated officially to be home to 4 million people but likely much larger, and therefore among the biggest cities in Africa.

Our specific contributions are three-fold. First, we collected information on prices for a major staple in major production zones to the final terminal market. Most studies do not take into account that commercial surplus of staples in these countries is heavily clustered. Comparing staple food marketing practices between zones that sell few staple food crops and those that do consume in large quantities is often not relevant. Second, we gathered data on the structure of value chains by carefully inquiring on procurement and sales by these value agents. We find that rural–urban value chains are relatively short. Consistent with this structure, we find that margins in these major commercial domestic staple value chains are surprisingly small and that the average share of the final retail price that the producer receives reaches about 80 percent. Third, we find that producer prices over space decline in line with transportation costs, releases by the producer of teff stocks in storage over the year is rather smooth, and distress sales are of minor importance.

Our findings point to some important policy implications. First, given the lack of good data on food value chains and the often fast changes that are happening in such value chains globally (e.g. Reardon et al. 2012), the collection of reliable primary data is required. Such data might better inform the policy debate on the extent of different constraints in the functioning of these food value chains and on ways that policies can address them. Second, policies aimed at improving market efficiencies—such as stimulating increasing involvement of cooperatives in output marketing (CTA 2012), the establishment of modern exchanges (Francesconi and Heerink 2010; Gabre-Madhin 2012), or warehouse receipt systems (World Bank 2009, 2012)—should be carefully assessed as to where exactly these policies are expected to improve market functioning, especially of staples, and what the expected benefits would be compared to the costs.

The structure of the paper is as follows. We first present the data. In section 3, we look at some basic descriptives that illustrate the functioning of these value chains. Section 4 looks at the structure and at price formation in the chain. In section 5 and 6, we discuss spatial and temporal concerns respectively. We finish with the conclusions in section 7.

2. DATA

The purpose of the study is to understand how the rural–urban teff value chain functions. We rely on data from major teff producing areas and follow the value chain from there to Addis Ababa, the capital of Ethiopia. To get at this information, two types of activities were organized. Interviews were conducted with key informants in the value chain in September and October 2012. That information was used to design questionnaires for each level in the value chain. These questionnaires were then fielded at the end of 2012. The implemented instruments included surveys upstream in the value chain with teff producers and communities, midstream with rural and urban wholesalers and truckers, and downstream with cereal shops, mills, and cooperative retail.

Upstream in the value chain, we selected 1,200 teff farmers. The selection of these farmers involved several steps. First, the five zones with the highest commercial surplus of teff in the country were chosen. In 2011/12, these five zones combined represented 38 percent and 42 percent of the national teff area and commercial surplus, respectively. Second, within each production zone, the *woredas* were ranked from smallest to largest producer (in terms of area cultivated). We then divided the *woredas* in two, the less productive (cultivating all together 50 percent of the area) and the more productive *woredas* (cultivating all together 50 percent of the area). Two *woredas* were randomly selected from each group. Third, a list of all the *kebeles* of the selected *woredas* was obtained. Two *kebeles* were randomly chosen from the top 50 percent producing *kebeles* and one from the low 50 percent producing *kebeles*. Fourth, a list of all teff producers in the preceding season in the selected *kebeles* was then made. They were ranked from small to large teff producers (based on areas cultivated). We then divided the farmers in two groups, the small production (cultivating all together 50 percent of the area) and the large production farmers (cultivating all together 50 percent of the area). Twenty farmers were then selected: 10 from the small production and 10 from the large production farmers. In total, 240 farmers were interviewed per zone.

Midstream, the following strategy was followed. First, 40 rural wholesalers were interviewed in each rural zone. For each *woreda*, the major trading town or temporary wholesale market used by farmers in that *woreda* was selected. A census of all traders in that market/town was then made. As the focus of the study was to understand the value chain from rural areas to Addis Ababa, ten traders that ship teff to Addis Ababa were then randomly selected from this list in these towns/markets. Four such towns/markets were selected for each zone. Second, in Addis Ababa, 75 wholesale traders and brokers were interviewed in total. One-third was interviewed in the Ehil Beranda wholesale market and two-thirds in the Ashwa Meda market, reflecting the relative shares of teff wholesale marketing for Addis Ababa that each market handles. Twenty-five wholesalers were randomly selected in Ehil Beranda (13 without and 12 with shops) and 50 (25 with and 25 without shops) in Ashwa Meda. Ninety truck drivers transporting teff were also interviewed (one-third in Ehil Beranda and two-thirds in Ashwa Meda).

Downstream, we relied on a stratified sampling scheme to select a representative sample of teff retail shops in Addis Ababa. Based on the map of the city, we created five geographical strata with two neighboring similar sub-cities in each stratum. We then randomly selected one sub-city from each stratum, giving us in total five sub-cities to work with. Next, we collected information from the city's Trade and Industry Office, which provided us the complete lists of teff outlets in each sub-city. We then randomly selected outlets to be interviewed. First, all the consumer cooperatives selling teff were surveyed at the sub-city level. Second, in each selected sub-city, four *kebeles* were selected randomly. In each selected *kebele*, all the flour mills were surveyed and five cereal shops were randomly selected and surveyed. In total, 282 retail outlets were interviewed.

Table 2.1 gives an overview of the sample and some basic characteristics of the different value chain agents. The value chain is dominated by men. Fifteen percent of the retail outlets are managed by women but their contribution to other functions in the value chain midstream is limited. Ninety-five percent of the rural wholesalers and all the truck drivers and urban wholesalers are men. Female-headed teff farming households make up 5 percent of our sample. The level of education is slightly higher for value chain agents midstream, with average years of education between 8 and 9 years. It is lowest for the farmers at 5 years. The average years of experience in the teff business is around 8 and 10 years for all agents.

Table 2.1—Sample set-up and basic descriptives

	Unit	Mean	Median	Standard deviation
Farmers				
Number of observations		1200	-	-
Gender head of household	share male	95.3	-	-
Level of education	years of schooling	4.6	4.0	2.9
Experience in teff business	years	9.6	10.0	1.5
Rural wholesalers				
Number of observations		205	-	-
Gender	share male	94.6	-	-
Level of education	years of schooling	7.9	9.0	3.9
Experience in teff business	years	9.5	8.0	7.8
Truck drivers				
Number of observations		90		
Age	years	29.7	29.0	7.1
Gender	share male	100.0		
Level of education	years of schooling	9.4	10.0	1.8
Urban wholesalers/brokers				
Number of observations		75	-	-
Brokers	share	65.3	-	-
Traders	share	64.0	-	-
Gender	share male	100.0	-	-
Level of education	years of schooling	8.7	8.0	3.4
Experience in teff business	years	8.9	7.0	6.7
Urban retailers				
Number of observations		282	-	-
Mills	share	83.3	-	-
Cereal shops	share	9.9	-	-
Consumer cooperatives	share	6.7	-	-
Gender	share male	84.7	-	-
Level of education	years of schooling	7.7	8.0	4.4
Experience in teff business	years	8.2	5.0	7.8

Source: Authors' calculations.

3. DESCRIPTION OF THE TEFF VALUE CHAIN

3.1. Marketing Upstream

Table 3.1 presents some basic descriptives of teff marketing upstream, i.e. by farmers. An average teff producer sold 507 kg in the year prior to the survey. The majority of this teff sold was white, making up two-thirds of all teff sold, and the quantities of mixed and red teff sold are rather small.[3] Minten et al. (2013) show that the shift from red and mixed teff to white teff varieties is a major change that has happened in the last ten years in these production areas. We find that 36 percent of all the produced teff is sold but that there are large differences between different qualities. While 58 percent of the production of *magna* ("superwhite") teff is sold, this is as low as 13 percent for red teff. The number of marketing transactions by these farmers is rather limited. The median is 1 and the average is 1.75.

Farmers were asked for each marketing transaction to give details on the specifics of that transaction.[4] The majority of the sales are to traders at local wholesale markets or to traders with a fixed shop, often in regional markets. Farmers traveled on average 1.5 hours to get to the place of sales and on-farm sales or sales in the village are therefore relatively less important, in contrast with other countries in Africa (Chamberlin and Jayne 2012). Direct sales to consumers make up 7 percent of all transactions. Sales to cooperatives or government institutions (such as the Ethiopian Grain Trade Enterprise) are rather limited: they make up less than 1 percent of the sales transactions. While cooperatives are very

[3] The most widespread quality distinction used in the teff value chain in Ethiopia relates to the color of the grain. The distinction between *magna* ("superwhite"), white, mixed, and red teff is widely used and well known by farmers as well as traders, and we will therefore use it as a measure for quality throughout this paper. Teff quality is also often evaluated by origin. While the quality of teff is also judged by a number of other factors, such as physical appearance, impurities, aroma, texture, and nutritional quality, these are often difficult to measure objectively.

[4] In the case that farmers had more than five transactions (which was rare), they were only asked questions on the five most important ones.

important in input distribution in Ethiopia, they are not a significant participant in cereal output markets (see also Minten et al. 2012). An average sales transaction concerns 300 kg of teff for a value of 3,776 Birr (or about 200 USD). In 84 percent of the sales transactions, this was handled by a male member of the household. Inter-linked transactions with traders are of very little importance upstream. Ninety-nine percent of the transactions were paid immediately and in cash. In only 2 percent of the transactions did the farmer receive input advances from the buyer.

Table 3.1—Characteristics of marketing transactions by teff farmers

	Unit	Mean	Median	Standard deviation
Commercial surplus				
Teff sold per household, quantity	kg	507	250	1130
Magna teff sold per household, quantity	kg	134	0	441
White teff sold per household, quantity	kg	318	100	1028
Mixed teff sold per household, quantity	kg	22	0	128
Red teff sold per household, quantity	kg	33	0	149
Teff, commercial surplus for producing households	%	36	33	26
Magna teff, commercial surplus for producing households	%	58	58	26
White teff, commercial surplus for producing households	%	41	40	28
Mixed teff, commercial surplus for producing households	%	24	17	28
Red teff, commercial surplus for producing households	%	13	0	21
Characteristics of marketing transactions				
Transactions per teff farmer for producing households	number	1.75	1.00	1.52
Type of buyer:				
Farmers	%	0.6		
Farmer-assembler (farmer trader)	%	5.2		
Assemblers from outside village	%	5.5		
At wholesale market: traveling trader going to Addis Ababa	%	17.5		
At wholesale market: traveling trader going elsewhere	%	16.3		
Trader with fixed shop, selling teff to Addis Ababa	%	29.8		
Trader with fixed shop, selling teff elsewhere	%	17.4		
Consumer	%	7.0		
Other (miller, cooperative, EGTE/government)	%	0.7		
Total	%	100.0		
Sale location:				
On the farm or home	%	3.1		
Trader shop (fixed)	%	60.3		
Local (weekly) market	%	34.7		
Other (roadside, cooperative, at mill)	%	1.9		
Total	%	100.0		
Travel time between departure and arrival sales location	minutes	92.0	80.0	65.3
Time spent at location of sale before sale	hours	0.9	0.5	1.0
Total quantity sold per transaction	kg	299	200	685
Type of teff sold:				
Magna	%	22.4		
White	%	60.3		
Mix	%	7.2		
Red	%	10.2		
Total	%	100.0		
Total amount received	Birr	3,776	1,800	18,082
Price received	Birr/quintal	1,065	1,000	232
Person that sold the teff	% male	84.0		
Payment in cash	%	99.6		
Input advances received from buyer	% yes	1.9		
Payment in cash and immediately	%	99.1	100.0	9.1

Source: Authors' calculations.
Note: EGTE = Ethiopian Grain Trade Enterprise.

3.2. Marketing Midstream and Downstream

Table 3.2 presents marketing descriptives of value agents midstream and downstream. Their yearly teff turnover varies between 36 ton for urban retailers to almost 700 ton for urban wholesalers and brokers. Few of the traders report to be involved in long-time storage. The traders were asked details on the different types of services that are provided to suppliers and clients. The data indicate seemingly significant transaction costs between different layers of the value chain. Weighing happens at every level, at the time of purchase as well as sales. Quality assessments are also done for each transaction. This is usually done through visual checks or by rubbing the teff. Some of the agents report to even chew the teff to determine its quality (47 percent, 28 percent, and 20 percent of the urban traders/brokers, rural traders, and retailers respectively). Family, kin, and ethnic relationship are often presumed to be important in agricultural trade (Gabre-Madhin 2001; Fafchamps and Minten 1999). Table 3.2 shows that urban brokers/traders work with a rather limited number of suppliers—seven on average over a 12 month period—and that they procure almost two-thirds of their supplies from the zones that they are originally from. This suggests indeed tight, and often family, networks at that level. On the other hand, only 7 percent of the retailers work with suppliers that are originally from the same zones as theirs.

In contrast with the farm level, credit is much more prevalent in the value chain midstream and downstream. Questions were asked on the importance of credit as well as advances. While few of the rural traders pay their suppliers on credit, this is much more important for urban wholesalers (60 percent) and urban retailers (45 percent). However, the credit is mostly of short duration. The average duration varies between 7 and 17 days. The share of traders that pay on credit themselves are important. Advances are sometimes given to ensure supplies—20 percent of the urban retailers reported giving advances. However, no urban traders reported providing advances.

Table 3.2—Descriptives of marketing agents

		Rural traders		Urban traders/ brokers		Urban retailers	
	Unit	Mean	Median	Mean	Median	Mean	Median
Value assets	1000 Birr	242.4	71.5	122.4	8.9	337.4	78.7
Yearly turnover of teff	ton	252.6	134.3	694.1	585.0	35.9	25.0
Do storage of teff for longer than a month	share (%)	13.7		21.3			
Services for suppliers							
Picked up teff in own/rented truck	share (%)	44.9		9.3		31.1	
Teff is weighed when bought	share (%)	93.2		40.0		98.4	
Teff quality is sampled when bought	share (%)	100.0		100.0		99.3	
If yes, visually checked	share (%)	97.6		100.0		100.0	
If yes, rubbed teff by hand	share (%)	68.3		88.0		62.3	
If yes, chewed the teff	share (%)	28.3		46.7		20.4	
Bags are provided to suppliers	share (%)	23.4		1.3		23.5	
Services for clients							
Deliver to clients	share (%)	91.7		46.7		67.1	
Grade and sort to sell to clients	share (%)	85.9		90.7		-	
Teff is weighed when sold	share (%)	94.6		100.0		99.2	
Teff quality is sampled when sold	share (%)	88.3		100.0		97.1	
Provide bags to clients	share (%)	71.7		98.7		25.2	
Credit							
Suppliers that are paid on credit	share (%)	8.5	0.0	60.5	60.0	45.5	50.0
If yes, number of days before payment	number	11.1	7.0	6.7	5.0	16.6	15.0
Suppliers that were given advances	share (%)	8.7	0.0	1.1	0.0	20.9	20.0
Clients that pay on credit	share (%)	39.0	25.0	47.9	50.0	30.2	30.0
If yes, number of days before payment	number	17.7	15.0	8.0	7.0	20.5	20.0
Clients that gave advances	share (%)	2.5	0.0	0.0	0.0	4.3	5.0
Relationships							
Number of suppliers worked with in last 12 months	number			6.7	4.0		
Trader/broker is originally from Addis Ababa	share (%)			15.0			
Procurement from trader's zone of origin	share (%)			65.0	100.0		
Broker that retailer works with is from same zone	share (%)					7.2	

Source: Authors' calculations.

4. STRUCTURE AND PRICE FORMATION

4.1. Structure of the Value Chain

To get at the structure of the value chain, rural and urban wholesalers and urban retailers were asked from whom they obtained supplies and to whom they sold. The importance of each type of buyer and seller in total supplies was asked for each three-month period over the 15 months prior to the survey. Given that there was no clear seasonal pattern over time, we present in Table 4.1 only the averages over that period.[5] The results illustrate the surprisingly short supply chain that is in place to bring teff to Addis Ababa. Eighty-five percent of the teff supply is directly from farmers to rural traders based in the wholesale markets or regional towns in these five major production zones that were visited. Seventy-six percent of the teff that they procured is directly sold to traders/brokers in wholesale markets in Addis Ababa. Seventy-seven percent of the sales of these urban brokers/traders are going to mills and cereal shops in town. Eighty-six percent of what these retail shops sell is sold directly to consumers. The results are largely consistent if we triangulate the sales and procurement patterns at different levels.

Table 4.1—Procurement and sales patterns (averages over traders and for last 15 months)

	Rural traders		Urban traders/ brokers		Urban retailers	
	% bought from	% sold to	% bought from	% sold to	% bought from	% sold to
Procurement sources and sales destinations:						
Farmers	84.9		4.5		9.8	
Farmer-traders or rural assemblers	13.3		2.5		4.3	
Traders in wholesale markets/wholesalers	1.3	8.1		5.8		
Cooperative unions	0.3	0.0	0.0	1.3	0.1	
Brokers		76.3				
Traders/brokers in Addis Ababa					68.3	
Mills/cereal shops		13.2				
Traders located outside Addis Ababa			83.2		17.6	
Traders in Addis Ababa			9.8			
Enjera wholesalers				0.8		1.3
Enjera wholesale companies				0.2		0.0
Enjera retailers with fixed shops				4.4		4.8
Enjera retailers without fixed shops				1.7		5.2
Institutions				1.8		0.2
Restaurants				1.4		2.1
Mills				69.8		
Cereal shops				6.8		
Consumers				5.7		85.7
Supermarkets				0.1		0.4
Others	0.2	2.4	0.0	0.3	0.0	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0
Number of observations	188	185	74	72	238	222
Percentage sold to:						
Addis Ababa		92.8		91.8		
Rural zone where trader was interviewed		4.6		-		
Other zone		2.4		8.2		
Percentage procured from:						
Five major production zones				91.2		
East Gojjam				34.8		
West Gojjam				2.1		
West Shewa				44.8		
East Shewa				2.0		
South West Shewa				7.5		
Other				8.8		

Source: Authors' calculations.

[5] No weighted averages for the turnover of the traders are shown (they would show the importance for the whole urban–rural value chain). No significant differences were noted with simple averages.

This illustrates that the prevalent structure of the value chain from these major production zones to the urban city are rather short, from producer to regional trader to urban trader/broker to urban retailer. In the most common case, there are therefore three intermediaries found between farmers and urban consumers. This finding is against conventional wisdom.[6] Note that 32 percent of the urban retailers obtain their products directly in rural areas (bypassing the urban wholesale markets), making the value chain even shorter. On the other hand, the value chain can also be longer, as rural traders procure 13 percent of their produce from rural assemblers or farmer-traders and 10 percent of the urban wholesalers/brokers obtain produce from other urban wholesalers/brokers.

At the bottom of Table 4.1, we present statistics on procurement areas and destination of sales. Ninety-two percent of all the teff sales by the interviewed urban wholesale traders was destined to Addis Ababa. While Addis Ababa was seen in the past as a clearing house for national cereal trade, i.e. the national cereal trade went through Addis Ababa as all major traders were stationed there (Gabre-Madhin 2001), this is seemingly less the case now than before. The larger agricultural marketing flows in the country, as well as improved communications, might have contributed to that change (Minten et al. 2012). Urban traders were also asked to indicate from which zone they procured teff. The five production zones where the producer surveys were fielded make up for 91 percent of all the teff coming to Addis Ababa. In our survey set-up, we thus captured well the major suppliers to Addis Ababa as well as end-users, rarely the case in surveys of food value chains.

4.2. Price Formation in the Chain

Prices were carefully collected at each stage of the value chain for each quality at the time of the survey. We also asked information on the origin of the teff (i.e. the *woreda*) as that is also often seen as an important determinant of quality, though difficult to verify objectively. Prices were asked from farmers for the different qualities at the time of the survey for their most common place of sale. While they might not have sold teff recently, farmers are often very well aware of current prices for the major crops that they grow. The advantage of this method is that there are fewer problems with recall. For traders, prices were asked for all qualities that they were selling that day or week. One issue with the price collection process is that the surveys were fielded at different periods. The rural surveys were fielded in October–November 2012 (period 1) while the urban surveys were fielded in November–December 2012 (period 2). To address this problem, a daily wholesale market price survey was conducted where prices for different teff qualities and origins were carefully and consistently collected with a large number of traders in three urban wholesale markets during each of the periods. This information allows for an adjustment in price levels between periods and for a consistent comparison.

Using these prices, we present in Table 4.2 two specifications to get at the price composition in these value chains. In the first specification, we regress the price for each quality on different value chain level dummies. In the second specification, we do the same exercise but include *woreda* dummies as additional controls for quality. Producer price locations were divided in two, depending if the farmer chose to report prices at the farmgate or at the rural market. The wholesale urban market price observations are split into two periods. The results in Table 4.2 show the consistency in price composition from these data. Farmgate prices in 7 out of the 8 specifications are lower than rural market prices, rural market prices are significantly below urban wholesale prices, and urban retail prices are higher than wholesale prices during the same period.

An F-test to measure if prices changed significantly over the two periods is presented below the regression results. For the two specifications and for the four qualities, the prices decreased significantly in the second period compared to the first one, reflecting the downward price pressure from the newly arriving harvest in the second period. One issue for price analysis in value chains is the willingness of traders to reveal prices as that information would show their profits and margins, often information that they are hesitant in sharing with outsiders. As we have price statements by farmers in rural markets as well as procurement prices by rural traders during that same period, we are able to compare both sources of information. An F-test reported at the bottom of each regression shows that there is no significant difference between these measures for 7 out of the 8 reported regressions (the exception is white teff in the specification without *woreda* controls), indicating that prices at the trader level are reasonable and seemingly well collected.

[6] Fufa et al. state “The teff value chain is fragmented and involves many players. Most farmers sell to assemblers individually, who then sell on to traders and wholesalers. Most teff is sold at harvest when prices are low.” (2011, 2)

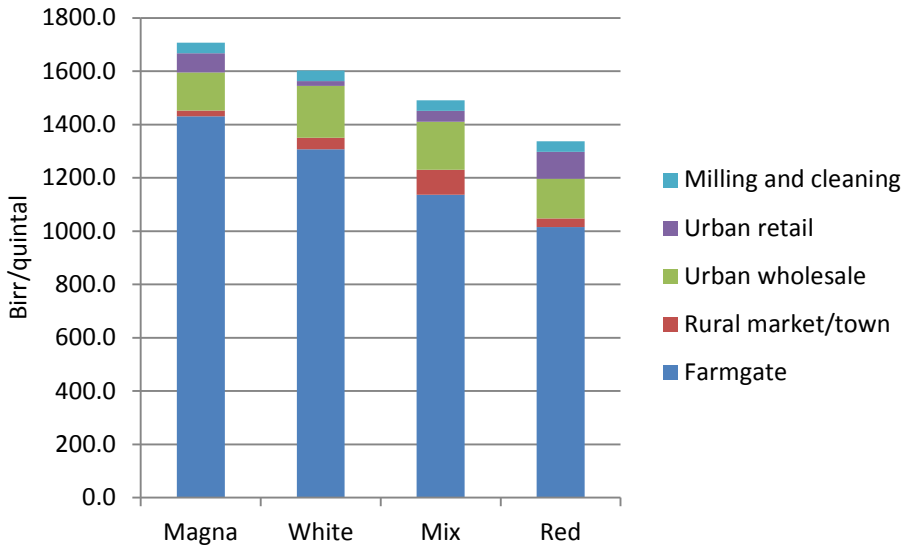
Table 4.2— Price regressions over the teff value chain (price at time of survey; Birr/quintal)

Level	Source	Time of survey	Unit	Magna		White		Mix		Red	
				Coeff.	t-value*	Coeff.	t-value*	Coeff.	t-value*	Coeff.	t-value*
Specification 1: Without *woreda* (community) controls											
Farmgate	Farm survey	Period 1	yes=1	-167.2	**-8.1**	-210.1	**-13.7**	-253.2	**-5.6**	-159.3	**-5.4**
Rural market	Farm survey	Period 1	yes=1	-146.0	**-12.2**	-166.3	**-20.2**	-159.9	**-6.1**	-126.0	**-5.3**
Rural market	Rural trader survey	Period 1	yes=1	-143.7	**-15.8**	-141.7	**-16.0**	-128.5	**-11.5**	-128.2	**-10.5**
Urban wholesale market	Urban trader survey	Period 1	yes=1	-2.5	-0.4	28.1	**4.6**	20.1	**2.7**	22.6	**2.3**
Urban wholesale market	Urban trader survey	Period 2	yes=1	-68.9	**-10.3**	-46.2	**-5.3**	-60.9	**-8.6**	-123.0	**-13.5**
Urban retail (default)	Urban retailer survey	Period 2	yes=1								
Intercept				1598.1	**336.7**	1516.5	**391.3**	1389.9	**279.1**	1173.9	**161.9**
Number of observations				859		1386		1042		639	
R squared				0.35		0.34		0.28		0.26	
MSE				93.28		118.34		103.13		116.31	
F-test if…				F()	Prob>F	F()	Prob>F	F()	Prob>F	F()	Prob>F
… rural market price reported by farmers is equal to reports by traders				0.03	0.87	5.20	**0.02**	1.30	0.25	0.01	0.93
… wholesale market price is equal in period 1 to period 2				101.69	**0.00**	66.78	**0.00**	113.93	**0.00**	284.64	**0.00**
Specification 2: With *woreda* (community) controls											
Farmgate	Farm survey	Period 1	yes=1	-145.4	**-7.9**	-166.8	**-11.1**	-227.8	**-5.1**	-79.7	**-2.3**
Rural market	Farm survey	Period 1	yes=1	-105.8	**-7.5**	-132.0	**-12.5**	-151.6	**-5.4**	-92.9	**-3.8**
Rural market	Rural trader survey	Period 1	yes=1	-90.8	**-8.8**	-118.6	**-10.7**	-108.2	**-7.4**	-96.2	**-7.0**
Urban wholesale market	Urban trader survey	Period 1	yes=1	11.0	1.5	16.3	**2.3**	1.9	0.2	18.0	1.5
Urban wholesale market	Urban trader survey	Period 2	yes=1	-58.2	**-7.6**	-62.6	**-8.1**	-81.5	**-8.2**	-140.2	**-14.1**
Urban retail (default)	Urban retailer survey	Period 2	yes=1								
Intercept				1649.0	**224.0**	1433.7	**204.8**	1451.6	**51.6**	1054.7	**30.1**
Number of observations				847		1376		1031		626	
R squared				0.53		0.52		0.45		0.46	
MSE				80.27		103.00		92.34		102.26	
F-test if…				F()	Prob>F	F()	Prob>F	F()	Prob>F	F()	Prob>F
… rural market price reported by farmers is equal to reports by traders				1.30	0.25	1.20	0.27	1.97	0.16	0.02	0.88
… wholesale market price is equal in period 1 to period 2				160.27	**0.00**	82.35	**0.00**	133.87	**0.00**	286.75	**0.00**

Source: Authors' calculations.
Note: * t-values in bold are significant at the 5 percent level.

We use the regression results of Table 4.2 to construct an average price composition graph from farmer to consumer for period 1, i.e. October–November 2012, for the four main qualities. As urban retail prices were collected later when prices had declined, we adjust the urban distribution costs upward for that period, assuming that absolute margins stayed similar in both periods. We also add the information that was collected on average milling and cleaning costs to get at the final price formation of teff flour in retail markets. Figure 4.1 illustrates that the share of the farmers in final retail prices of grain are an astonishing 78 percent to 86 percent, depending on the quality. The average picture is contrary to conventional wisdom that most farmers in developing countries only obtain a small share of final retail prices. The bulk of the margin between farmers and retailers consists of the margin between rural and urban wholesale markets. On average for the four qualities, the urban–rural wholesale margin makes up 54 percent of the total margin between farmgate prices and urban teff flour prices. The margin between farmgate and rural wholesale markets, between urban wholesale and retail, and for milling and cleaning contribute the rest, i.e. 15 percent, 19 percent, and 13 percent respectively.

Figure 4.1—Teff price structure by quality in the period October–November 2012



Source: Authors' calculations.

This average price composition picture is for the period October–November when prices are relatively high (as just before the new harvest). Producer shares will come down when prices are relatively low after the harvest period. This figure is also an average picture for all farmers combined in the sample. Farmers that are further out obtain obviously a lower share. The issues with spatial and temporal variation are discussed in more depth below, in sections 5 and 6 respectively.

5. VARIATION OVER SPACE

Transportation costs and remoteness matter enormously in agricultural markets in developing countries (Teravaninthon and Raballand 2009; Deichmann, Shilpi, and Vakis 2009; Fafchamps and Shilpi 2003; Gollin and Rogerson 2010; Alavi et al. 2012). In this section, we study how transportation costs and marketing behavior differ over space between Addis Ababa and rural production areas. First, we look at the transport sector and analyze how teff is shipped from rural to urban areas. Second, we discuss how farmers' teff marketing is affected by these transport costs.

To better understand how the transport sector for agricultural products in Ethiopia works, a survey was implemented with truck drivers that ship teff from rural areas to Addis Ababa's wholesale markets, where they were interviewed. Truck drivers were asked about the characteristics of themselves, the owner of the truck, and about the type of trucks used. Detailed questions were also asked about the last roundtrip (coming from rural areas to Addis Ababa and leaving from Addis Ababa to rural areas). Table 5.1 presents some of the descriptive statistics.

The average carrying capacity of a truck that ships teff to Addis Ababa is rather small, i.e. 5 ton. It has been used for about 10 years and its value is evaluated at about 0.5 million Birr (or about 25,000 USD). In only 10 percent of cases is the driver also the owner of the truck. Drivers are paid a monthly salary as well as a daily allowance. Most of the busi-

nesses involved in the transport of teff are small in size as the median number of trucks owned is one.[7] The average distance covered in the last trip was 228 kilometer. Twenty percent of the trucks drove on non-paved bad quality roads during the trip while 46 percent only drove on paved roads. The cost of transport is 18 Birr/quintal per 100 km (or almost 10 USD/ton per 100 km), significantly lower than recent estimates (24 USD/ton per 100 km) on the costs from primary to terminal markets (World Bank 2012). It might be that there is significant competition in these commercial agricultural areas, driving down costs compared to other areas in Ethiopia. On the trip to Addis Ababa, transporters transported goods for about two sellers and they delivered goods to over three buyers on average. In 82 percent of the cases, a transport broker was used to find a load. Transport charges for the return trip to rural areas are similar to traveling to Addis Ababa. However, in one-quarter of the cases the truck was idle on the return, indicating that it is often more complicated to find goods to ship out of Addis Ababa than to Addis Ababa. This is possibly confirmed by the higher prices that brokers charge for finding loads for trips out of Addis Ababa.

Table 5.1—Descriptives of transport

	Unit	Mean	Median	Standard deviation
Characteristics of truck				
Carrying capacity	quintals	51.2	50.0	15.8
Age	years	9.7	7.0	14.1
Value	1000 Birr	500.0	500.0	261.9
Characteristics of truck driver				
Is also the owner	share (%)	10.7		
Is paid a fixed amount per month	% yes	98.9		
If yes, monthly salary	Birr	1,183	1,000	514
Is paid a per diem	% yes	96.6		
If yes, daily per diem	Birr	90.9	100.0	24.8
Characteristics of owner				
Age	years	39.6	38.5	10.6
Gender	% male	98.1		
Education	years	8.8	10.0	3.8
Trucks owned	number	1.1	1.0	0.6

Characteristics of last trip		To Addis Ababa			From Addis Ababa		
		Mean	Median	Standard deviation	Mean	Median	Standard deviation
Distance	km	228	254	145	231	260	149
Road quality:							
- Only paved road	share (%)	45.6			46.6		
- Drove on non-paved road but good quality	share (%)	33.0			33.0		
- Drove on non-paved bad quality road	share (%)	21.4			20.4		
Time for travel between departure and arrival	hours	6.8	8.0	3.7	6.8	8.0	3.8
Time for unloading/loading/searching	hours	4.7	5.0	2.7	4.7	5.0	2.6
Time for whole trip	hours	-	-	-	22.6	23.3	8.0
Trucks which were idle	share (%)	0.0			25.2		
Capacity of truck used	%	94.9	100.0	13.9	81.0	100.0	35.3
Total value of good transported	1000 Birr	66.8	65.0	23.3	160.0	150.0	86.0
Transport payment	Birr/quintal	41.8	40.0	19.5	46.1	40.0	28.4
Transport payment per 100 km	Birr/quintal	18.3	15.7	13.4	19.9	15.4	19.1
Transport payment per 100 km	USD/ton	9.7	8.3	7.1	10.5	8.1	10.1
Number of sellers transported for	number	2.4	2.0	5.2	3.9	3.0	3.7
Number of pickup points	number	1.8	2.0	1.0	3.1	3.0	2.7
Number of buyers delivered to	number	3.4	4.0	1.3	4.0	3.0	3.4
Number of delivery points	number	3.7	4.0	1.3	4.3	3.5	3.5
Transport broker used	% yes	82.4			83.0		
Payment to transport broker	Birr	174	150	104	258	250	109

Source: Authors' calculations.

[7] The World Bank (2012) shows that different types of companies are active in the transport sector in Ethiopia, including private companies with large fleets, transport associations consisting of a group of private operators with a limited number of trucks, government operated public transportation companies, and enterprises and sole proprietors that involve one or more individuals owning and operating their own trucks. Our results indicate that the latter companies take care of most teff transport.

To understand how distance traveled is related with transport charges, a regression was run where these transport charges per quintal are regressed on different explanatory variables including distance but also the size of the truck, road quality, number of sellers and buyers, and the use of a broker. We include a quadratic term in the distance as to allow for potential curvature in the effect of distance. Two specifications were run, one including data for the trip to Addis Ababa only and a second one where data for the round trip—when mostly no teff is transported—are added as well. The results are shown in Table 5.2. Distance and the intercept—reflecting the fixed part of the transportation cost—are the only variables that come out significant in the regression. It is estimated that for every 100 km extra traveled, transport charges go up by about 13 Birr per quintal (about 7 USD per ton per 100 km).

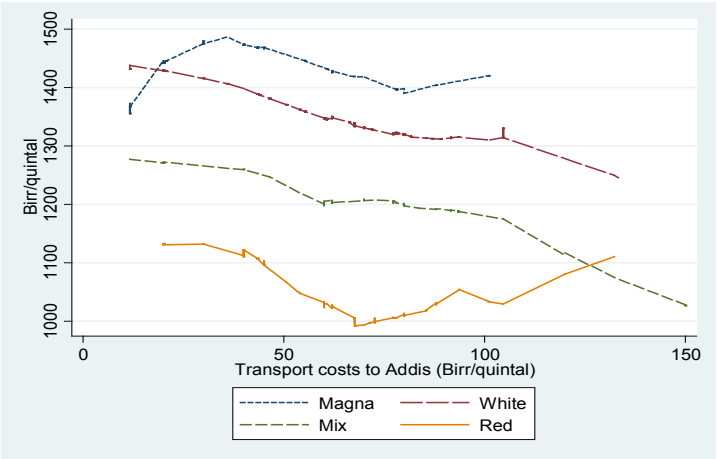
Table 5.2—Determinants of transportation costs by trucks (in Birr/quintal)

Explanatory variables	Unit	Trip to Addis Ababa only		Roundtrip	
		Coeff.	t-value*	Coeff.	t-value*
Distance	100 km	13.23	**6.97**	12.00	**5.33**
Distance squared	100 km	-0.45	-1.63	-0.35	-1.37
Size of truck	quintals	-0.06	-0.81	-0.05	-0.96
Road quality (default only paved road):					
Drove on non-paved road but good quality	yes=1	-0.17	-0.05	3.99	0.84
Drove on non-paved bad quality road	yes=1	3.52	1.21	2.03	0.81
Number of sellers transported for	number	0.09	0.77	0.02	0.10
Number of buyers delivered to	number	0.32	0.37	0.03	0.47
Broker used	yes=1	3.55	1.56	-0.71	-0.22
To Addis Ababa	yes=1			1.87	0.53
Intercept		12.68	**3.15**	16.31	**2.56**
Number of observations		101		177	
F()		47.86		44.67	
Prob>F		0.00		0.00	
R-squared		0.69		0.35	
Root MSE		11.46		19.37	

Source: Authors' calculations.
Note: * t-values in bold are significant at the 5 percent level.

As transportation costs go up significantly with increasing distance to Addis Ababa, this is then supposed to show up in farm prices, assuming that costs would be transmitted to farmers. Using non-parametric regressions, Figure 5.1 shows the relationship of the reported producer prices at the time of the survey of the four main teff qualities with transportation costs to Addis Ababa. We note overall clear decreases in teff prices the farther that farmers are located from the terminal market. While at the time of the survey the share of the producer price in the final retail price of the most traded teff quality (the *white* variety) close to the city reaches over 90 percent, this drops to 80 percent for the most remote farmers. The only exception of the strong influence of transportation costs on producer prices is found in the case of red teff, which shows this drop only until half way through the sample. The price increases again when farmers are farther out. It is possible that this is linked with the relatively lower importance of red teff in the major value chain toward Addis Ababa and price setting in these more remote settings might be more driven by local demand parameters.

Figure 5.1—Producer prices of teff by transportation costs to Addis Ababa



Source: Authors' calculations.

We further test the influence of transport costs on producer prices through a multivariate regression framework where we control for other confounding factors in price formation. We rely on two measures of producer prices as dependent variable. The first is the stated price by the farmer in his most common place of sale at the time of the survey. The second is the price that the farmer received in teff marketing transactions in the last 12 months prior to the survey. On top of transportation costs to Addis Ababa, we control in the first specification for the place of sales and in the second regression for place of sales, quantity sold, as well as the timing of sales. Standard errors are estimated after accounting for within cluster (*kebele*) correlations and possible heteroskedasticity.

The results of the regression are shown in Table 5.3. We test through an F-test if producer prices drop as fast as transportation costs to Addis Ababa increase for all specifications (the stated and the actual price for the four qualities). In all the eight cases, this hypothesis cannot be rejected, indicating that teff producer prices drop in line with transportation costs.[8,9] The results further show that prices at the farmgate are mostly lower than prices in markets. However, differences are not significant. Farmers that sell larger quantities are usually able to negotiate higher per unit prices (e.g. Fafchamps and Hill 2005). Coefficients of this variable are significant in the case of the two most important qualities (white and *magna*). As expected, we also note strong seasonality in prices, with prices significantly higher in the period just before harvest.

Table 5.3—Determinants of teff prices (in Birr/quintal)

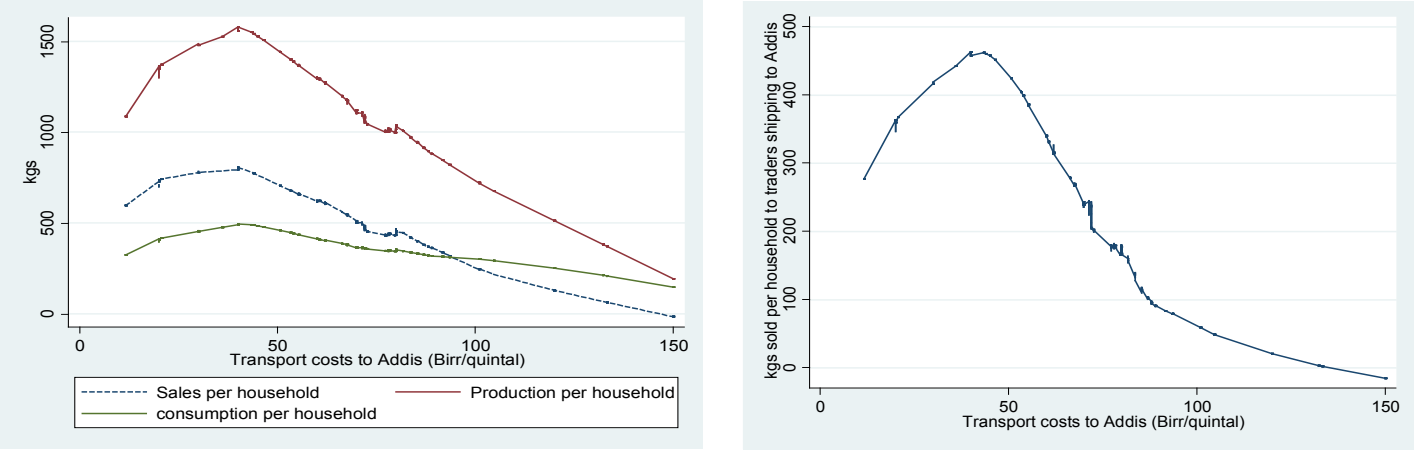
	Unit	Magna		White		Mix		Red	
		Coeff.	t-value**	Coeff.	t-value**	Coeff.	t-value**	Coeff.	t-value**
Stated price at the time of survey*									
Transport costs to Addis from *kebele*	Birr	-0.71	-0.85	-1.75	**-2.88**	-1.18	-1.75	-1.61	**-2.03**
Farmgate	yes=1	-31.02	-0.95	-48.68	**-2.21**	-59.54	-1.15	-0.60	-0.02
Intercept		1488.77	**30.92**	1467.49	**37.72**	1304.38	**30.37**	1141.34	19.50
Number of observations		203		565		76		121	
R squared		0.02		0.07		0.08		0.03	
MSE		140.75		151.17		194.94		197.40	
F-test if producer prices drop as fast as…		F()	Prob>F	F()	Prob>F	F()	Prob>F	F()	Prob>F
… transport costs to Addis increase		0.12	0.73	1.52	0.22	0.07	0.79	0.59	0.45
Obtained price for transactions over the last 12 months*									
Transport costs to Addis from kebele	Birr	-1.01	-1.27	-0.50	-0.87	-1.39	**-2.51**	-0.81	-1.14
Quantity	log()	18.88	**1.91**	45.23	**4.35**	11.95	0.60	-1.18	-0.06
Farmgate	yes=1	-14.91	-0.34	-63.89	-1.47	92.42	1.09	68.07	1.05
Monthly dummies (September/October=default)									
October/November	yes=1	-65.21	-0.95	49.65	0.97	-129.74	-1.16	-177.20	**-2.39**
November/December	yes=1	-355.17	**-4.75**	-358.28	**-8.15**	-548.55	**-4.20**	-318.22	**-2.60**
December/January	yes=1	-428.60	**-9.25**	-343.17	**-8.34**	-345.22	**-1.86**	-264.34	**-3.54**
January/February	yes=1	-396.21	**-8.37**	-321.16	**-8.31**	-490.80	**-5.58**	-199.92	**-3.08**
February/March	yes=1	-392.15	**-8.54**	-317.37	**-9.24**	-442.90	**-4.77**	-303.36	**-4.30**
March/April	yes=1	-337.17	**-5.96**	-250.62	**-6.49**	-423.82	**-4.60**	-239.84	**-3.41**
April/May	yes=1	-300.00	**-6.26**	-201.12	**-5.23**	-361.57	**-4.11**	-247.73	**-4.12**
May/June	yes=1	-240.59	**-6.09**	-175.82	**-5.14**	-373.35	**-3.87**	-186.46	**-3.20**
June/July	yes=1	-232.09	**-6.32**	-128.32	**-3.70**	-232.49	**-3.05**	-161.66	**-2.86**
July/August	yes=1	-102.08	**-2.66**	-65.20	**-2.02**	-212.49	**-3.53**	-188.37	**-2.57**
August/September	yes=1	-68.15	-1.71	-0.77	-0.02	-112.40	-1.65	-100.41	-1.24
Intercept		1452.11	34.39	1277.84	26.27	1408.31	15.18	1107.96	14.01
Number of observations		453		1230		166		201	
R squared		0.33		0.3		0.33		0.15	
MSE		186.11		190.85		202.36		185.55	
F-test if producer prices drop as fast as…		F()	Prob>F	F()	Prob>F	F()	Prob>F	F()	Prob>F
… transport costs to Addis increase		0.00	0.99	0.73	0.40	0.49	0.49	0.07	0.79

Source: Authors' calculations.
Notes: * Standard errors are estimated after accounting for within cluster (*kebele*) correlations and possible heteroskedasticity. ** t-values in bold are significant at the 5 percent level.

[8] This is in contrast to results reported by Minten and Kyle (1999) in Zaire as well as Gollin and Rogerson (2010) in Uganda. They find that producer prices drop much faster, possibly linked with decreasing levels of competition and increasing risk.
[9] A specification was also tried where *woreda* dummies were included to additionally control for quality. In none of the cases was the F-test significant.

While we find that producer prices vary over space, other production and marketing measures show strong associations across space as well. Figure 5.2 (left side) shows how production, commercial surplus, and consumption per teff producing household vary with transportation costs to Addis Ababa. We see the highest commercial surpluses achieved by farmers that face the lowest transportation costs. Commercial surplus decreases to almost zero for those farmers that are most remote; these farmers drop to subsistence levels. Consumption levels of teff per household show less variation over space. However, the most remote farmers have slightly lower consumption levels of teff.[10] The right side of Figure 5.2 shows how the quantities of commercial surplus that are sold to traders that ship the product to Addis Ababa vary by transportation costs to Addis Ababa. As could be expected, we find a strong relationship. For those farmers that live close by, the majority of commercial surplus is sold to traders that ship to Addis Ababa. For farmers that live further out, they ship to other places or to other types of sellers or more importantly, they just sell less.

Figure 5.2—Commercial surplus and quantity sold to traders shipping to Addis Ababa



Source: Authors' calculations.

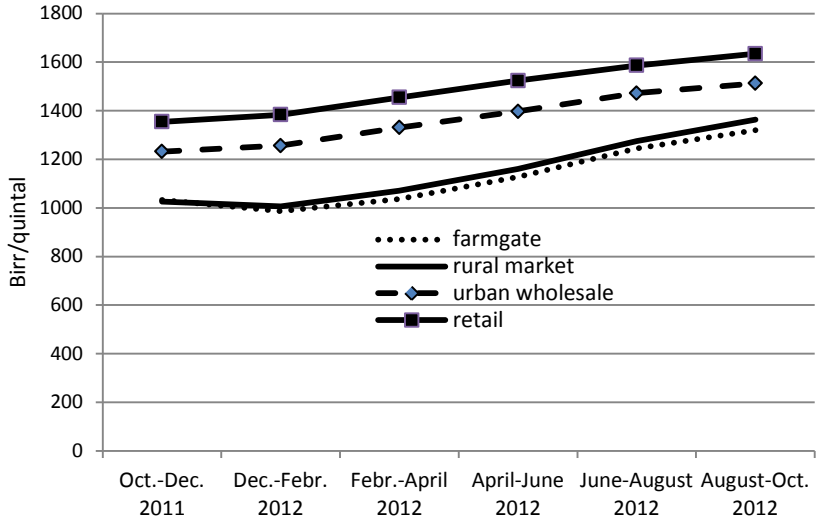
6. TEMPORAL VARIATION

Seasonality is important in most agricultural markets but especially in Ethiopia because of a short rainfall season, limited irrigation possibilities, and therefore often the reliance on one crop a year (Dercon and Krishnan 2000; Devereux, Sabates-Wheeler, and Langhurst 2012). We look in this section at seasonality in price behavior and in use of production, including sales. Recall data on prices were asked from the different value chain agents for two-month periods over the previous season. These collected prices were regressed on seasonal and on quality indicators. The results of the seasonal coefficients are shown in Figure 6.1.

The lowest prices are observed at the harvest period (December–February) and the highest toward the end of the year (August–October). Retail prices increased by 15 percent and producer prices by about 40 percent in the months of August–October compared to the harvest price. Similar seasonal price amplitudes have also been found in other studies (Rashid and Negassa 2011; Minten et al. 2012) and the survey year thus illustrates a seemingly typical pattern. The share of the producer in the final retail price is significantly lower at harvest time given that retail prices are significantly lower and that marketing margins do not change very much in absolute terms. However, producer prices still make up 71 percent of the urban retail price during the harvest period. While urban distribution margins do not change over the year, we note a slight increase in margins between rural markets and urban wholesale markets during the harvest season compared to the off-season period. This might be partly driven by higher transport costs during the harvest period (Minten et al. 2012).

[10] Possibly illustrating the economic superior characteristics of teff as more remote households are often poorer (e.g. Jacoby and Minten 2009).

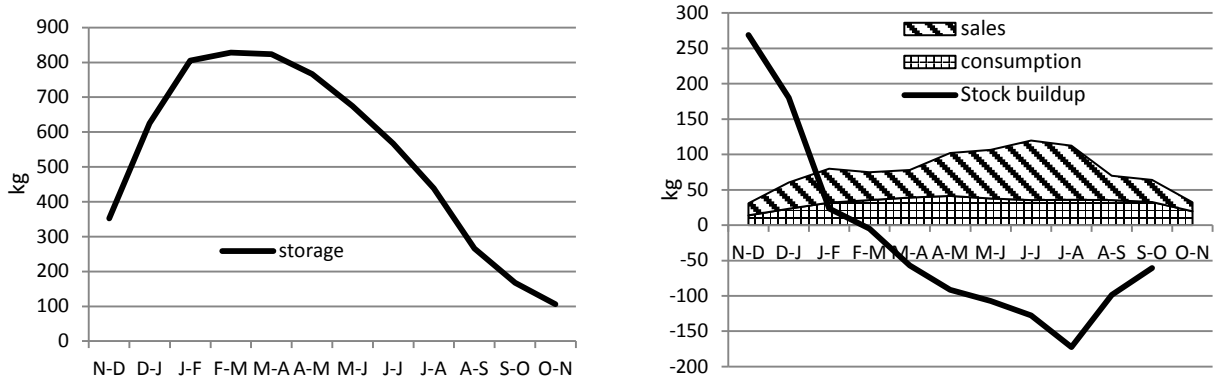
Figure 6.1—Seasonal average teff prices in the value chain



Source: Authors' calculations.

Data were further collected on monthly storage, sales, and consumption of teff. Figure 6.2 shows how these measures change over the year. The figure on the left illustrates the average smooth withdrawal of teff from peak storage after harvest (at about 800 kg per household in the month of March). This average storage level comes down to about 100 kg per household in November.[11] The figure on the right shows monthly sales, consumption, and stock changes. Stock changes are calculated by comparing monthly changes in stock position, i.e. positive values indicate a stock buildup while negative values signal stock release. Stock buildup is happening during the months of November until March. Stock withdrawal is mainly done between March and October. The main uses of teff production are consumption and sales.[12] Teff consumption increases immediately after harvest and stays stable over the year. It drops to half the level in the months before the harvest. As expected, we also note strong seasonal patterns in the sales of teff. Surprisingly, the peak of sales in our survey data is not immediately after harvest but it is a couple of months afterwards. Stock release is highest during the period of July–August (*Hamle*), also the month when the sowing of teff takes place.

Figure 6.2—Seasonality in storage (left side) and monthly use of teff (right side)



Source: Authors' calculations.

As we have variation of prices over time, over space, as well as in quantities sold by different farmers, this information allows us to calculate the average producer share in the Addis Ababa retail price over the seasons.[13] We use as the retail prices the average price reported by the retailers for every two months for the four qualities over the 12 months prior to the survey. The producer prices are then divided by retail prices for the same period and for the same quality. For the calculation of prices, we weigh them by the quantity sold by particular producer as to represent the commercial value chain. Using this method, the average share of the producer in the final retail price in Addis Ababa—reflecting the share

[11] Teff can be stored for relatively longer periods without quality loss and the graph suggests that some farmers indeed store across years seemingly using teff as a savings device.
[12] Sales and consumption are the most important uses of teff production. They make up 46 percent and 33 percent, respectively, of total use of the production in the year prior to the survey.
[13] The analysis presented in section 4 could possibly be criticized by arguing that this is not the main sales period for farmers as well as a period of relatively high prices in the off-season.

of the consumer price that went to the producer for the 12 months prior to the survey—is estimated to be as high as 79.4 percent. The median is evaluated at 79.2 percent. This calculation with different price collection methods (recall data) thus confirms the order of magnitude that was found by using the reported prices at the time of the survey (in Section 4).

Finally, we turn to the incidence of distress sales at the farm as such sales, usually immediately after harvest, are presumed to be important in these teff markets (Fufa et al. 2011).[14] We use two indicators as a measure of distress in teff marketing. For each sale transaction, farmers were asked to indicate if they would have sold teff at that time if the price of teff would have been 10 percent lower. If they said yes, a follow-up question was asked if they would have sold at a price that would have been 50 percent lower. The positive answers to these questions are used as measures of 'distress' and 'extreme distress' sales respectively. Using these indicators, it is estimated that 19 percent of the transactions were sold in distress and 10 percent in extreme distress (Table 6.1). In contrast, in 71 percent of the transactions, farmers would not have accepted a lower price of that order of magnitude.

To explore what are the associates of these distress sales, a multinomial model is run with the three categorical variables (normal, distress, and extreme distress) as dependent variable and with characteristics of the transactions and of the household as explanatory variables. Distress sales show a significant seasonal pattern: they are relatively more prevalent immediately after harvest as shown by significant coefficients for the period December/January and January/February for both indicators. Extreme distress sales are characterized by smaller quantities sold and households seem to be only willing to sell in extreme distress those quantities that are required to satisfy their urgent liquidity needs. Two other variables come out significant for both measures. First, households that have off-farm income sources are less affected by distress sales. This seems logical as they can rely on other income resources and can thus reduce pressure on sales of teff at periods of low prices. Second, more remote households are affected by more distress sales, possibly because of higher poverty levels as well as lower production levels in the more remote areas (Jacoby and Minten 2009).

[14] "… [teff] farmers usually sell their produce immediately after harvest, resulting in high supply in those seasons, thereby leading to lower farm gate prices. In almost all cases of the focus group discussions conducted, the study noted that the immediate selling behavior of farmers is the result of their immediate liquidity requirements." (Fufa et al. 2011, 26)

Table 6.1—Multinomial model of distress sales

	Unit	Distress "would accept 10% lower price"		Extreme distress "would accept 50% lower price"	
		Share		Share	
Descriptives					
Number of transactions sold in distress	%	19.5		10.1	
Quantity of teff sold in distress	%	22.0		6.5	
Regression results*		**Coeff.**	**t-value****	**Coeff.**	**t-value****
Independent variables					
Characteristics of transaction					
Quantity sold (quintals)	log()	-0.030	-0.39	-0.509	**-5.07**
October/November	yes=1	0.176	0.27	0.988	1.52
November/December	yes=1	0.929	1.83	1.406	**2.43**
December/January	yes=1	1.340	**3.56**	1.344	**3.01**
January/February	yes=1	0.728	**2.01**	0.891	**2.07**
February/March	yes=1	0.696	1.91	0.545	1.24
March/April	yes=1	0.172	0.45	-0.177	-0.36
April/May	yes=1	0.650	1.84	-0.564	-1.15
May/June	yes=1	0.078	0.22	0.003	0.01
June/July	yes=1	0.412	1.17	0.253	0.59
July/August	yes=1	0.350	0.95	0.243	0.55
August/September	yes=1	0.575	1.44	0.320	0.64
Characteristics of household					
Education head of household	years	-0.011	-1.15	0.017	1.46
Age head of household	years	-0.001	-0.22	0.024	**2.89**
Gender head of household	male=1	0.443	1.43	0.899	1.90
Size of household	number	-0.088	**-2.76**	-0.007	-0.17
Share of young in household	share	0.444	1.26	-0.163	-0.36
Share of elder in household	share	1.076	1.73	0.688	0.84
Household has off-farm income	yes=1	-0.472	**-3.13**	-0.853	**-3.88**
Land owned by household	hectares	0.029	0.74	-0.090	-1.86
Value of livestock in Birr	log()	-0.070	-1.53	-0.130	**-2.30**
Value of non-land assets in Birr	log()	0.004	0.07	0.006	0.07
Distance to market in minutes	log()	0.153	**2.19**	-0.087	-0.91
Transport costs to Addis Ababa	Birr	0.008	**3.07**	0.008	2.46
Intercept		-2.035	**-2.52**	-2.466	-2.21
Number of observations		2042			
Wald Chi2(46)		233.35			
Prob>chi2		0.00			
Pseudo R2		0.07			

Source: Authors' calculations.
Notes: * robust standard errors. ** t-values in bold are significant at the 5 percent level.

7. CONCLUSIONS

The increasing urbanization in developing countries raises important questions on how food value chains function and on how opportunities can be harnessed from these changes to allow for better food security for rural as well as urban poor. We look in this study in particular at the case of the rural–urban value chain of teff in Ethiopia, by value its most important staple value chain, relying on an innovative new survey format. Surveys were fielded at each layer of the value chain from major production areas accounting for 42 percent of national commercial surplus and for more than 90 percent of the supply to the main terminal market in Addis Ababa, the capital of Ethiopia and also its largest city. We therefore look at the functioning of the most important staple value chain in the country. Almost 1,800 primary survey interviews in total with producers, traders, truck drivers, and retailers were conducted for this study.

We find that these value chains are relatively unsophisticated. At the farm level, there are no interlinked transactions with buyers of the produce (often seen in other countries, especially in more developed value chains), the role of credit is minor, and most of the transactions are cash transactions. Midstream and downstream, due to lack of grading and

standardization we see significant efforts in checking quality and quantity at the time of each transaction along the value chain. Overall however, value chains are short and farmers obtain a relatively high share of the final retail price (on average 80 percent). The majority of the farmers would not have accepted a significantly lower price at their times of sales, indicating the relatively minor importance of distress sales in farmers' marketing decisions. In contrast with common perceptions, commercialization in these major teff-producing areas of Ethiopia seems fairly well organized.

Our results raise questions as to why they are in contrast to conventional thinking. Several reasons can be given. First, the literature on value chain functioning is heavily dominated by case study research (e.g. Dawe et al. 2008; Hayami, Kikuchi, and Marciano 1999), often raising questions on the representativeness of findings.[15] Second, changes are quickly happening in these value chains, especially in these zones where much of the teff produced is marketed, driven by improvements in transport infrastructure, better communication, and increasing demand for food choice and quality in cities (e.g. Reardon et al. 2012). It is possible that research has not kept pace with these changes. Third, we studied a relatively un-sophisticated market where there is little value addition. The situation might be different for other products (Miller and Jones 2010). Fourth, we studied cereals where assessment of quality and quantity is relatively straightforward, and losses in the value chain are relatively small. Value chains of root crops where assessments of quality and quantity are more complicated or of fruits and vegetables where perishability and losses are a more important issue might show a different structure and higher margins. Fifth, we studied a product that has a relatively high price in urban retail market. For example, the price of teff is on average double the price of maize (Minten et al. 2012). As such, even if the maize market in Ethiopia is as efficient as that for teff, the share of the final retail price that maize producers receive may result in a different picture and level of performance. Teff is also a major staple crop. The situation might be different for non-staples or for products where markets are thin. Finally, the value and services that traders bring to the system are often not well appreciated. In the face of increasing or volatile food prices, traders are often blamed.[16] In consequence, their importance in the value chain may often be overstated.

Our findings point to some important policy implications. First, given the difficulty in correctly assessing market functioning, policies aimed at improving market efficiencies—such as stimulating increasing involvement of agricultural cooperatives in output marketing, the establishment of modern exchanges, or warehouse receipt systems—should be closely examined to determine how and where these policies are expected to improve market functioning and what the expected benefits would be compared to the costs of their implementation. Second, increasing investments in road infrastructure to bring in more remote areas and the lowering of transportation costs through removal of barriers in investments (World Bank 2012) is shown to clearly increase the prices that farmers receive. Third, if the objective of policy makers is to reduce consumer prices in urban areas, relatively more attention should be given to lower farm production costs given that these costs make up the biggest part of the final retail price.

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[15] Such case study approach is seemingly often linked with budget and time constraints in value chain assessments as well as with the difficulty of implementing surveys over different value chain participants.

[16] For example, India forbade forward trading on commodity exchanges for a number of crops as to control food inflation. The increasing global volatility in food prices has been blamed as well on extensive speculation, but disproven by some authors (Irwin, Sanders, and Merrin 2009).

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