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Structural transformation in Ethiopia: Evidence from cereal markets

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Abstract

We study cereal wholesale markets in Ethiopia in the last decade (2001–2011), a period that has been characterized by important local changes affecting agricultural markets, including strong economic growth, urbanization, improved road and communication infrastructure, an increase in importance of cooperatives and commercial farms, and a doubling in commercial surplus. We find that these changes are associated with significant declines in real price differences between supplying and receiving markets, in cereal milling margins, as well as in retail margins. Important improvements have thus happened in the last decade in Ethiopia's food marketing system, traditionally identified as a major cause of food security problems in the country.

Keywords: Ethiopia, marketing system, price analysis, transformation

1. Introduction

Given the importance of food in expenditures of households in developing countries, the functioning of food markets and its impact on food prices are closely watched by policy makers and consumers alike as prices are important determinants of overall welfare in these settings. High food marketing costs can push consumer prices up to unaffordable levels for vulnerable groups and further hampers farmers' incentives to invest in new production technologies. The importance of food markets has become even more prevalent since the recent global food crisis when food prices reached very high levels (Headey et al. 2010).

The interest in food markets is especially relevant in Ethiopia given disastrous implications in the past of badly functioning food markets for food security, with food stocks available in some parts of the country and widespread famine in other parts (Webb and von Braun 1994; Gabre-Madhin 2001a, 2012).[1] Major reasons for historically badly functioning food markets have been linked to lack of market information, bad road infrastructure and high transaction costs, and distress sales and lack of storage by small farmers (e.g. von Braun and Olofinbiyi 2007). However, important changes have happened in this area in the last decade in Ethiopia. We assess in this paper the extent of these changes for cereal markets, relying on primary data collected from wholesale markets and on secondary data on cereal prices and margins.[2] We study more in particular changes in drivers of market transformation and in cereal price formation over the period 2001–2011.

We find that the period under study has been characterized by important changes in five drivers affecting the functioning of agricultural markets. First, fast economic and income growth is leading to food demand changes, most notably higher consumption levels and a shift to more preferred cereals such as teff, as well as to high-value products such as meat, dairy products, and fruits. Second, urbanization is leading to larger rural–urban food and cereal marketing flows. Third, investments in road infrastructure and a better organized transport sector have led to significant real declines in transportation costs. Fourth, the widespread availability of mobile phones has changed access to price information for a large number of players in the commercial circuit and has led, for some, to a different way of doing commercial deals. Fifth, cooperatives, but especially private commercial farms (often privatized state farms), have started to emerge as important players for some cereals.

Price data collected over the last 10 years at wholesale and retail level show that these changes are associated with significant declines in real margins of wholesale food prices between supplying and receiving markets over time, in real cereal milling margins, as well as in retail margins. We find that cereal prices showed important real increases over the decade but price levels were affected differently by market with relatively lower price rises in cereal deficit and vulnerable regions. It thus seems that the cereal marketing system is undergoing important changes in Ethiopia to the benefit of producers and consumers alike.

While these findings are encouraging for the country, there is still significant room for market improvements. First, while large investments in road improvements have been made in the last decade(s), Ethiopia was starting from a low base and the country still has one of the lowest road densities in the world (von Braun and Olofinbiyi 2007). Second, even when roads are available, transport costs are still relatively high compared to international standards and further measures are seemingly needed to stimulate lower rates in the transport sector. Third, while access to information is now widely available for traders and brokers, penetration and use of mobile phones by farmers is still one of the lowest in Africa. Fourth, food prices in Ethiopia still suffer from large price volatility, often linked with ad hoc

[1] This interest is reflected in the literature as a significant body of research exists that has looked at food price related issues in Ethiopia (for an overview of that literature, see Appendix A.1).
[2] While livestock, oilseeds, etc. are also important in the agricultural economy of Ethiopia, they are beyond the scope of the current paper.

policy decisions (such as price controls and other market interventions) which might hamper sustainable private market development.

The structure of the paper is as follows. In section 2, we discuss the data and the methods used. Section 3 gives a short overview of the food economy of Ethiopia and the price evolution in the country in the last decade. In section 4, we empirically document the drivers for structural transformation in the country and discuss economic and income growth, urbanization and commercial surplus, roads, access and use of communication technology by brokers and traders, and cooperatives and their importance in cereal trade. In section 5, we study temporal price variation in the last decade. In section 6, we look at spatial price variation. We evaluate the premia and margins in section 7 and look more in particular at quality price premia, processing margins, and retail margins. We finish with the conclusions in section 8.

2. Data and methodology

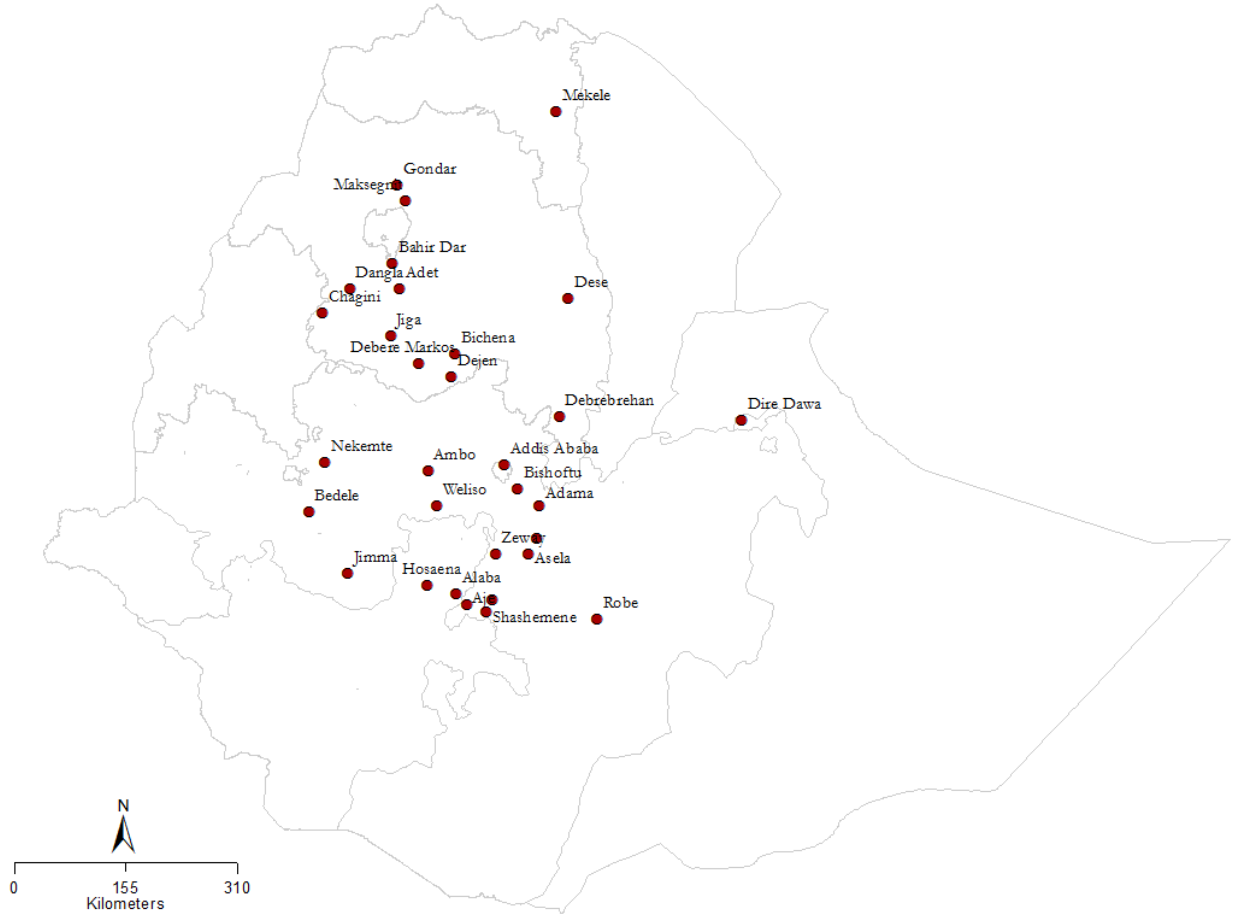
We rely on two main datasets—using primary as well as secondary data—for the analysis in the paper. The Ethiopian Grain Trading Enterprise (EGTE), a grain procurement arm of the government, gathers prices of cereals and oilseeds on 66 major wholesale markets in the country. Prices are collected during the early morning, late morning, and afternoon on major market days and a simple average is made from these prices as to get to monthly prices. No prices are asked for but they are noted from observing actual transactions. Producer, wholesale, and retail prices[3] are all collected but only wholesale and retail prices at selected markets are made available publicly. These data were obtained in electronic form and are thus available for analysis.

To complement these price data, a survey was conducted on the major 31 cereal markets of the country in the beginning of 2012 as to get at the changes that have happened on these markets in the last ten years. Figure 2.1 below shows the exact location of these wholesale markets. These markets were chosen because of the availability of consistent wholesale cereal price series of EGTE. Almost all major cities as well as most important production areas are included in these series.[4] The survey was conducted with focus groups of transporters and key informants for specific crops in the selected wholesale markets. The focus groups were comprised of respondents with significant experience in cereal trade in that market (as there were a large number of recall questions). Questions were asked on the extent of changes in transport costs and travel time between different wholesale markets, changes in access to and spread of mobile phones and the use of mobile phones in agricultural trade, and the importance of cooperatives in output markets. Given that we only interviewed focus groups on these markets where these crops were deemed important—as indicated by the markets where EGTE collects prices for these crops—, the total focus groups per crop differ, i.e. 25 groups for teff, 16 for wheat, 5 for sorghum, 6 for barley, and 19 for maize, or a total of 71 focus groups. The details by market are given in Appendix A.2.

[3] Producer prices are defined as those prices that are received by producers at the wholesale market; wholesale prices are the prices that wholesalers obtain when they sell in large bulks; retail prices are prices on the wholesale market obtained by traders that sell in small quantities to consumers.

[4] Of the 13 cities with a population over 100,000, two of these cities were not part of the EGTE price series, i.e. Harar and Awassa.

Figure 2.1—Wholesale markets in EGTE survey



Source: Authors' compilation

As the weight of individual cereals in the Consumer Price Index (CPI) is relatively low and by lack of any reasonable alternative, we rely on this national CPI as constructed by the Central Statistical Agency (CSA) to deflate wholesale prices. We use a de-seasonalized index as we are interested in seasonal patterns. To construct such a de-seasonalized index, we calculated a twelve-month moving average and use the constructed series as the deflator.

We look at six characteristics of price behavior. First, we look at temporal trends, i.e. seasonality and yearly movements. To get at these, a price model of cereal grains is estimated as follows:

Log (real price of cereal grain i) = f(year, month, market location, quality)

Second, we look at quality premia and spatial margins. In contrast with the previous model, we include in this second model a dummy for every month (12 months*10 years=120 dummies) as to control for monthly fixed effects. Controlling for all potential temporal variation allows us to focus on quality and location issues solely. The regression used is as follows:

*Log (real price of cereal grain i) = f(year*month, market location, quality)*

Third, we look at the processing and retail margins. To do this, we combine the wholesale prices with two other datasets. For the analysis of processing margins, we merge the data collected by CSA in retail markets on cereal flour prices with the wholesale cereal grain market prices. We only retain the prices for these markets and for those periods that are

common to both datasets. For the analysis of the retail margins, we merge the wholesale prices with the prices collected by EGTE at the retail level. Unfortunately, these retail price data are only available until the end of 2009 and we thus have to limit our analysis to that period. We follow a similar method as explained above and the estimated regression is as follows:

*Log (real price of cereal i) = f(year*month, market location, quality, grain/flour, retail/wholesale)*

A major objective of the study is to evaluate structural transformation in these markets. To understand if a structural break in these time series occurred in the last decade, we interact the different variables with a time dummy for the 2nd part of the period studied (2006–2011). We then assess the significance of that coefficient and compare it statistically with its size in the first part of the decade (2001–2005) through an F-test. In the case of a significant difference, we conclude that a structural break occurred over the last decade. We present the results of these tests for seasonal changes, spatial variation, quality premia, and processing margins and also follow a similar strategy when we look at the time series of the structural drivers for change.

3. Background

Cereals make up an important part of the food system in Ethiopia. It is estimated that almost three-quarters of the planted area in Ethiopia was allocated to cereals in 2010/2011 (CSA 2011). On the consumption side, it is estimated that an average person in Ethiopia consumes about 150 kilos of cereals per year (Table 3.1). Consumption levels of cereals are slightly higher in rural areas (152 kg) compared to urban ones (137 kg). The most important cereal, in quantity terms, is maize, followed by sorghum, wheat, and teff. Barley is the least important of the five.

We note strong differences in the types of cereals consumed between urban and rural areas. Urban consumers eat three times as much teff as their rural counterparts, i.e. 61 kg versus 20 kg. On the other hand, per capita maize and sorghum consumption in rural areas is significantly higher than in urban settings. Table 3.1 further shows that cereals account for about half of all expenditures of an average household and that the share of expenditures on cereals of the top 60 percent is significantly lower than for the poorest 40 percent. As seen in other countries, richer people shift away from cereals to higher-valued food products, including meat, dairy products, and fruits and vegetables, as well as to other non-food consumption items.

Table 3.1—Consumption of cereals

	Per capita consumption (kg)			Share in consumption expenditures (%)						
					All		Bottom 40%		Top 60%	
	National	Rural	Urban	National	Urban	Rural	Urban	Rural	Urban	Rural
Teff	25.9	20.1	61.4	8	23	6	17	8	16	7
Wheat	29.6	31.2	20.2	9	8	9	6	10	4	10
Barley	12.8	14.3	3.8	4	1	4	1	6	1	5
Maize	37.7	42.2	10.4	12	4	13	3	11	1	9
Sorghum	32.2	35.9	9.3	10	3	11	3	10	1	9
Other cereals	11.4	8.1	32.2	4	12	2	16	3	12	3
Total cereals	149.6	151.7	137.2	46	51	46	46	47	36	43

Source: Berhane et al. (2011), based on HICES of 2004/2005

Ethiopia relies mostly on local cereal production to assure the consumption of its inhabitants. This is shown in Table 3.2. International trade is important and it is estimated, in the case of cereals, that the share of international trade over local production varied between 8 percent and 14 percent for the three years examined—2001, 2005, 2009. We see significantly different patterns for different crops. While the ratio of trade to production is highest for wheat and reached levels of almost two-thirds of local production in 2001, it was much less important for most other cereals (Table 3.2).

Table 3.2—Import and export of cereals

	Year		
	2001	2005	2009
Imports			
Imported quantity (tons)			
Barley	5,775	0	0
Maize	23,500	30,436	54,466
Sorghum	8,500	2,861	268,640
Wheat	1,031,000	862,146	1,735,590
Total cereals	1,068,775	895,443	2,058,696
Imported value (1000 USD)			
Barley	1,319	0	0
Maize	8,500	10,500	22,000
Sorghum	1,800	400	95,000
Wheat	150,000	224,444	490,000
Total cereals	161,619	235,344	607,000
Exports			
Export quantity (tons)			
Barley	9	9	25
Maize	1,327	2,606	0
Sorghum	118	13,420	0
Wheat	0	195	1
Total cereals	1,454	16,230	26
Export value (1000 USD)			
Barley	4	3	37
Maize	217	453	0
Sorghum	36	3,559	0
Wheat	0	29	1
Total cereals	257	4,044	38
Production (1000 tons)*			
Teff	1,736	2,175	3,179
Barley	945	1,270	1,750
Maize	3,138	3,337	3,076
Sorghum	1,538	2,173	3,897
Wheat	1,571	2,219	2,971
Total 5 cereals	8,928	11,174	14,873
Relative importance of trade - share trade over production			
Barley	0.61	0.00	0.00
Maize	0.79	0.99	1.77
Sorghum	0.56	0.75	6.89
Wheat	65.63	38.86	58.42
Total 5 cereals	11.99	8.16	13.84

Source: FAOSTAT and CSA
Notes: * 2001=2000/2001; 2005=2005/2006; 2009=2009/2010; only meher

Food and agricultural policies have been characterized by several important interventions that affected food prices over the period studied.[5] The agricultural economy of Ethiopia is extremely vulnerable to weather shocks which has important implications on food and agricultural prices and thus on policy prioritization. To address these different shocks, the government has traditionally intervened in markets through purchases, storage, and sales by the EGTE. The EGTE purchases grains when prices are low and releases them when prices reach a certain ceiling. However, the quantities bought and sold are usually around 2–3 percent of total marketed quantity in the country and are thus not expected to have had significant effects on prices overall. Over the last ten years, aid shipments to Ethiopia also remained substantial. They are evaluated at 4–7 percent of total consumption. In some years, however, this was significantly higher. For example, Tadesse and Shively (2009) estimate that food aid made up about 16 percent of the cereal consumption in 2003.

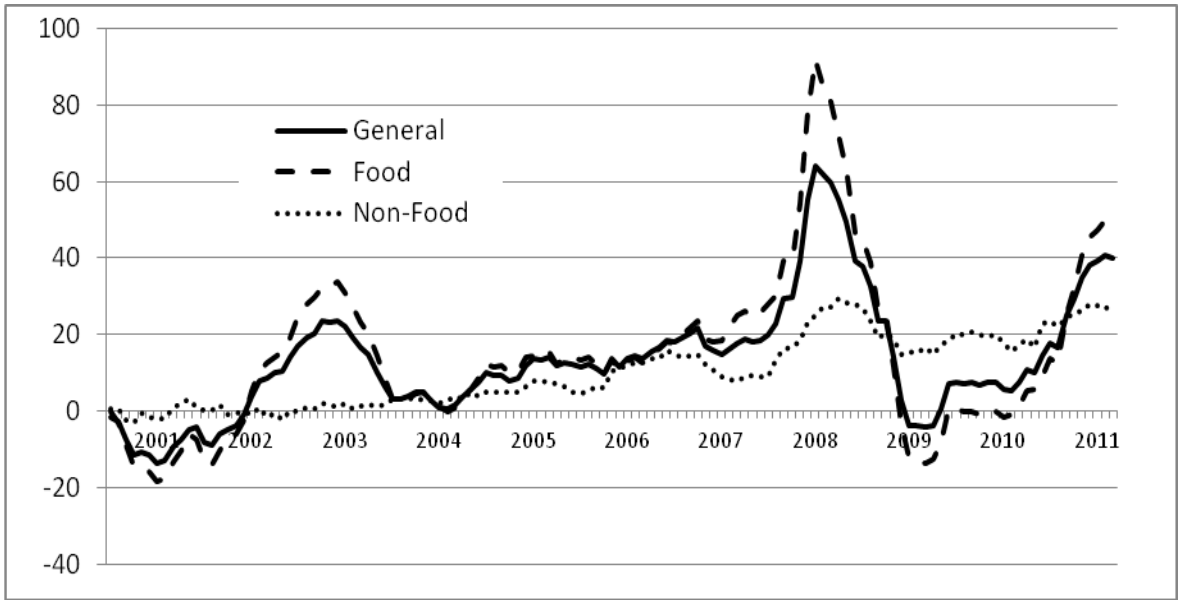
On top of production shocks, the agricultural economy is characterized by important price variability. Price inflation has been an important issue in Ethiopia in most recent years, posing especially significant risks for net food buyers. There were four direct responses to high food price increases in 2007 and 2008 (Dorosh and Rashid 2012): (1) imposition of an export ban, (2) re-introduction of urban food rationing, (3) informal suspension of local procurement by the World Food Program (WFP) and others, and (4) direct government imports for open market sales and price stabilization. In an effort to reduce food price inflation in 2011, the government imposed price caps on 17 basic food commodity items in the beginning of that year.[6] However, given that these price caps had negative consequences on the availability of some of the food items, that decision was reversed in June 2011 for most crops. It only stayed in effect for some higher value commodities, e.g. sugar and edible oils.

Using monthly data of the CPI calculated by CSA, Figure 3.1 illustrates the extent of inflation using year-to-year changes (i.e. comparing price levels in a particular year) of prices compared to the same month in the previous year. Figure 3.1 further shows the evolution of food and non-food inflation. Three important observations can be made from the figure. First, we see significant variation in the extent of inflation in Ethiopia during the period 2001–2011. There were three periods that inflation exceeded 20 percent, i.e. in the years 2003, 2008, and 2011. The highest peak was noted in 2008 when inflation peaked above 60 percent. Second, food prices are significantly more variable than non-food prices and have thus contributed more than non-food to general variability in inflation. Third, food inflation is more frequently higher than lower compared to non-food inflation, indicating that it has contributed more than non-food to inflation in the country.

[5] For a more complete overview, see Dorosh and Rashid (2012).

[6] These products included among others bread, cooking oil, sugar, meat, and rice. Sugar prices were set sat ETB 14/kg (USD 0.8), meat at ETB 52/kg (USD 3), rice at ETB 12.4/kg (USD 0.70).

Figure 3.1—Inflation in Ethiopia, using year-to-year changes, in percent

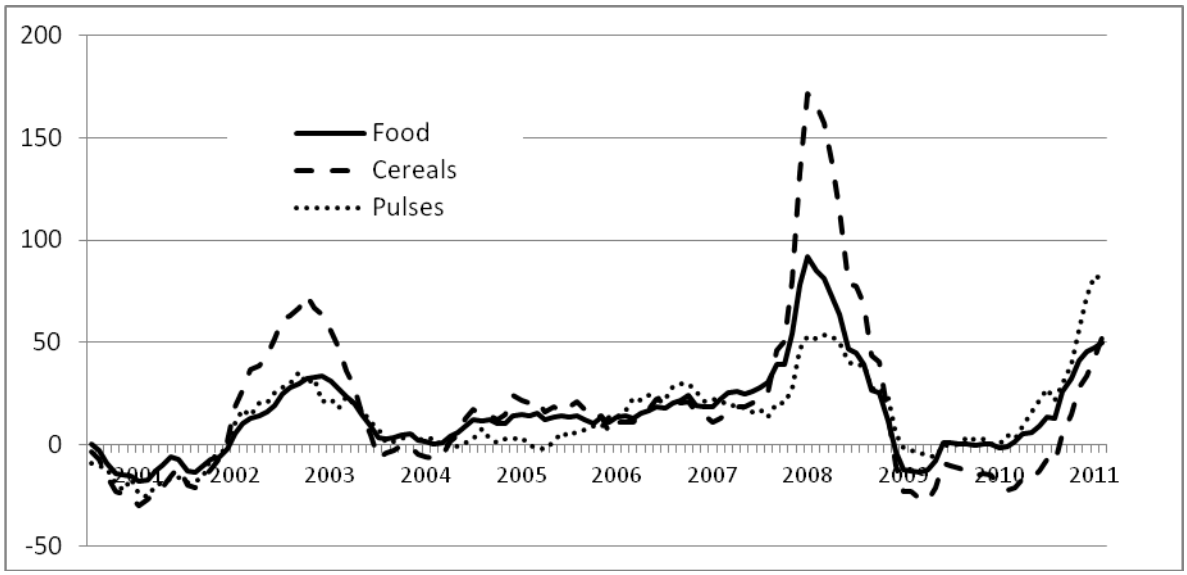


Source: Authors' calculations

Several events can be associated with food price changes in the country. A bumper crop in 2000–2001 and 2001–2002 led to a collapse of some local market prices. On the other hand, widespread drought in 2003 led to a reduction of maize production by more than 50 percent and required food assistance of 1 million ton (Dorosh and Rashid 2012). The global food crisis in 2008 pushed real cereal prices to very high levels. As Ethiopia is an importer of food grains, this affected local prices in an important way and exacerbated food inflation. It should be noted that non-food price inflation also went up significantly during that period, to the highest level over the period studied, suggesting that price inflation was not only due to the global food crisis. Since that high peak, the food index dropped significantly to a level lower than zero before starting its subsequent rise.

Figure 3.2 shows price variability over the same period for the two major food groups in the consumption basket of Ethiopian consumers, i.e. cereals and pulses. The figure illustrates the extent to which especially cereal price variability has been a contributor to food price variability. The extremes in cereal price variability are much more pronounced than in food price variability overall. The behavior of cereals is in contrast with pulses which have seemingly helped to dampen variability in food prices, except for the last year of the period considered.

Figure 3.2—Inflation for food, cereals, and pulses, using year-to-year changes, in percent



Source: Authors' calculations

Table 3.3 confirms the differentiation of price inflation between food and non-food and between different sectors within the food category. The noted changes reflect mostly patterns also seen in international markets. Spices, coffee, and tea have shown the highest rise in prices, driven by high international prices and the increasing demand for ginger from Sudan. Second are meat and cereals, again driven by international prices for meat and an increase of import prices for cereals. High-value commodities such as fruits and vegetables and dairy products show the lowest increases over time.

Table 3.3—Inflation in the food sector, 2000–2011 (price index at start = 100; total change of the index over the indicated period is reported)

	Period		
	January 2001–December 2005	January 2006–August 2011	January 2001–August 2011
General	135	305	416
Food	142	333	473
Non-Food	111	260	294
Cereals	166	319	531
Pulses	119	386	461
Prepared Foods (Pasta, Bread)	114	321	366
Dairy product	116	297	344
Meat	161	285	465
Oils & Fats	124	372	465
F&V	136	319	439
Spices	142	513	726
Potatoes & Other Tubers	133	315	422
Coffee, Tea	143	433	617
Other food items	101	243	245

Source: Authors' calculations

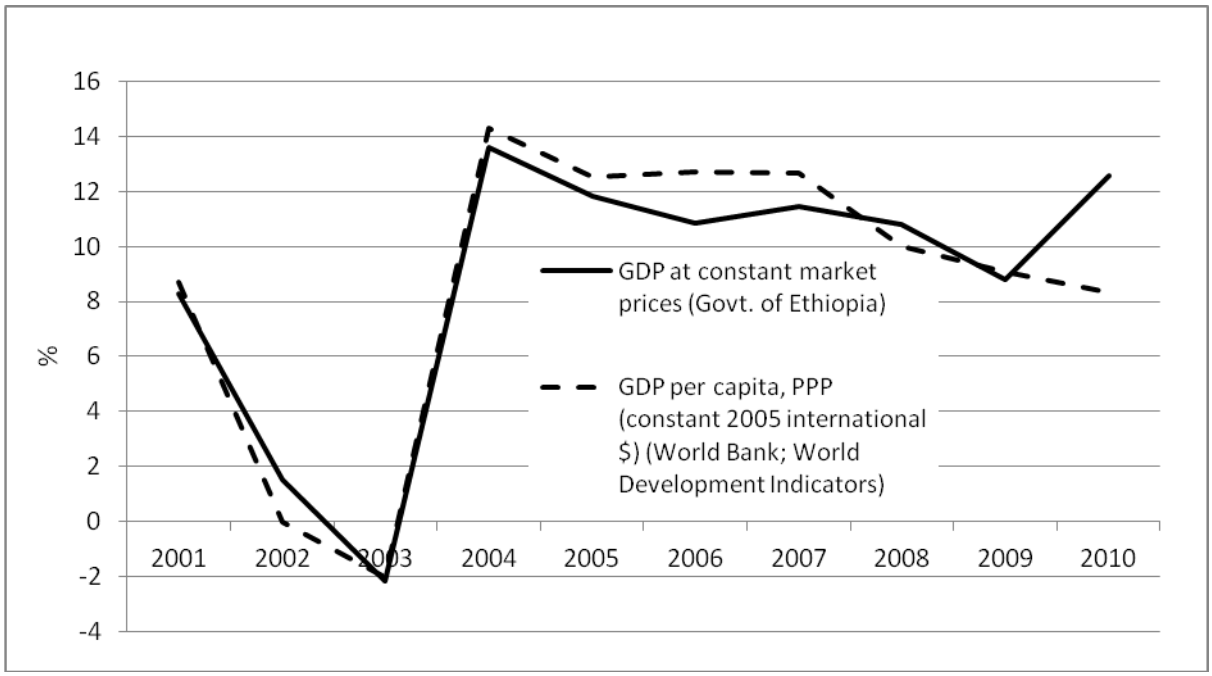
4. Drivers for structural transformation in cereal markets

In the last decade, a number of structural changes have happened in the general economy as well as in the food economy of Ethiopia—on top of the changes in food markets internationally (Headey et al. 2010)—that have affected cereal markets and price formation in the country. While it is hard to estimate the exact effects of the changes of these different factors on food price formation and market transformation, it is clear that they all have to some extent contributed. We discuss consecutively economic and income growth, urbanization and commercial surplus, transport and communication infrastructure, and cooperatives.

4.1. Economic and income growth

Ethiopia has been in the second part of the last decade one of the fastest growing economies in the world, a remarkable feat for a non-oil exporting African country. Figure 4.1 shows how its per capita GDP (as measured in real USD and in Purchasing Power Parity (PPP)) has evolved over the last ten years. While growth was negative in the beginning of the decade, it shot up from 2004 onwards and has stayed in double digits since, except for the GDP measured in PPP in 2009 and 2010. While it is yet unclear how the benefits of economic growth were distributed among Ethiopia's population, the upshot is that such growth rates lead to significantly different consumption bundles for that part of the population that benefited from this growth, with associated impacts on food markets.

Figure 4.1—Per capita annual GDP growth in Ethiopia, 2001–2010



Source: Authors' calculations

To understand impacts on food markets, two effects can be distinguished, i.e. the extent to which incomes of consumers are affected as well as how consumers change consumption bundles because of increases in income. First, there is evidence that consumption expenditures are increasing—and poverty levels declining—as shown in data from national household surveys. Real per adult equivalent consumption in 2004/2005 (at 1995/1996 constant prices) was 1,542 ETB, an increase over five and ten years earlier of 16 percent and 17 percent (MoFED 2008). Kuma (2010) finds similar results in urban areas, i.e. an

increase of almost 15 percent in consumption expenditures in cities between 1994 and 2004. Analysis of recent national household data show that poverty declined between 2004/2005 and 2010/2011 from 38.7 percent to 29.6 percent, indicating further welfare improvements over the period considered (MoFED 2012). Second, Tafere et al. (2010) have looked at demand elasticities in the country and find the typical pattern found in other countries. Meat, fruit, and vegetables are found to be superior food items while most cereals are found to be economically normal crops. Kuma (2010) documents how consumption patterns in urban Ethiopia have quickly changed with a rapid increase in milk and milk products, meat, and fruit consumption documented over a ten-year period. Even within cereals, differential demand elasticities are found, with teff having significant higher demand elasticities and the lowest ones found for sorghum and maize (Tafere et al. 2010).[7]

4.2. Urbanization and the increase in commercial surplus

In the last decades, Ethiopia has been characterized by rapid urbanization, though starting from a low base (Schmidt and Kedir 2009). This trend is important for cereal markets as the urban population typically does not grow its own food and relies on markets for its food needs. Increasing urbanization thus often leads to increasing flows of agricultural commercial surplus in a country. Based on data from the national census in 2007, Schmidt and Kedir (2009) estimate that 14.2 percent of the total population lived in urban areas in Ethiopia and that urban centers have grown at up to 3.7 percent per year on average. Using these growth rates, the urban population grew by 44 percent or 3.7 million people over the period 2001–2011. To put that number into perspective: Assuming that the average urban consumption level of cereals was as high as estimated in the national household survey (HICES) of 2004/2005 and that the urban population relied completely on production shipped in from rural areas, this would imply an increase of commercial flows of about 500,000 tons between 2001 and 2011 or about 65,000 additional truck loads (of 7.5 tons, a FSR truck) between rural and urban areas, or 650 additional trucks per year (assuming 100 cycles per truck).

The increase of commercial quantities of cereals traded in the country over the last decade is seen in Table 4.1, based on official statistics published by the CSA. Comparison of all statistics collected over time is a bit cumbersome given that some of them (such as the production by large and medium-scale commercial farms) are not systemically collected over time. However, the data from these two years allow us to make two important points. First, cereal production from smallholders has increased dramatically over the last ten years. This holds for all cereals, but to different extents: while sorghum production increased by 156 percent, maize only grew by 78 percent. Similar increases are seen for commercial surplus. For the five cereals together, it is estimated that commercial surplus increased by 117 percent over the ten-year period.

Second, large and medium scale commercial farms are relatively less important in cereal production. In none of the crops do they account for more than 6 percent of total production. However, when the relatively low commercial ratio of the smallholders is taken into consideration and it is assumed that commercial farms sell all production, these commercial farms become much more important. It is estimated that they make up 33 percent, 26 percent, and 21 percent of all quantities sold of maize, sorghum, and wheat, respectively.[8] The commercial farms are of little importance in the teff and barley commercial circuit. It is

[7] A local miller located around the Merkato area in Addis described the different purchase habits of his clients as follows. The richest households buy only white teff to prepare *injera*. When they are really rich, they will even only purchase the highest quality white teff, i.e. Magna (often originating from the region around Debre Birhan). The poorer households buy smaller quantities daily and purchase lower quality teff (red teff). They further mix with lower priced cereals such as sorghum and rice. The poorest mix with sorghum while the group just above that uses rice to mix with teff.

[8] It might also be the case that relatively more commercial farm produce ends up in cities because of quality advantages.

likely that the importance of these commercial farms is growing over time, although numbers are hard to get at the national level. In the two last decades, the Ethiopian government leased land that was 'unused' (or underused as often used for livestock grazing) or that was cultivated by state farms to commercial enterprises. Box 4.1 describes the change of one of the important maize producing zones in Ethiopia and illustrates how the emergence of commercial farmers has an increasing influence there on total agricultural commercial quantities sold.

Table 4.1—Dynamics in agricultural production over the last decade

	Cereal crop					
	Teff	Barley	Wheat	Maize	Sorghum	5 cereals
2001/2002						
Private peasant holdings (meher+belg)						
Area cultivated (1000 ha)	1,895	966	1,089	1,702	1,195	6,847
Private peasant holdings (meher)						
Area cultivated (1000 ha)	1,818	771	1,005	1,323	1,132	6,049
Production (1000 quintals)	16,273	9,319	14,444	28,002	15,462	83,500
% sold	25.85	10.83	19.55	10.22	11.47	15.18
Commercial surplus (1000 quintals)	4,207	1,009	2,824	2,862	1,773	12,675
2010/2011						
Private peasant holdings (meher)						
Area cultivated (1000 ha)	2,761	1,046	1,553	1,963	1,898	9,221
Production (1000 quintals)	34,835	17,063	28,557	49,861	39,599	169,915
% production increase over last decade	114.07	83.10	97.71	78.06	156.11	103.49
% sold	28.63	12.06	19.64	11.41	10.78	16.24
Commercial surplus (1000 quintals)	9,973	2,058	5,609	5,689	4,269	27,598
% surplus increase over last decade	137.09	103.89	98.62	98.80	140.70	117.73
Large and medium-scale commercial farms (meher)						
Area cultivated (1000 ha)	9	2	45	59	62	177
Production (1000 quintals)	127	40	1,504	2,844	1,490	6,005
Share commercial farms						
% share in production	0.36	0.23	5.00	5.40	3.63	3.53
% share in commercial surplus	1.26	1.91	21.15	33.33	25.87	17.87

Source: CSA data

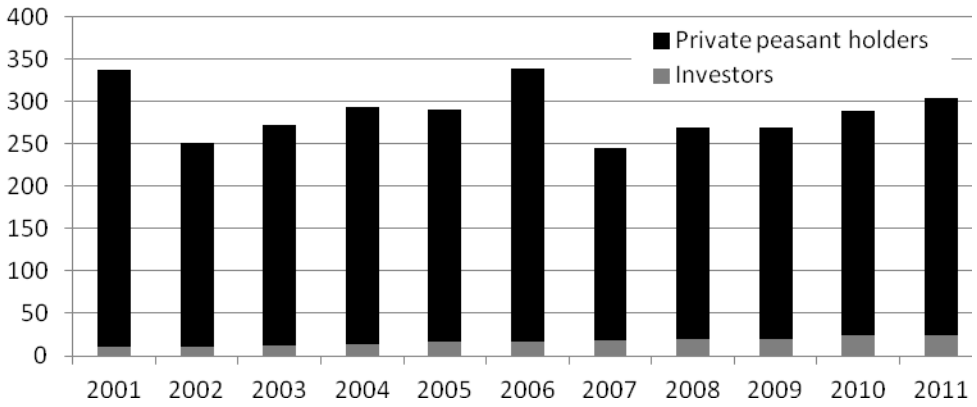
Box 4.1—Peasant private holders versus investors: The case of East Wollega (Oromia)

We evaluate below the importance of peasant private holders versus investors for the zone of East Wollega in the Oromia region. Data on large land leases were obtained from the local Investment Agency. These data are compared to areas cultivated by peasant private holders as reported in the sample surveys of the Central Statistical Agency. East Wollega is especially important in maize supply for the country and it is estimated that this zone makes up about 7 percent of national maize supply, based on the data of the peasant private holders (CSA 2011). However, these data do not include the land areas that are cultivated by the so-called "investors". These investors obtain land leases from the local Investment Agency as to grow specific crops. About 120 land agreements are currently in place, counting for about 48,000 hectares in total.[9,10] It is estimated that about 25,000 hectares of these are used for cereal cultivation. Figure 4.2 shows that the share in total cultivated area in this zone from these investors is relatively small, as is the case at the national level.

[9] About 47,000 hectares belonged to state farms at the end of the Derg period. 20,000 hectares was allocated to investors while the other areas were given to local settlers and surrounding farmers. Over time, the agency identified other land for cultivation.

[10] Only the leases lower than 1,000 hectares are dealt with in this office. If leases larger than 1000 hectares have to be decided, this will be decided at the federal level.

Figure 4.2—Total cereal area in East Wollega (in 1000 hectares) for private peasant holders and investors in, 2001–2011

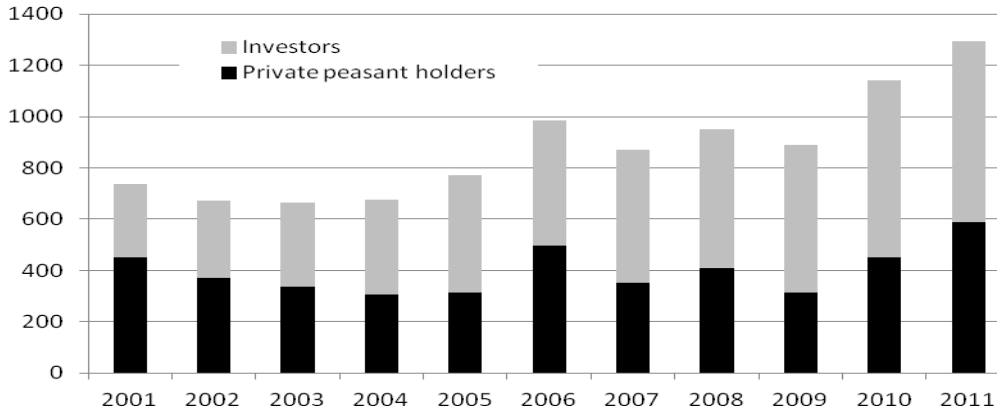


Source: Investment Agency and CSA

However, these farms are relatively much more important for commercial surplus in the zone. To get at their importance, we make some simple assumptions. First, we assume that all the production from these investors is commercialized, that cereal cultivation equals solely maize, and that yield levels are the same as for peasant producers. Second, CSA has published three numbers over the last ten years on the commercialization ratio of peasant holders and we use the average of these as to get at the commercialization ratio for maize (17.11 percent). Third, three years are missing on the production of private peasant holders. In this case, we interpolate between the year before and after using a simple average of production in these years.

These assumptions are used to construct numbers on the evolution of investors in total commercial surplus in the zone in Figure 4.3. The figure shows that: (1) commercial surplus in East Wollega has high growth rates; the commercial surplus in 2011 was 67 percent higher than in 2005; (2) the growth rate of investors was significantly higher than for smallholders over that same period, i.e. 88 percent compared to 53 percent; and (3) the share of the investors in total commercial surplus has grown in the last ten years from about 39 percent to more than half, i.e. 54 percent. Based on these simple assumptions, we thus conclude that we are likely witnessing an important transformation in local marketing conditions in Ethiopia where large farmers are becoming much more important in supply chains for cereals, especially so for maize.[11]

Figure 4.3—Maize commercial surplus in East Wollega (in 1000 quintals per year) for private peasant holders and investors, 2001–2011

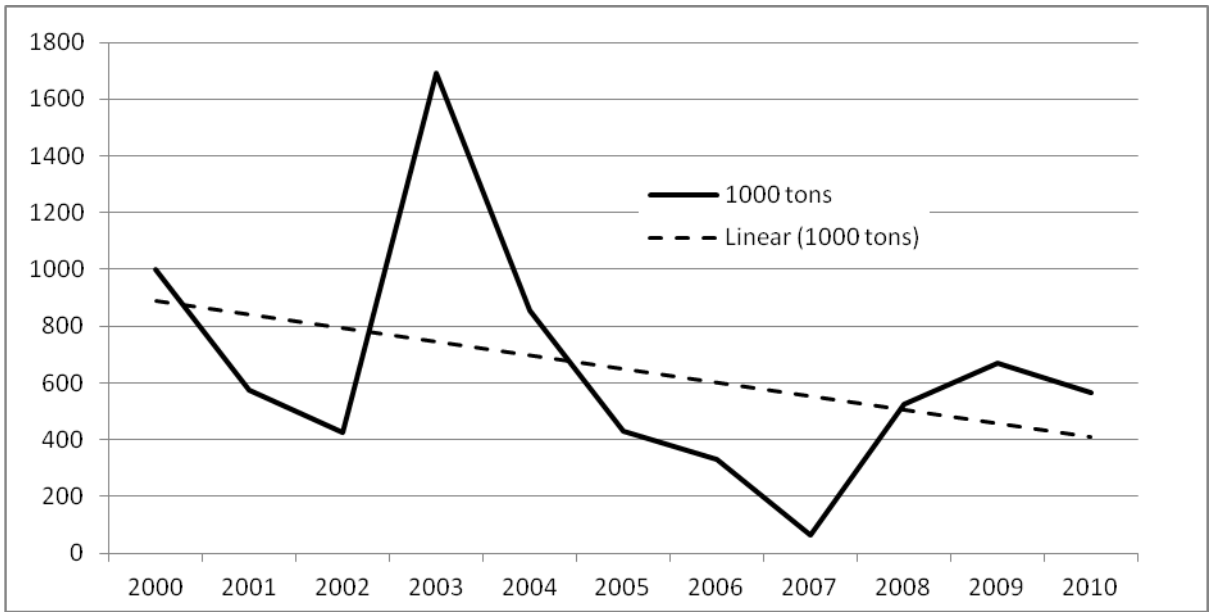


Source: Investment Agency and CSA

[11] This analysis relies on assumptions that can be questioned and that are difficult to verify in practice. However, interviews with key informants involved in maize production and trade confirm these trends.

The increasing private commercialization also seems associated with a relatively lesser importance of food aid relief in total food flows. Figure 4.4 shows the evolution of relief food distribution (including locally procured food) over the last 10 years.[12] It shows the high peak of relief food aid after the major drought in 2003 (1.7 million tons) but it also illustrates that the absolute (as shown by a declining trend line) and relative (when compared to private commercial flows) importance of this relief aid has declined over time: While relief aid distribution made up about 80 percent of commercial surplus of private peasant holdings in 2000, this ratio declined to about 20 percent in 2010.

Figure 4.4—Food relief aid in Ethiopia (in 1000 tons), 2000–2010



Source: Joint Government and Humanitarian Partners Document

In the focus groups, we also asked information on numbers of traders and brokers on the markets, and of cereal trucks that arrive on these markets. These numbers, presented in Table 4.2, confirm the data of rapidly increasing commercial surplus over the last decade and we see, on average, significantly more trade on these markets. The focus groups reported that the number of the trucks increased over the ten year period by 67 percent and 79 percent in the peak period and lean period, respectively. These quantities seem to overshoot the growth rates of population of cities in the country (Schmidt and Kedir 2009), possibly indicating higher consumption levels over time in the cities, more trade between rural areas that might pass through these urban wholesale markets, as well as a shift from other means of transport to trucks. We further asked focus groups to also evaluate the number of traders and brokers that operate on these markets. They were reported to have increased by respectively 140 percent and 252 percent over that period, possibly suggesting greater competition as well as a lower turnover per trader and broker compared to ten years ago. This phenomenon is illustrated in Box 4.2.

[12] As reported in the annual report on humanitarian requirements as published in the Joint Government and Humanitarian Partners' Document.

Table 4.2—Evolution of traders and trucks on wholesale markets

	Number of cereal trucks per week arriving				Number of wholesale ... in market			
	… in peak period		… in lean period		cereal traders		cereal brokers	
Year	Mean	Median	Mean	Median	Mean	Median	Mean	Median
2001	34	20	14	7	30	30	8	3
2002	35	20	14	7	33	25	9	3
2003	36	20	15	7	37	30	9	3
2004	38	23	16	7	41	35	12	3
2005	40	20	17	8	45	35	14	4
2006	45	25	18	8	48	37	16	4
2007	46	25	19	10	52	37	18	5
2008	48	25	22	10	61	40	21	5
2009	51	30	21	10	67	45	23	5
2010	54	32	23	10	70	45	26	6
2011	57	35	24	10	73	50	28	8
Number of obs.	31		31		31		31	
Growth 2001-2011 in percentage	67	75	79	43	140	67	252	167

Source: Authors' compilation

Box 4.2—Increase in traders in cereal trade

Trader and broker focus groups on the Addis Ababa market indicated the rapid changes in the number of traders and brokers found in supply regions and on the Addis Ababa market.

In Addis, it was estimated that ten years ago, about 10 to 20 brokers dealt in maize trade. This had increased in 2011 to about 200 brokers (including about 50 seasonal brokers). In teff trade, there were ten years ago 200 wholesalers that were involved in teff. All of these teff wholesalers owned a shop on the market. However, in recent years, traders without shops became more active on the market. Their number was in 2011 estimated at about 300–400. An important complaint heard from the licensed brokers was about the rapid influx of these un-licensed brokers in recent years, as they obviously created increased competition for them.

Similar increases in the number of traders and brokers were mentioned by the focus groups in supplying regions. In the supply region of East Wollega (Nekemt), it was estimated that trade was ten years ago controlled by about 3 or 4 major traders. This had increased in 2011 to 30 or 40 major traders in that region. The new traders often used to work for the previous major traders and then set up their own business.

Source: Authors' compilation

4.3. Roads and transportation costs

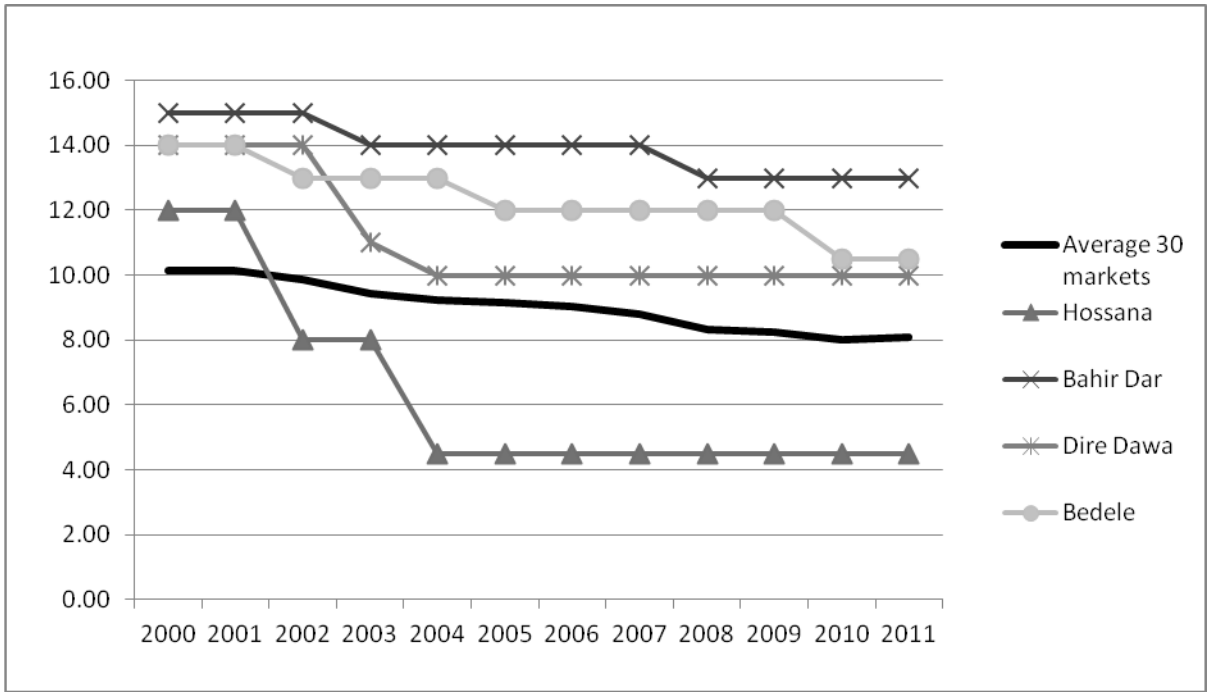
Several factors might have led to changes in transportation costs over the last ten years. We discuss consecutively changes in the road network and investments in road infrastructure improvements, changes in the types of trucks being used, the cost of fuel, and an increase in competition. We finish with an analysis of transport cost changes over time and of the factors that explain observed transport costs between wholesale markets in the year prior to the survey.

First, the Ethiopian government embarked on a large road investment program since it came to power and there is currently an unprecedented level of infrastructure development in Ethiopia. For example, all-weather surfaced roads are being and have been built between the capitals of all regions. It is estimated that the all-weather surfaced roads totaled 19,000 km in 1993 and were up to 44,300 km in 2008, more than a doubling in fifteen years. This road development has important effects on the connectivity of agricultural markets in the

country. In the wholesale market survey, transporters were asked how long it takes to travel between different wholesale markets in the country and the Addis wholesale market and how this has evolved over the last ten years. This is shown in Figure 4.5 below.

The results show that transport times have on average fallen by 20 percent, i.e. from 10 hours to 8 hours, over the last ten years (Figure 4.5). Similar declines were noted for a selected number of markets east, west, south, and north of Addis Ababa. However, it seems that especially the south of the country has increasingly been better integrated in the commercial circuit as travel times from that area have decreased most significantly, as seen in the enormous drop in travel time for trucks coming from Hossana. In 2000, it took trucks 12 hours to get from there to Addis. This declined to only four hours in 2011.

Figure 4.5—Time required (hours) to travel by truck between wholesale markets and Addis Ababa



Source: Author's compilation
Note: The average is based on the travel time form Addis to the 30 studied wholesale markets

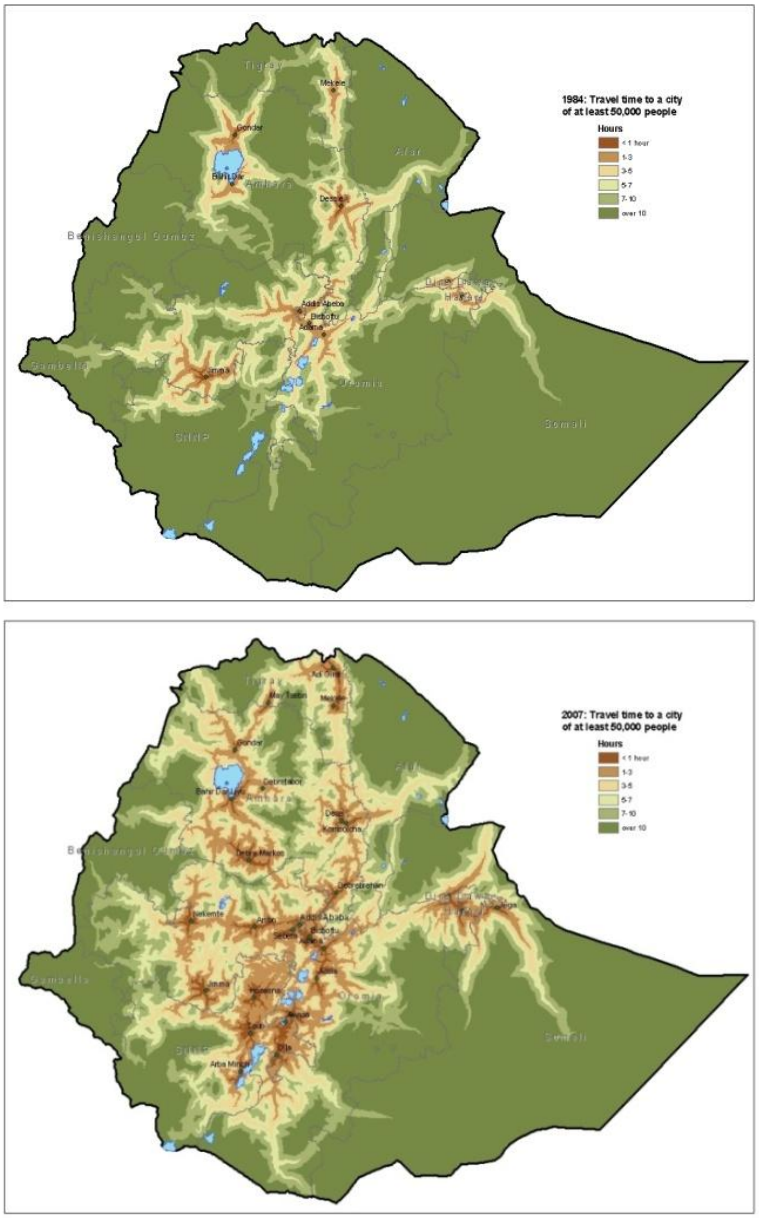
Based on the population census from different years, a similar trend in connectivity is shown of people that are connected to towns of more than 50,000 people. Because of improved infrastructure and because of urbanization, population census data show the percentage of people that were connected with cities increased dramatically over a twenty-three year period, i.e. between 1983 and 2007 (Figure 4.6), e.g. Schmidt and Kedir (2009) estimate that the percentage of the population that lives further away than10 hours from a city decreased from 40 percent in 1984 to 12 percent in 2007. Given that a number of large construction works continued after the census, it can safely be assumed that this situation improved even further afterwards.

Second, the price of fuel has shown important changes over time. The Ethiopian government used to subsidize fuel prices until October 2008 but stopped doing that since.[13] The combination of abolishing the fuel subsidies and of the increase in international fuel prices has led to a significant increase of real fuel prices over time. Based on CSA retail price data,

[13] Ethiopia froze fuel prices between August 2006 and January 2008; it had decreased the price of gasoline in February 2007. In October 2008, it eliminated fuel price subsidies altogether (Kojima 2009).

it is estimated that the real price of diesel in the beginning of the decade was 60 percent lower than at the end of the decade. Given that fuel is an important determinant of transport costs, this will have contributed to relatively higher transport costs over time.

Figure 4.6—Travel time, Ethiopia, 1984 and 2007

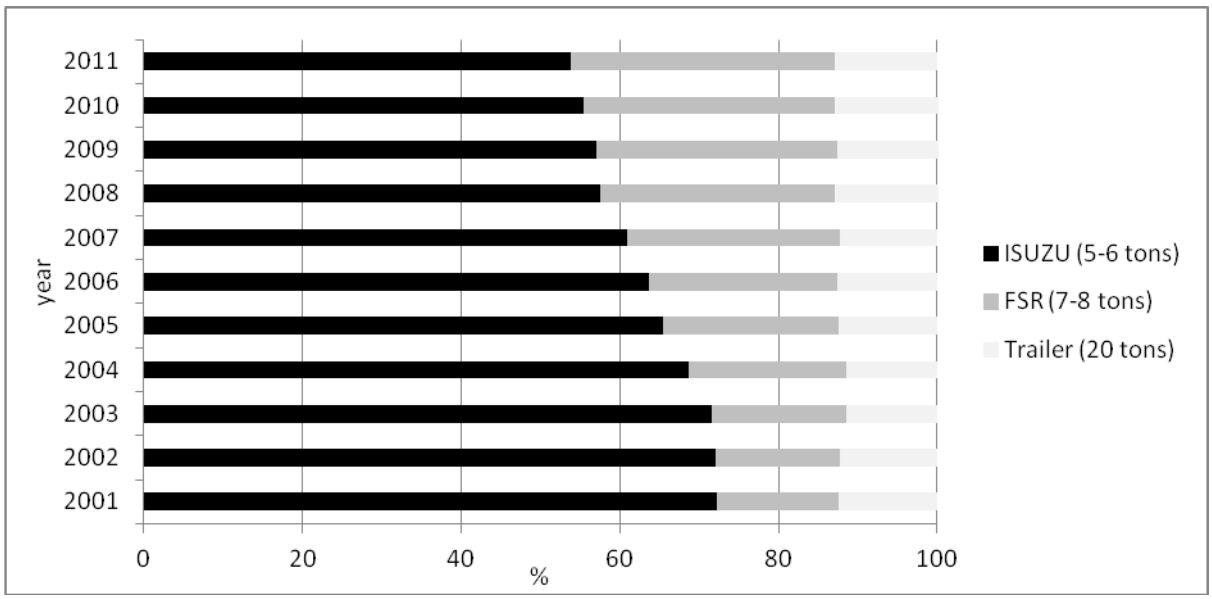


Source: Schmidt and Kedir 2009

Third, different means of transport are characterized by different transport costs. The bigger the trucks, the lower the transport costs. Because of the increasing quantities being shipped between markets, it has become easier to fill up loads and bigger trucks have incentives to enter into food trade. Over time, we thus note an increasing importance of larger trucks (FSR; able to carry about 7–8 tons) compared to smaller ones (Isuzu; carrying about 5–6 tons). While the share of FSR of all the trucks that transported cereals was about 15 percent in 2001, this has now increased to 33 percent (Figure 4.7). The use of trailer trucks, able to transport 20 tons, is still limited and overall they make up 13 percent of the trucks that transport cereals (they are more important for longer distance journeys). However, given that

they are able to transport between twice or four times the load of the smaller trucks, their share is significantly higher in total quantities of cereal transported.

Figure 4.7—Importance of different types of trucks arriving on wholesale markets



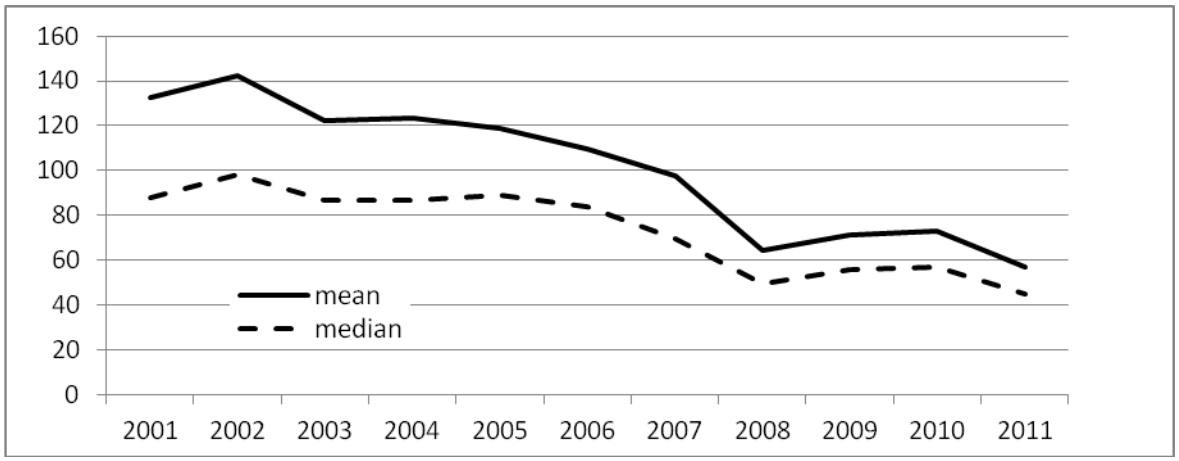
Source: Authors' compilation
Note: 100% = all trucks

Fourth, while increasing competition in the transport sector is hard to measure, there is evidence that there are an increasing number of trucks that are imported in the country, e.g. *Comtrade*[14] data show that the number of trucks imported in the country doubled between 2001 and 2011, higher than increases of trucks noted in wholesale markets. These increases illustrate the important increases in commercialization in the country but also do reflect important other changes in the country, such as in construction.

Transporter focus groups were asked to estimate travel costs over the last ten years for those trips that were commonly done from the market where they were interviewed. To allow for comparison over time, these prices were deflated by the CPI.[15] The results are shown in Figure 4.8. The results show that the mean and median of transport costs dropped at the end of the decade to half—or even lower—the costs that were charged in the beginning of the decade. The improvements in roads, the shift to bigger and cheaper trucks, and possibly the improved competition in the transport sector have far outweighed the rise of fuel prices and have seemingly led to significantly lower real transportation costs between markets in the country.

[14] Data on international trade are collected by the UN and can be downloaded from http://comtrade.un.org/
[15] For those trips where no complete time series could be collected from the group over the whole ten years, the rest of the series was deleted. Thus, we ended up with 204 consistent price series of transport costs between wholesale markets.

Figure 4.8—Real transportation costs between cereal wholesale markets over the last decade (2011 prices, ETB/quintal)



Source: Authors' compilation

To better quantitatively understand the determinants of transport costs at the time of the survey, we use the quarterly data collected from the transporters on cereal wholesale markets on transport costs in the year prior to the survey and look at explanatory variables of transport costs. We test to what extent these are explained by travel time, the type of trucks used, the likelihood of getting access to a load for the return trip, seasonal dummies, and the type of good transported. The results are reported in Table 4.3. We report a specification of a level regression as well as a logarithmic form. In both cases transport costs are deflated by the CPI.

We find that travel costs are significantly influenced by all the determinants included in the model. First, the longer the trip, the higher the transport costs. One hour more travel time increased the travel costs by 8 ETB/quintal or by 20 percent. There is some curvature in the effect of travel time but its effect is not large. This result suggests that transport costs have partly come down over the last decade in Ethiopia because these travel times decreased on average by 20 percent (as shown in Figure 4.4). Using the coefficients from the (level) regression, this effect would then have led to an average 24 percent decrease in average real transportation costs between 2000 and 2011 *ceteris paribus*.[16] Second, trailer trucks can transport cereals at significantly lower costs. Compared to Isuzu/FSR trucks, transport costs charged by trailers are 34 percent or 24 ETB/quintal lower. Unfortunately, we are unable to distinguish between the ISUZUs and FSRs. Third, there are also significant seasonal effects in transport costs. These are seemingly related to important seasonal demand and supply differences in transport services, given the large importance of transport of agricultural products—and its inherent seasonal nature—in Ethiopia's transport sector. It is estimated from our model that transport costs at harvest time are between 13 percent and 25 percent higher than during the off-season. Fourth, the transport of cereals is significantly more expensive than of non-cereals (about 10 percent). Fifth, on roads where trucks are often obliged to travel empty because of the lack of a return freight, the costs are also significantly higher (+ 8 percent). This is especially relevant for trips to cities in the east of the country (such as Dire Dawa) where truckers reported to have much more difficulty in filling up their truck for the return trip.

[16] 2 hours * 7.73 ETB divided by an average transport cost of 63.1 ETB.

Table 4.3—Determinants of transport costs

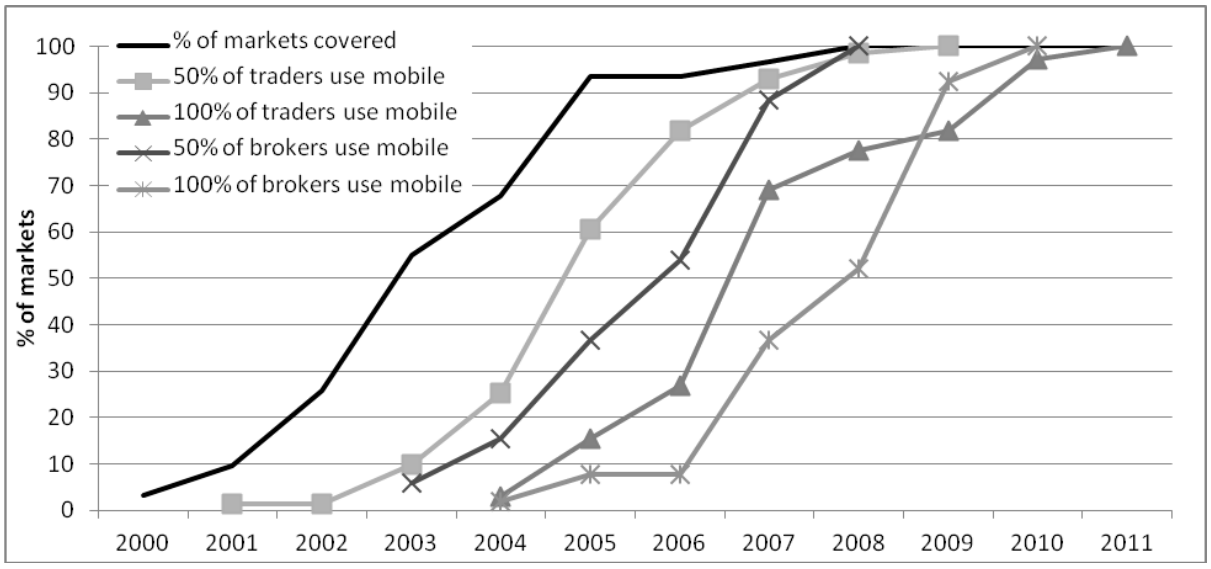
		Cost in ETB/quintal		Log (cost)	
Explanatory variable	Unit	Coeff	t-value	Coeff	t-value
Time required	hours	7.73	35.56	0.20	50.79
Time required squared	hours	-0.12	-15.36	0.00	-30.19
Default = trailer truck					
ISUZU/FSR truck	yes=1	23.53	22.07	0.34	20.70
Default = December - February 2011					
March-May 2011	yes=1	-8.73	-6.77	-0.13	-6.47
July-August 2011	yes=1	-14.05	-10.94	-0.25	-11.73
September-November 2011	yes=1	-14.71	-11.51	-0.25	-11.87
Default = transported non-cereals					
Transported cereals	yes=1	3.82	4.42	0.10	6.83
Trucks often travel empty	yes=1	8.80	6.20	0.08	3.19
Intercept		-11.29	-6.32	2.37	71.07
Number of observations		2054		2054	
F(8,2045)		595.93		850.76	
Prob>F		0.00		0.00	
R-squared		0.72		0.78	
Root MSE		19.74		0.33	

Source: Authors' calculations

4.4. Mobile phones

Mobile phones have become widely available in Ethiopia allowing traders and farmers to exchange information more easily. The widespread availability of the mobile phone in rural areas of developing countries has been shown to lead to a number of beneficial effects on farmers and on the trade environment (e.g. Aker and Fafchamps 2011; Jensen 2007). At the time of the survey, almost all traders and brokers, and this for all five studied cereals, were using mobile phones in their business. Figure 4.9 shows how cell phone coverage changed in the 31 wholesale markets surveyed. In 2000, only the Addis Ababa market had access to cell phone coverage but that quickly changed and by the year 2005 there was almost universal coverage of these rural wholesale markets. Figure 4.9 further shows that cell phone coverage led to a 100 percent use of mobile phone by all the traders and brokers of all the cereal crops in that town, after only 4 to 5 years on average.

Figure 4.9—Mobile phone use by brokers and traders on wholesale markets, cumulative percentage over markets, 2000–2011



Source: Authors' compilation

To understand the impact of this rapid spread of cell phones on cereal trade, further follow-up questions were asked. First, as to better understand their access to communication technology over time, focus groups were asked to assess the percentage of traders and brokers that had access to fixed phones before mobile phones became available. The results reported in Table 4.4 indicate that a large majority of these traders and brokers had access to fixed phones at some location (at home, on the market, or at another location). About half of the traders reported to have a fixed phone at home before, indicating that mobile phones did not fill in complete communication voids as seen in other countries.

Second, focus groups were asked to further state the frequency of use of fixed phones before and cell phones now. An average broker is now estimated to make on average 34 business calls per day during the peak trading period, for a trader this is 24. The number of calls drops off significantly in the lean period reflecting the important seasonality in their business activity as we shall see later. Before mobile phones became available, fixed phones were used less often and it is estimated that the number of calls, that an average broker or trader does related to his business, has increased three- to six-fold.

Third, questions were then asked for what purpose these mobile and fixed phones are and were used by traders and brokers (Table 4.4). Almost all traders and brokers report that they use mobile phones to transmit prices. 38 percent of the traders and 34 percent of the brokers use the mobile phone to request for a show-up with the product at the market. A lower percentage uses it to agree on prices with sellers and buyers. Seemingly, as given the lack of standards in Ethiopia, buyers still want to inspect the produce personally before a deal is done. On the other hand, a large majority of traders use the phones to follow up on payments of traders and buyers. This number is much lower for brokers, possibly because they are less involved in credit markets. When comparing the situation now with the period of the fixed phones, it is clear that more information is obtained and more deals are done by phone. For most of the options offered (price information, deals with sellers, buyers, and transporters), we see at least a doubling of the percentage of traders and brokers that practice it by phone.

Table 4.4—Use of mobile phones by traders and brokers

	Percentage of traders/brokers			
	Mean	Median	Mean	Median
Percentage of traders/brokers that had access to a fixed phone	now		before	
a. Traders				
… at home			46	50
… on the market			22	15
… at another location			62	75
b. Brokers				
… at home			11	5
… on the market			3	0
… at another location			56	65
Estimated number of phone calls per trader per day related to his trade business	by mobile phone		by fixed phone	
a. Traders				
… In the peak period	24	25	8	5
… In the lean period	8	8	2	2
b. Brokers				
… In the peak period	34	30	6	5
… In the lean period	11	10	2	2
Use of phone	" Are mobile phones used to…"?		"Were fixed phones used to…"?	
a. Traders				
"… inform/transmit prices"	86	99	47	50
"… agree on prices (plus quantity/quality) with sellers"	36	25	14	5
"… request a show-up (quantity requested but without price agreements) with sellers"	38	25	16	0
"… agree deals (prices and quantity) with transporters"	40	35	6	0
"… agree on prices (plus quantity/quality) with buyers"	46	45	19	10
"… request a show-up (quantity requested but without price agreements) with buyers"	38	25	19	10
"… follow-up payments with buyers/sellers"	81	100	31	25
b. Brokers				
"… inform/transmit prices"	59	75	20	15
"… agree on prices (plus quantity/quality) with sellers"	20	0	2	0
"… request a show-up (quantity requested but without price agreements) with sellers"	34	0	11	0
"… agree deals (prices and quantity) with transporters"	39	45	7	0
"… agree on prices (plus quantity/quality) with buyers"	20	0	6	0
"… request a show-up (quantity requested but without price agreements) with buyers"	36	0	12	0
"… follow-up payments with buyers/sellers"	45	30	13	0
Number of observations	71		71	

Source: Authors' compilation

Focus groups were further asked to indicate how the situation in trade has changed in the period before the mobile phone became accessible and the period afterwards (Table 4.5). While it is hard to argue that the mobile phone was the sole cause of these changes, it is

nevertheless probable that access to a mobile phone has contributed significantly to some of these changes. Most of the traders and brokers believe that he is now contacted by, or contacts himself, more sellers, buyers, and transport brokers before a deal is done. There is currently more bypassing of wholesale markets, in rural supplying areas as well as in Addis. Respectively 94 (88) percent and 61 (66) percent of focus groups state this to be the case for traders (brokers). Gabre-Madhin (2001a) shows that Addis has traditionally played the role of clearinghouse in cereal trade in Ethiopia, because of its central geographical location and the lack of alternative roads. This might slowly be changing because of easier access to information and the improved road network.

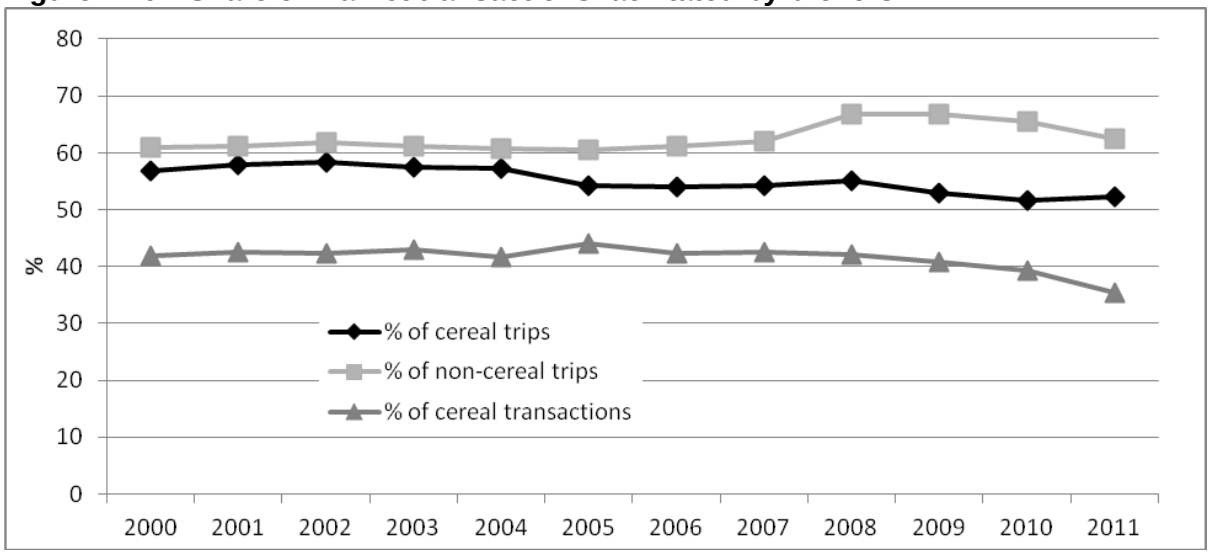
Table 4.5—Reported perceived changes in trade because of access to mobile phones

	Percentage				Number
	Yes	No	No change	Total	of Obs.
"In your opinion, compared to the period just before mobile phones were Introduced, for an average trader/broker now…"					
a. Traders					
"… He contacts/is contacted by more sellers before he does a deal"	97	0	3	100	71
"… He contacts/is contacted by more buyers before he does a deal"	96	3	1	100	71
"… He contacts more transport brokers before he does a deal"	96	1	3	100	71
"… He coordinates more/better with transport brokers to fill up larger trucks"	92	6	3	100	71
"… He transacts more at sellers/buyers/his location instead of the wholesale market (merchandise does not come to market)"	94	6	0	100	71
"… He bypasses the Addis wholesale market more"	61	21	17	100	70
b. Brokers					
"… He contacts/is contacted by more sellers before he does a deal"	96	2	2	100	52
"… He contacts/is contacted by more buyers before he does a deal"	98	2	0	100	52
"… He contacts more transport brokers before he does a deal"	96	0	4	100	52
"… He coordinates more/better with transport brokers to fill up larger trucks"	92	4	4	100	52
"… He transacts more at sellers/buyers/his location instead of the wholesale market (merchandise does not come to market)"	88	10	2	100	52
"… He bypasses the Addis wholesale market more"	66	18	16	100	50

Source: Authors' compilation

One additional impact of having access to a mobile phone is that traders might try to bypass brokers as it has now potentially become easier for traders to be in contact with different buyers and sellers themselves—as search costs have decreased—and they might not need to incur the additional costs anymore for these broker services. Figure 4.10 shows the evolution of the percentage of trips and cereal transactions that have been facilitated by transport brokers and cereal brokers respectively. An average over markets indicates that more than 40 percent of cereal transactions were facilitated by brokers until 2008. Since then, the percentage of transactions that is being facilitated by brokers has declined and it was estimated in 2011 at about 35 percent. Similarly, but smaller, declines are noted in the case of transport brokers as well.

Figure 4.10—Share of market transactions facilitated by brokers



Source: Authors' compilation

4.5. Cooperatives

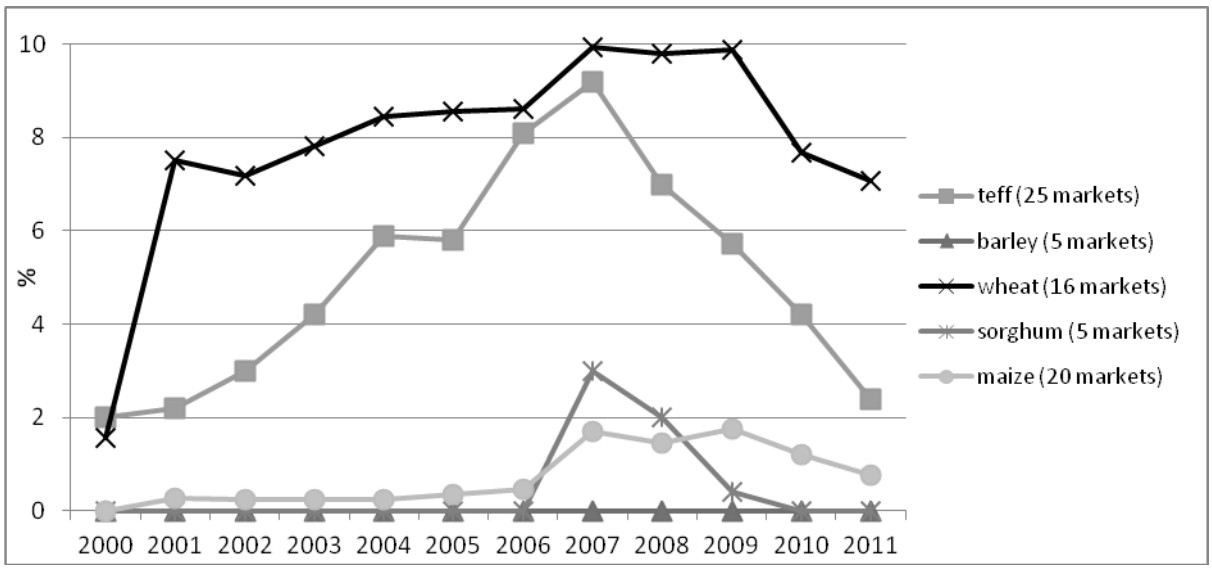
Agricultural cooperatives are widely established in the country. It is assumed that cooperatives can play an important role in improving the access of smallholders to markets (Bernard et al. 2010; Francesconi and Heerink 2010). However, while they have been enormously successful in the marketing of some crops, such as coffee, their importance in cereal markets is less pronounced given that coordination of output sales by cooperatives is more complicated in such situations. Based on a large-scale survey of farmers and cooperatives in 2005/2006, Bernard et al. (2010) show that only a limited number of farmers participate in cooperatives even if cooperatives were established in their villages. Especially the smallest farmers tended to not use cooperatives. International experience has shown that cooperatives are especially successful in cases of export crops or perishable products (such as dairy) where coordination between small farmers is a precondition for a successful development of the value chain (e.g. Cunningham 2009). For these reasons the role of cooperatives is seemingly less important for cereal crops.

An empirical indicator of the importance of cooperatives in cereal sales on wholesale markets is shown in Figure 4.11. Traders on the wholesale markets were asked to evaluate the share of cooperatives in each year of the ten years prior to the survey for the different cereals studied. Several points are worth making. First, the share of total cereal sales through the wholesale market made by cooperatives is still rather limited as none of the stated percentages is higher than 10 percent. Second, the share of cooperatives has been growing until the years 2007–2009, but is on the decline since. For example, the share of cooperatives has declined from 9 percent in 2005 to 2 percent in 2011 in the case of teff and from about 10 percent in 2009 to 7 percent in 2011 in the case of wheat. Third, cooperatives are rather important in wheat trade, as it allows farmers to aggregate and to obtain often higher prices from the larger millers. They are also important in teff trading though their role is considerably declining over the past four years. They are least important for the three other cereals, i.e. sorghum, barley, and maize.

It should be noted that these numbers might not correctly reflect the importance of cooperatives overall in cereal markets as cooperatives might rely on alternative marketing channels beyond cereal wholesale markets. In any case, given the limited importance of these alternative channels, we can safely conclude that the cooperatives are less important

in these cereal markets than for some of the export crops in Ethiopia. These alternative marketing channels—and vertical integration processes that might bypass wholesale markets—might be appearing but it is unclear to what extent this is happening at the national level. For a case study on the emergence of such channels, see Box 4.3.

Figure 4.11—Average share of cereals sold by cooperatives on cereal wholesale markets, as reported by traders' focus groups, 2000–2011



Source: Authors' compilation

Box 4.3—Vertical integration of land investors and processors

The increasing importance of large-scale producers might contribute to the emergence of more vertical integration with often important implications on input and output markets (Swinnen 2007). This is illustrated by the case of the Yetebaberut mill in Bale Robe. The owner of the Yetebaberut mill was involved in wheat production since the middle of the 2000s when he obtained a large land lease from the government. He produces wheat on about 240 hectares of land. In the last two years, he set up a new large-scale mill in Bale Robe (the largest in town) with equipment imported from China. This mill is supplied for half of its capacity by production from its own farm and the other half of the required supplies is bought from traders and farmers in the region (20 percent from local commercial farms and 80 percent from traders).

He sells the wheat flour mostly to local markets (70 percent) but also to Addis (30 percent) where he links directly with large wholesalers. Increasing urbanization—and the growth of smaller towns—leads to a larger number of people that need to rely on food markets and might thus give an incentive to the emergence of such larger millers able to exploit economies of scale. Over time, these mills might outcompete smaller mills as they have more efficient milling techniques (30 kg of byproducts per quintal of grain milled compared to 28 kg for traditional mills). These modern mills also focus exclusively on branded flour, with important price premia compared to unbranded ones.

Source: Authors' compilation

In the previous five sections, we have looked at what changes have happened in the last decade for the different drivers that might have affected the performance of cereal markets in Ethiopia. We have found that important changes have occurred in almost all of these domains. A synthetic overview of the changes that have happened as well as the statistical tests on the significance of these changes is given in Table 4.6. For all the drivers of structural change tested, we see mostly significant changes between the first and second

part of the decade. The only driver where almost no average difference was noted between the first and the second part of the decade is the share of cooperatives in cereal trade.

Table 4.6—Changes in structural factors in the last decade

Driver	Average	Average	Test of structural change	
- Measure	2001-2005	2006-2011	t-value	Pr(|T|>|t|)
1. Economic growth				
- GDP per capita (constant 2000 USD)	4.65	19.60	-2.86	**0.02**
- GDP per capita, PPP (constant 2005 international USD)	6.69	10.56	-1.13	0.29
2. Urbanization/commercial surplus				
Cereal trucks per week arriving….				
- … in peak period	36.60	50.17	-5.81	**0.00**
- … in lean period	15.20	21.17	-5.10	**0.00**
3. Roads and transportation costs				
- time taken to travel between markets (hours)	9.57	8.41	4.58	**0.00**
- real transportation costs paid between markets	127.75	78.72	4.88	**0.00**
4. Mobile phones				
Share of markets (%) where at the end of the period ….				
- … 100% of traders are using mobile phone	15.49	100.00	-	-
- … 50% of traders are using mobile phones	60.56	100.00	-	-
- … 100% of brokers are using mobile phone	7.69	100.00	-	-
- … 50% of brokers are using mobile phones	36.54	100.00	-	-
5. Importance of cooperatives				
Average share (%) of cereals sold by cooperatives on markets				
- Teff	4.22	6.10	-1.43	0.19
- Barley	0.00	0.00	-	-
- Wheat	7.90	8.83	-1.52	0.16
- Sorghum	0.00	0.90	-1.55	0.16
- Maize	0.27	1.21	-3.97	**0.00**

Source: Authors' compilation

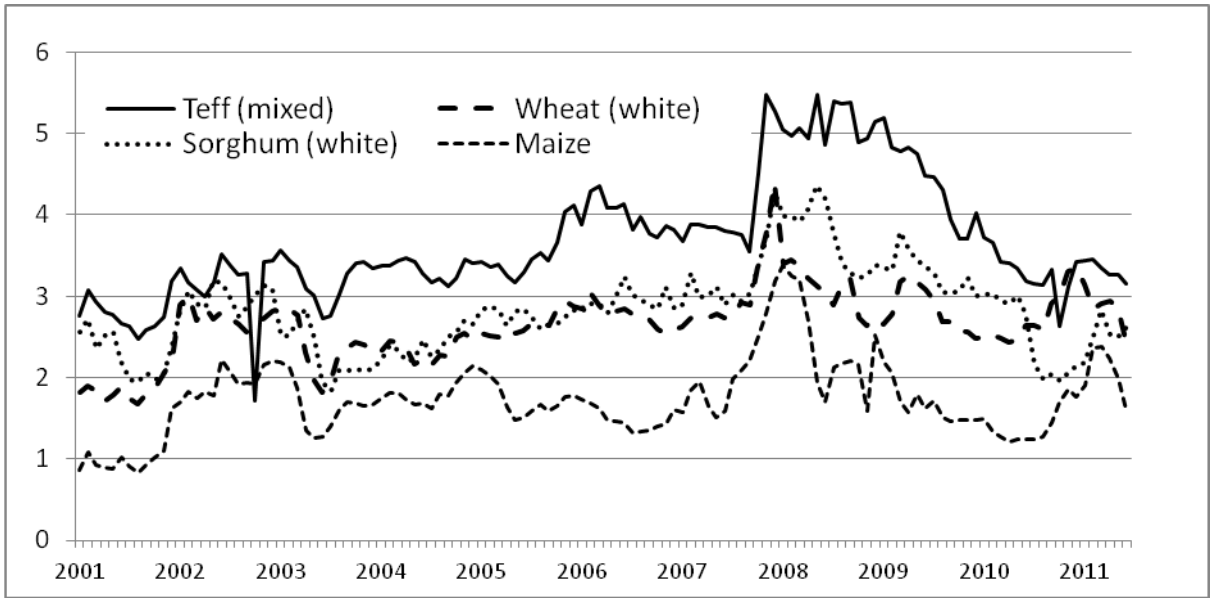
It is anticipated that increasing urbanization, marketing by cooperatives, and income growth would lead to more quantities traded, economies of scale, and thus lower margins overall. Access to better price information should lead to a more efficient marketing system, lowering margins overall. Changes in food preferences because of income growth might lead to higher quality premia if changes in the supply of quality products do not keep pace with changes in demand. In the next three sections, we look empirically at what the implications of some of these changes have been on cereal price formation. We discuss consecutively temporal and spatial price variation and market margins (quality premia, processing margins, and retail margins).

5. Temporal price variation

5.1. Price trends

Figure 5.1 shows the real price movements, using monthly deflated prices, of the four main cereals in Addis. Several important findings emerge. First, we see that the highest real price was achieved in the middle of 2008, at the height of the (first) food crisis. The peak was reached at that point for the four cereals. However, the decline from that peak is different for the different cereals. While the internationally traded products (maize, wheat) declined rapidly when prices did so in international markets, this was less the case for the locally traded cereals (sorghum, teff) where the decline was more gradual, especially so for teff. In any case, despite high volatility over the period, cereal prices at the end of the decade were mostly at similar levels as at the beginning for locally traded cereals but still significantly higher for internationally traded ones. Second, the ranking of the prices of the different cereals stays surprisingly constant over the period, possibly reflecting little relative changes between them in supply and demand conditions. Teff, the most expensive cereal, is characterized by prices that are twice as high as prices of maize, the least expensive cereal, indicating why teff is relatively more consumed by the rich (Tafere et al. 2010). Third, we see very high correlations between the price movements of the different cereals and peaks and troughs for the different series mostly co-incide.

Figure 5.1—Real cereal prices in Addis, 2001–2011 (in real ETB per kg)



Source: Authors' compilation based on EGTE wholesale price

Several authors have looked at a number of hypotheses to explain local price behavior in the country. Three major factors determine behavior, i.e. international prices, local demand changes, and local supply changes. Given that Ethiopia is an importing country for some cereals (such as wheat), international prices determine in this case local price behavior. Rashid (2010) and Dorosh and Ahmed (2009) find that cereals were imported when local prices were reaching higher levels than import parity, except in the period when Ethiopia was characterized by significant foreign exchange problems at the end of the first decade of 2000s. In the case of non-traded cereals such as teff, a puzzle remains why prices stayed relatively high despite the large productivity increases in the country (Rashid 2010). It seems that more research in this area would be useful.

In Table 5.1, we estimate the first model discussed in the methodology section. We compare the wholesale price in the first period of the decade with the second period, controlling for seasons, location, and quality. In all cases we do see a significant rise in the cereal prices in the second period. The highest rise is seen in the case of teff and barley, where prices in the second period where 21 percent higher than in the first period. The lowest price rise is noted in the case of maize. Real prices for this cereal were in the second period 11 percent higher. The other two cereals are in between, with an increase of 18 percent for wheat and of 14 percent for sorghum.

In Table 5.1, we further present the price trends in the four large cities in the country (Addis Ababa, Nazreth, Mekelle, and Dire Dawa). We see that price changes were not uniform over cities. Addis shows the highest rises in the second period while prices in Mekelle and Dire Dawa (in the north and east of the country) were relatively much less affected by price rises. We will discuss reasons for this later on.

Table 5.1—Changes of real cereal prices over time

	Value dummy period 2006–2011*									
	All markets		Addis Ababa		Nazreth		Mekelle		Dire Dawa	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
Teff	0.21	**44.94**	0.25	**16.99**	0.21	**14.06**	0.15	**9.43**	0.12	**7.81**
Barley	0.21	**28.37**	0.27	**13.60**	0.23	**10.49**	-	-	0.14	**7.93**
Wheat	0.18	**24.12**	0.23	**11.53**	0.21	**8.06**	0.06	**2.02**	0.07	**2.89**
Sorghum	0.14	**10.53**	0.23	**10.62**	0.21	**6.13**	0.01	0.28	0.20	**7.38**
Maize	0.11	**6.36**	0.12	**2.57**	0.46	**5.18**	-0.02	-0.40	-0.10	**-1.69**

Source: Authors' calculations
Note: * based on regression of form: log(price)=f(dummy 2006–2011, market, quality, month)

5.2. Seasonality

Agriculture is usually a very seasonal activity in any country. This is even more the case in Ethiopia given the heavy dependence on very seasonal rainfall and little use of irrigation for agricultural production. This seasonality has been shown to have important effects on e.g. seasonality in welfare and on vulnerability (Dercon and Krishnan 2000).

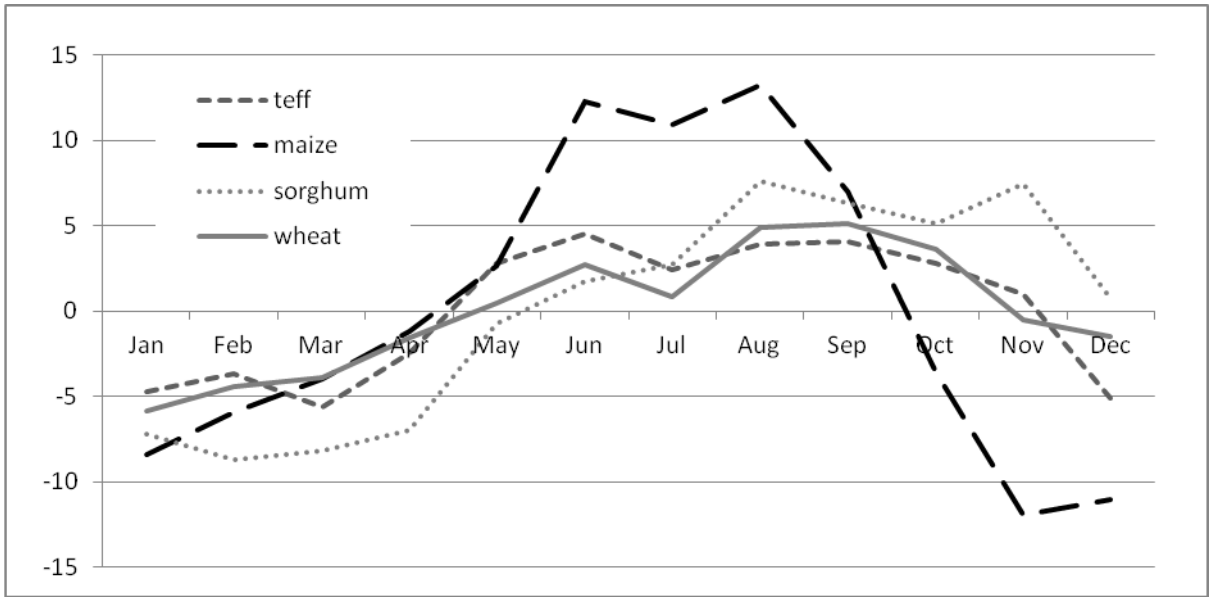
Agricultural output is mostly produced in the Meher period (where planting is done during the major rainy season in the country, i.e. July/August): that period accounted for 97 percent of total production in the country in 2007/2008. There is also a small second production season, called the Belg (with planting being done at the end of the year). The area share of the Meher season is lower than the production share as yields are usually significantly lower in the Belg season. Larger farms also usually exclusively focus on the Meher season (Seyoum, Dorosh, and Asrat 2011). While the Belg is overall less important, its share in total production is relatively higher for some crops such as maize, e.g. in 2007/2008, the Belg counted for 22 percent of total maize area cultivated and about 10 percent of total production (Seyoum, Dorosh, and Asrat 2011).

Given the heavy reliance on one major harvest in the year—which timing differs relatively little between regions—and given the relatively lower importance of international trade in cereals towards smoothening seasonal movements in prices, it is expected that price seasonality would be significant in such cereal economy. Price seasonality would potentially have decreased over time because of better road networks as regions become better integrated with each other and with international markets and as transport costs itself show less seasonality because of quality of road differences between rainy and dry seasons.

While different methodologies exist on estimating seasonal price movements, we rely in this case simply on the results of a regression where the log of yearly prices, deflated by a de-

seasonalized price index, is regressed on yearly dummies and seasonal dummies (controlling for location and quality). We then shift the seasonal dummies to ensure that the average of seasonal indices over the period is equal to zero as to make results of seasonal amplitudes comparable across crops. The results of this exercise are presented in Figure 5.2. We see that the amplitude of the seasonal price movement is largest for maize: differences of the prices between the peak and the trough are as high as 25 percent. Prices are highest during the month of August and lowest during the month of November. Sorghum shows the second highest amplitude of the cereals, with price differences of about 15 percent. Third and fourth come teff and wheat with an amplitude of about 10 percent. In all cases is August a month of high prices while troughs depend on the crop. Maize troughs are seen at the end of the year while for other cereals, they come later, i.e. between January and March. When the stability of the amplitude of the seasonal movement between the first and the second period of the decade are compared, we find that three out of the five cereals do not show any significant change over time (Table 5.2). However, we do note a significant decline in the case of sorghum and wheat.

Figure 5.2—Seasonality in wholesale cereal prices in Addis, in percent



Source: Authors' compilation

Table 5.2—Cereal price seasonality

Product	Amplitude of season movement (%)				
	Overall	Period	Period	F-test structural change	
	2001–2011	2001–2005	2006–2011	F-value	Prob>F
Teff	9	11	9	1.32	0.25
Barley	13	16	13	0.87	0.35
Wheat	13	20	9	13.52	**0.00**
Sorghum	15	23	11	6.97	**0.01**
Maize	19	26	20	1.42	0.23

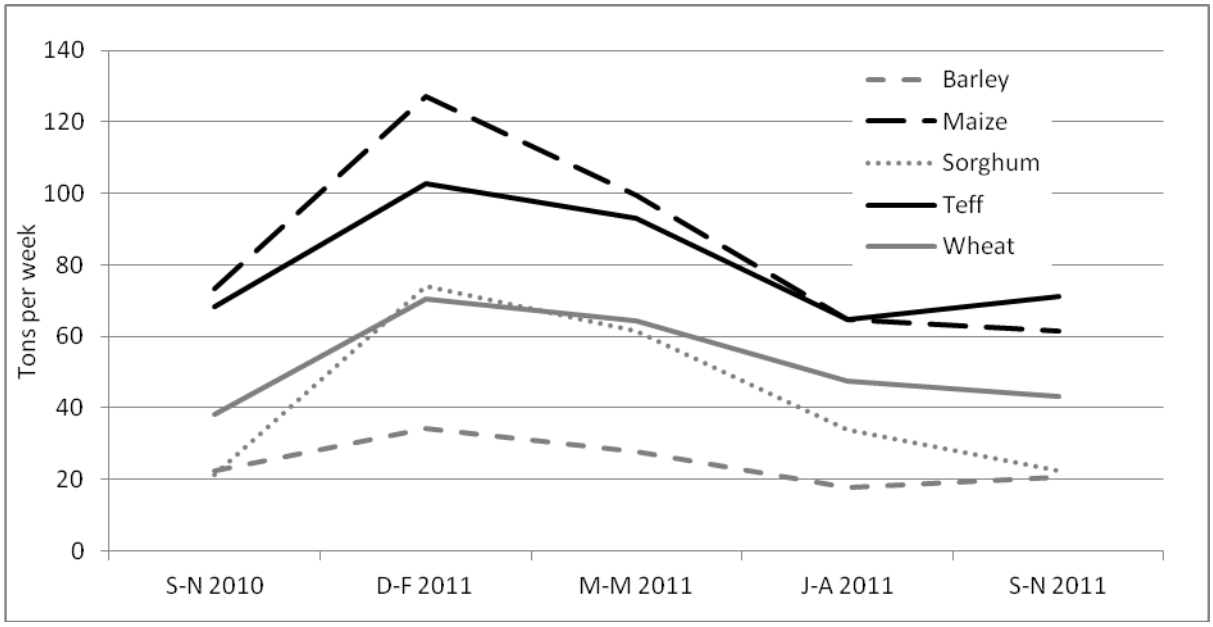
Source: Authors' calculations

Different explanations can be given for seasonal price movements. First, the movements of low prices at harvest time and high prices later in the year reflect storage costs as well as opportunity costs of money (that is embedded in the stored product). Second, product quality might change over the year but as the collected price data contain little information on quality characteristics of the product, we are not able to well control for these over the year. For

example, maize that comes fresh from the field and that contains lots of humidity is valued lower than dry maize. If a standard quality of maize would be used in our calculations, seasonal price movements of maize would probably even be more enhanced.

In the wholesale market interviews, questions were asked on seasonality of cereal trade as measured by the number of trucks arriving in the market during the year of the survey. We note important seasonality in cereal flows with the quantities traded often twice as high during the harvest season (December to February) than during the off-season (Figure 5.3). Such seasonal patterns thus presumably lead to important seasonal differences in income flows in rural areas (as price differences are much smaller than differences in quantities traded) as well as in quantities consumed of cereals. However, it should be noted that most of the relief aid that is given out in Ethiopia is done during the lean period and the commercial flows are to some extent replaced by food aid during that period.

Figure 5.3—Seasonality in arrivals of cereals (average tons per week) on 31 wholesale markets



Source: Authors' compilation
Notes: S-N 2010 = September–November 2010; D-F 2011 = December 2010–February 2011; M-M 2011 = March–May 2011; J-A 2011 = June–August 2011; S-N 2011 = September–November 2011

6. Spatial price variation

Ethiopia is characterized by very diverse agro-ecologies often leading to spatial specialization and differential agricultural production, as well as consumption, patterns (Chamberlin and Schmidt 2011; CSA, EDRI, and IFPRI 2006). Questions were asked to the focus groups in the wholesale markets on the average number of cereal trucks that were arriving and leaving from that market. That gives us an idea on the supplying and receiving areas in Ethiopia. The general trend in cereal market flows reflected in these data is that the west (maize, sorghum) and south (barley, wheat) are the major suppliers of cereals to Addis and to the east (Dire Dawa) and north (Mekelle) of the country, the cereal deficit areas in the country (Gelan and Dinka 2006; Gabre-Madhin 2001a). Mekelle is the capital of Tigray region; Tigray is among the poorest and most vulnerable regions in the country, together with the pastoralist regions (MoFED 2012). The supply base of teff is more diversified than for other cereals but major demands come from these three cities, not surprisingly also the three major cities in the country.

We test to what extent the stated flows are reflected in wholesale market price differences. We compare the prices of different markets to the Addis Ababa market (the default market) using the second regression model discussed in the methodology section. As the dependent variable is expressed in log of real prices, the reported coefficients show the relative difference with the Addis market. In a second specification, we split the analysis period in two parts and interact this with market places. We test for structural change by comparing price differences of the first period with the second period of major supply areas with Addis Ababa as well as price differences between major demand 'sinks', i.e. Mekelle and Dire Dawa (reported at the bottom of Table 6.1) with Addis Ababa. The results of the regression model reported in Table 6.1 allow us to make several points.

First, while Addis Ababa is the biggest city in the country, it does not always have the highest cereal price, often reflecting the effective flows of products. For example, all cereal prices in Dire Dawa are higher than in Addis, ranging from 7 percent (sorghum) to 27 percent (maize) higher. In Mekelle and Dessie, four out of five cereals are significantly more expensive than in Addis. The only exception is the case of sorghum which is to a large extent also produced and commercialized in the north. On the other hand, some markets are almost always cheaper for all cereals. This is the case, for example, in the markets of Shashemene and Nekemt, both located in major cereal production zones. Price differences in the country in general thus reflect quite well the perceived product flows.

Second, we see that the relative ratios are often changing significantly in the second part of the studied period, possibly reflecting the effective changes in transport costs between wholesale markets. In 9 of the 10 tested cases, as shown at the bottom of Table 6.1, relative differences of prices of Mekelle and Dire Dawa compared to Addis Ababa have declined significantly in the period 2006–2011 compared to the period 2001–2005. For example, while the price of maize was 39 percent and 26 percent higher in Dire Dawa and Mekelle in the period 2001–2005, this difference declined to 17 percent and 12 percent respectively for the period 2006–2011.[17] Similar changes are happening in differences from supply areas to Addis Ababa but to a lesser extent and often not statistically significant. This is partly explained by lack of infrastructure improvements for some of the supplying areas, such as Nekemt. On the other hand, for some cereal supply regions, major improvements are seen over time. While the price difference for wheat between Bale Robe and Addis Ababa was 31 percent for the period 2001–2005, this declined to 19 percent for the period 2006–2011.

Third, price variations between wholesale markets declined over time. The difference between the highest and the lowest coefficient in the first part of the decade compared to

[17] These are the differences of the coefficients from the market centers in question for 2006–2011 with the coefficient for Addis for the same period.

that difference in the second part of the decade, declined by 11, 27, 28, and 22 percentage points in the case of teff, wheat, maize, and barley, respectively. Only in the case of sorghum is a rise in price variability between markets noted. These numbers seem again to indicate the closer integration—although it is not formally tested—of these markets over time.

Table 6.1—Results of coefficients of regression: Regional retail price differences compared to Addis Ababa

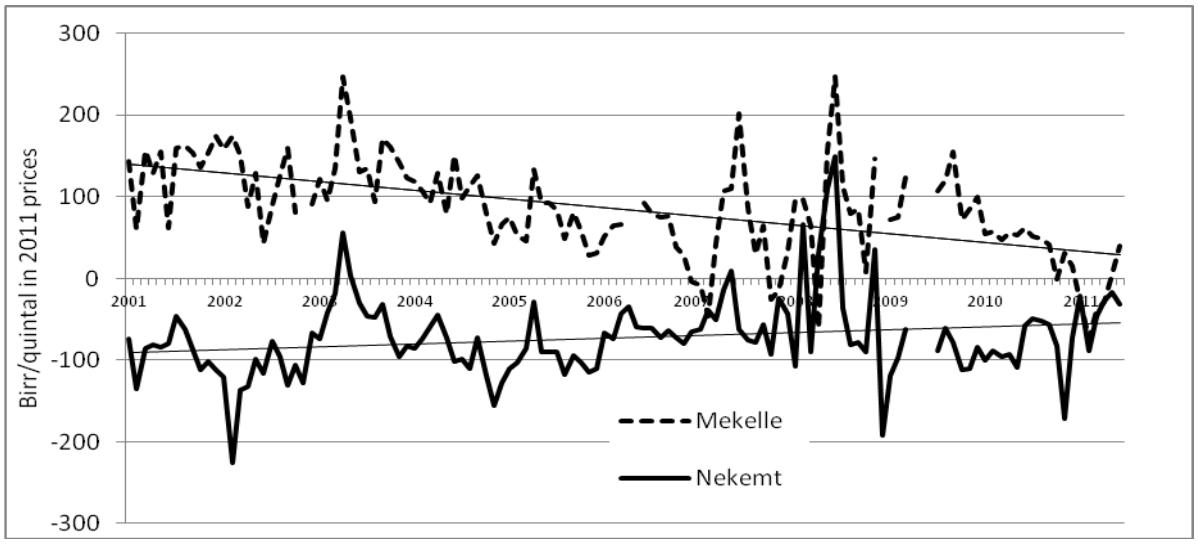
†	Market	Dummy time	Teff		Wheat		Maize		Sorghum		Barley	
		interaction	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
1	Ambo	none	-0.05	**-6.89**	-0.14	**-11.79**	-0.08	**-3.50**	-0.39	**-5.16**	-0.07	**-6.20**
	Assela	none	0.02	**3.01**	-0.09	**-7.03**	0.14	0.79			-0.10	**-9.74**
	Bale Robe	none	0.08	**8.25**	-0.24	**-18.72**					-0.49	**-31.12**
	Dessie	none	0.04	**5.92**	0.06	**4.14**	0.06	**2.68**	-0.15	**-9.80**	0.01	1.09
	Diredawa	none	0.12	**17.64**	0.19	**17.02**	0.27	**11.97**	0.07	**5.82**	0.15	**13.69**
	Gondar	none	0.00	0.59	0.11	**10.81**	0.06	**2.79**	-0.30	**-24.15**	0.23	**22.32**
	Jimma	none	-0.04	**-6.19**	0.06	**5.53**	-0.15	**-5.26**	-0.39	**-3.01**	0.04	**3.85**
	Mekele	none	0.08	**11.28**	0.18	**13.82**	0.18	**8.02**	-0.03	**-2.84**	0.12	**5.64**
	Nazreth	none	0.00	0.33	0.00	0.01	-0.01	-0.43	-0.10	**-6.50**	-0.06	**-5.03**
	Nekemt	none	-0.14	**-21.13**	-0.01	-1.12	-0.19	**-8.51**	-0.20	**-2.08**		
	Shashemene	none	-0.01	-0.87	-0.06	**-4.75**	-0.04	**-2.02**	0.01	0.09	-0.09	**-7.88**
2	Ambo	2001–2005	-0.06	**-5.81**	-0.16	**-10.44**	-0.10	**-3.18**			-0.03	**-1.70**
	Assela	2001–2005	0.03	**2.73**	-0.11	**-6.59**					-0.14	**-8.63**
	Bale Robe	2001–2005	0.02	**1.71**	-0.31	**-18.12**					-0.50	**-22.09**
	Dessie	2001–2005	0.09	**9.31**	0.09	**5.56**	0.09	**2.75**	-0.11	**-4.89**	0.05	**3.11**
	Diredawa	2001–2005	0.18	**19.03**	0.26	**19.12**	0.39	**12.02**	0.09	**5.63**	0.22	**13.49**
	Gondar	2001–2005	0.08	**8.24**	0.21	**15.10**	0.10	**3.09**	-0.24	**-13.79**	0.33	**19.67**
	Jimma	2001–2005	-0.04	**-4.50**	0.05	**3.67**	-0.20	**-3.89**			0.04	**2.38**
	Mekele	2001–2005	0.13	**13.11**	0.25	**14.43**	0.26	**7.96**	0.07	**4.11**	0.34	**11.34**
	Nazreth	2001–2005	0.02	**2.44**	0.01	0.40	0.02	0.43	-0.12	**-5.23**	-0.04	**-2.19**
	Nekemt	2001–2005	-0.17	**-17.31**	0.01	0.53	-0.23	**-7.23**				
	Shashemene	2001–2005	-0.03	**-3.05**	-0.06	**-3.44**	-0.06	**-1.74**			-0.09	**-5.37**
	Addis	2006–2011	0.16	**7.01**	0.35	**9.40**	0.46	**5.61**	0.14	**2.37**	0.39	**18.11**
	Ambo	2006–2011	0.12	**5.07**	0.23	**6.09**	0.41	**4.91**	-0.30	**-3.26**	0.29	**13.56**
	Assela	2006–2011	0.17	**7.69**	0.27	**7.21**	0.59	**3.05**			0.33	**15.15**
	Bale Robe	2006–2011	0.28	**11.57**	0.16	**4.31**					-0.07	**-2.33**
	Dessie	2006–2011	0.16	**7.12**	0.36	**9.19**	0.50	**6.04**	-0.06	-0.98	0.36	**14.07**
	Diredawa	2006–2011	0.22	**9.86**	0.44	**11.66**	0.63	**7.60**	0.19	**3.36**	0.48	**21.33**
	Gondar	2006–2011	0.11	**4.71**	0.38	**10.33**	0.50	**6.00**	-0.20	**-3.56**	0.55	**25.84**
	Jimma	2006–2011	0.12	**5.23**	0.41	**11.04**	0.32	**3.86**	-0.29	**-2.12**	0.43	**20.42**
	Mekele	2006–2011	0.20	**8.64**	0.46	**12.22**	0.58	**7.00**	0.02	0.27	0.26	**7.44**
	Nazreth	2006–2011	0.15	**6.40**	0.34	**9.01**	0.43	**5.11**	0.04	0.63	0.33	**15.09**
	Nekemt	2006–2011	0.04	1.62	0.32	**8.44**	0.31	**3.78**	-0.11	-1.01		
	Shashemene	2006–2011	0.17	**7.63**	0.28	7.52	0.43	**5.19**	0.12	0.87	0.32	**13.90**
	Test of structural change		F()	Prob>F	F()	Prob>F	F()	Prob>F	F()	Prob>F	F()	Prob>F
	Supply area* vs Addis		1.66	0.20	29.84	**0.00**	3.69	0.06	7.02	**0.01**	0.33	0.56
	Addis vs Dire Dawa		78.85	**0.00**	71.77	**0.00**	26.63	**0.00**	2.10	0.15	34.68	**0.00**
	Addis vs Mekelle		47.59	**0.00**	33.19	**0.00**	10.89	**0.00**	71.90	**0.00**	111.6	**0.00**

Source: Authors' calculations
Notes: † = Specification; * teff: Ambo; wheat: Bale Robe; maize: Nekemt; sorghum: Nekemt; barley: Shashemene

While spatial margins have on average declined over time between markets, these differences between markets are however characterized by significant variability. Figure 6.1 shows the real price difference of maize between the supplying region of Nekemt and Addis Ababa, and Mekelle and Addis Ababa. While there is a decline in margins as shown by the

trend line (and as shown in our regression results), there is also significant variability around this trend and there are an important number of months when profitable transport from this supply zone to Addis Ababa and to Mekelle is not possible.[18]

Figure 6.1—Real price differences of maize between the wholesale markets of Addis Ababa compared to Mekelle and Nekemt



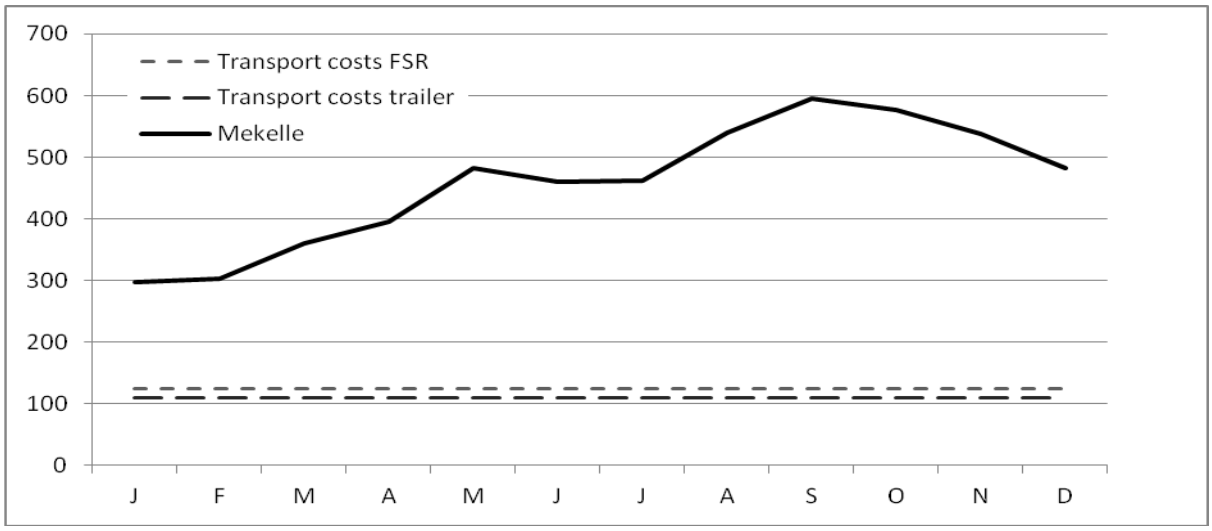
Source: Authors' compilation

The data collected for the long-haul transport costs between Mekelle and Nekemt in the year of the survey show that transportation costs between these markets vary between 125 and 110 ETB per quintal or 0.086 and 0.064 USD per ton per km for the FSR truck and trailer trucks, respectively (Figure 6.2).[19] To assess the importance of these domestic transport costs in final food prices, we plot the transport costs as well as the maize wholesale price in Mekelle in the year 2011. That comparison is most relevant as data from the wholesale survey in Mekelle show that there was a continuous flow of maize from Nekemt throughout the year 2011. It is estimated that at harvest time, transportation costs make up about 40 percent of the final destination wholesale price. This share declines to about 20 percent during the month of September.

[18] It is not immediately clear what the explanations are for this variability (other supply zones coming in, food aid, etc.) and additional data are needed to explain this.

[19] The comparison of Ethiopia's transport costs with international numbers show that they are in line with other African countries but that they are more expensive than other regions (Teravaninthon and Raballand 2009).

Figure 6.2—Transport costs from Nekemt to Mekelle and wholesale maize price in Mekelle, January–December 2011 (in ETB/quintal)



Source: Authors' compilation

7. Margins

7.1. Quality premia

When consumers get richer, they demand more quality food products, often implying an increase in quality premia for products (e.g. Vandeplas and Minten 2011). We look at these quality premia at the national level and in the case of Addis Ababa using the wholesale market prices of the EGTE. These EGTE data distinguish basic qualities, based on color, that allow calculating quality premia. It is to be noted that color is often only one —but important—characteristic of quality in cereal markets, e.g. Bekele and Ayele (2006) find that especially color and purity of teff play an important role for determining quality premia paid in the market place.

We show the results of the regression analysis on price premia and their evolution over time in Table 7.1. In all cases it is shown that *white* cereals are rewarded a premium over *mixed* cereals (or red in the case of teff). Quality premia of white products over mixed products vary between 8 percent in the case of wheat and 15 percent in the case of barley. White teff commands a premium of 26 percent over the price of red teff. When we look at the price premia paid in Addis Ababa with those for the other markets, we note that premia are in general higher in Addis Ababa. The stability of the quality premium coefficient changes little over time. In half of the cases, changes between the first and second period are significant. However, if changes are noted, they show a surprising decrease in the quality premia being paid. On the other hand, it seems that demand for quality products, especially in urban areas, is on the rise for some cereals, as illustrated in Box 7.1. The case study suggests that quality in production might have increased rapidly over time. It is however unclear to what extent this happened for other cereals at the national level.

Table 7.1—Quality premia of cereals

	Compared to	Overall		Period 2001–2005		Period 2006–2010		F-test structural change	
		Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	F-value	Prob>F
Wholesale price data - EGTE all									
Teff									
Mixed teff	White teff	-0.12	**-32.92**	-0.12	**-21.75**	-0.12	**-24.79**	0.00	0.99
Red teff	White teff	-0.26	**-73.95**	-0.28	**-52.94**	-0.26	**-53.41**	11.93	**0.00**
Barley									
Mixed barley	White barley	-0.14	**-26.17**	-0.15	**-19.77**	-0.13	**-17.81**	4.37	**0.04**
Wheat									
Mixed wheat	White wheat	-0.08	**-13.84**	-0.09	**-10.05**	-0.09	**-10.38**	0.07	0.80
Sorghum									
Mixed sorghum	White sorghum	-0.15	**-17.42**	-0.12	**-10.35**	-0.16	**-15.06**	7.84	**0.00**
Addis - EGTE wholesale market									
Teff									
Mixed teff	White teff	-0.11	**-13.39**	-0.12	**-9.39**	-0.11	**-9.54**	0.72	0.40
Red teff	White teff	-0.32	**-38.29**	-0.33	**-25.72**	-0.32	**-28.29**	0.85	0.36
Barley									
Mixed barley	White barley	-0.19	**-20.86**	-0.22	**-17.39**	-0.16	**-13.61**	11.77	**0.00**
Wheat									
Mixed wheat	White wheat	-0.11	**-14.84**	-0.12	**-12.07**	-0.09	**-9.13**	3.49	0.06
Sorghum									
Mixed sorghum	White sorghum	-0.11	**-17.22**	-0.13	**-15.02**	-0.09	**-10.35**	9.78	**0.00**

Source: Authors' calculations

Box 7.1—The increasing demand for quality in Ethiopia: The case of K.O.JJ. Food Processing Complex

K.O.JJ. is one of the biggest wheat flour mills in the country, processing on average about 50 tons of wheat per day and producing wheat flour as well as biscuits. The company is focused on processing quality wheat. It rejects the lower quality and pays a premium for better one. The premium that is paid is based on chemical lab tests that objectively measure the supplied wheat quality.

Over time, K.O.JJ. has assured quality supply by switching types of suppliers. Its supplier base consists for 60 percent from wholesalers, 25 percent directly from large farmers/investors, 13 percent from cooperatives, and 2 percent from government farms. Over time, cooperatives are losing share as the company finds it easier to get the required quality on time from the larger farms. The firm indicated that for all types of suppliers, assuring quality supply has become less of an issue in recent times than was the case in earlier years.

On the demand side, the company was almost exclusively selling products to wholesalers and traditional retailers ten years ago but now the sales to this segment have declined to 40 percent of their total sales. 60 percent of its sales is now directly to shops, hotels, restaurants, airlines, and supermarkets. This thus shows an important growth in the urban food service sector. Over time, the company also changed its products in the market place. While 50 kg branded bags were the only product sold ten years ago, it now diversifies into different sizes (5kg, 1 kg) of branded bags as to cater to the changing demands of clients. However, the 50 kg bags still make up the majority of their sales (80 percent).

The situation of K.O.JJ. illustrates that there is an increasing demand for quality food products in the country, and especially so in urban areas, and that some parts of the food industrial complex are filling these niche markets as to satisfy these demands. This is having effects on the supply side as well as on the diversity of products found in food retail.

Source: Authors' compilation

7.2. Processing margins

To analyze processing and milling margins, we compare the prices of milled products, i.e. flour (relying on CSA retail data from some markets that are common to the EGTE dataset) to the wholesale grain prices. We test to what extent the prices of the processed products are over time changing compared to the raw material. This is done in the case of Addis Ababa as well as for all common wholesale markets. In general, we find that the price of the flour products are declining over time and this for all the four cereal products for which CSA collected data (Table 7.2). This decline is significant in 6 cases out of 8 and is significant for all cereals in the case of Addis Ababa. This result might reflect an improvement in the milling sector as well as possibly an increase in the market for flour products (where people rely increasingly on purchasing flour products and forego the labor-intensive milling at home).

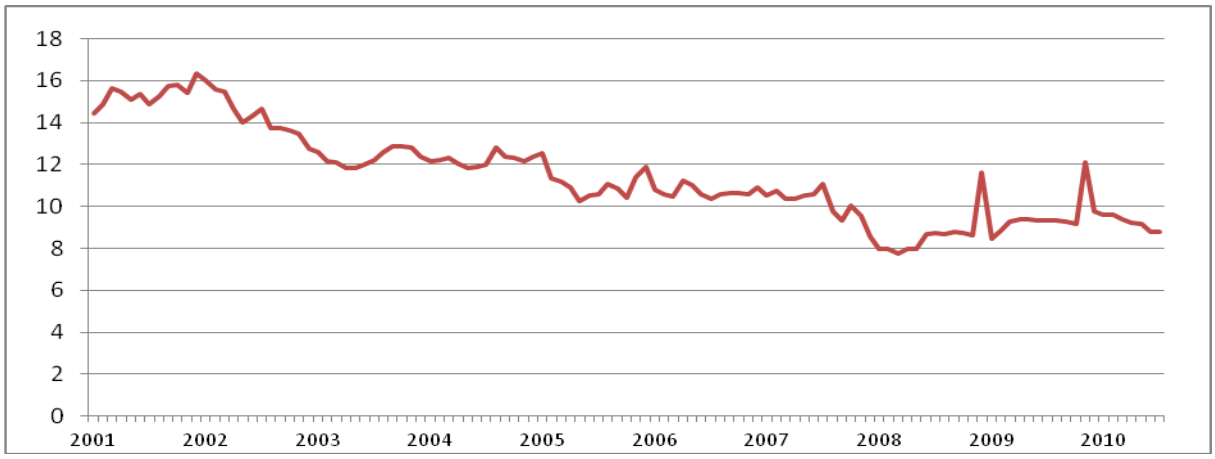
Table 7.2—Premium of flour over grain (measured as prices of flour retail to grain wholesale)

	Overall		Period 2001–2005		Period 2006–2010		F-test structural change	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	F-value	Prob>F
All markets								
Teff	0.22	**48.27**	0.29	**51.47**	0.15	**25.55**	391.91	**0.00**
Barley	0.45	**21.88**	0.67	**24.19**	0.38	**18.68**	134.61	**0.00**
Wheat	0.48	**57.76**	0.49	**45.75**	0.47	**38.27**	1.16	0.28
Maize	0.59	**47.33**	0.59	**38.45**	0.59	**34.44**	0.00	0.99
Addis Ababa								
Teff	0.31	**21.52**	0.37	**19.52**	0.24	**11.88**	21.50	**0.00**
Barley	0.08	**3.24**	0.27	5.06	0.03	1.28	15.54	**0.00**
Wheat	0.46	**19.61**	0.49	**19.16**	0.33	**5.84**	6.69	**0.01**
Maize	0.70	**24.38**	0.75	**22.18**	0.58	**10.85**	7.28	**0.00**

Source: Authors' calculations

Changes in the milling sector are confirmed by secondary data. Data from the Addis Ababa Trade and Industry Office Database on the number of mills in the city indicate an important increase of mills in the last decade. While the number of mills per *kebele* was less than one in the middle of the decade, this has increased to an average of five by 2011 (however, this increase is also likely explained by increasing formalization of the milling sector). It is possible that the increasing availability of mills has led to an increase of competition and a relative reduction in milling costs. This is found to be the case in the retail data that CSA collects as to construct the CPI. Using these data, it is found that the real milling charges at the end of 2010 had dropped to half of the level that was being charged 10 years earlier (Figure 7.1).

Figure 7.1—Real milling charges (ETB/100 kg cereals) over time (2001–2011)



Source: CSA data

7.3. Retail margins

As to estimate the changes that have happened in retail margins, we merge the data that EGTE collects on retail pricing with the wholesale price series. These data are collected with these traders which operate on or close to the wholesale market and which sell directly to consumers. However, traders in that area also often have wholesale activities on the side. The set-up of the retail price collection by EGTE has two disadvantages. First, retail data are only available until the end of 2009 and we thus have to limit analysis to a comparison between 2001–2005 and 2006–2009. Second, the retail data collected are not representative of the retail sector in the city as data are only collected for these particular retail agents discussed above (and do not include the amalgam of retailers that supply cereals in a city including shops, supermarkets, and especially the small mills). However, despite these drawbacks, the data can give us some indications on the size and on the evolution over time of retail margins.

Table 7.3 shows the results of the regressions, for all the markets for which these prices were available as well as for Addis Ababa separately. Several findings emerge. First, the size of the retail margin is significantly higher in Addis Ababa than for the rest of the country. This is not surprising given the higher retail costs in a large city as Addis Ababa (related to real estate as well as higher labor costs).[20] Second, the size of the margin differs between different crops. Teff is characterized by the lowest margin and maize by the highest. This might partly reflect the higher value of teff compared to other crops and the difference in absolute retail margins between the different cereals is thus significantly smaller, possibly reflecting the fixed costs of retailing of cereals (Gardner 1975). Third, we note mostly a decline in the retail margins over time when the first half of the decade is compared to the second half. In seven out of the ten changes tested, the decline is significant. In the case of Addis Ababa, the decline in cereal margins is significant for all five cereals. In this case, the average retail margin for cereals in the second half of the decade dropped to half the margin it was in the first part of the decade.

[20] For example, MoFED (2012) shows that nonfarm prices in Addis (mostly rent) are significantly higher than the rest of the country.

Table 7.3—Retail margins for cereals

	Overall		Period 2001–2005		Period 2006–2010		F-test structural change	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	F-value	Prob>F
All markets								
Teff	0.016	**6.20**	0.018	**5.17**	0.014	**3.51**	0.61	0.43
Barley	0.048	**13.32**	0.055	**11.51**	0.039	**7.05**	4.53	**0.03**
Wheat	0.044	**12.31**	0.050	**10.66**	0.036	**6.50**	4.03	**0.04**
Sorghum	0.026	**3.92**	0.034	**3.82**	0.016	1.57	1.70	0.19
Maize	0.049	**6.86**	0.040	**4.28**	0.060	**5.77**	2.01	0.16
Addis Ababa								
Teff	0.043	**9.24**	0.056	**8.92**	0.028	**4.05**	9.11	**0.00**
Barley	0.098	**15.70**	0.135	**17.19**	0.054	**6.25**	48.65	**0.00**
Wheat	0.090	**20.21**	0.122	**23.01**	0.050	**8.65**	83.30	**0.00**
Sorghum	0.076	**5.71**	0.120	**6.80**	0.023	1.20	13.62	**0.00**
Maize	0.105	**19.22**	0.128	**19.42**	0.078	**10.74**	26.61	**0.00**

Source: Authors' calculations

8. Conclusions

We study cereal wholesale markets in the last decade (2001–2011) in Ethiopia. This topic is important for two reasons. First, cereals make up almost half of the expenditures of consumers in Ethiopia and about three-quarters of the area planted. Any price and market changes have thus important welfare and food security implications. Second, the explicit purpose of several government plans over the last decade[21] has been to stimulate agricultural market transformation and an evaluation of market changes is thus important to understand effectiveness of government programs. We look at the drivers of structural change during that period as well as changes in cereal price behavior. To do so, we rely on a unique wholesale market survey that was fielded in the beginning of 2012 and on monthly price data collected on these wholesale markets during this period by the EGTE.

Five drivers for change over that period are identified. First, economic growth has been substantial over the period, likely leading to income growth and different demands for food. As seen in other countries, richer people in Ethiopia consume more high-value products such as meat, dairy, and fruits and vegetables. They also shift away from cheaper cereals such as maize and sorghum to the more expensive ones, such as teff. Even within specific cereals, there can be significant differences in preferences, e.g. white teff is generally being preferred much more than red teff.

Second, urbanization has increased rapidly and it is estimated that, compared to the beginning of the decade, 3.7 million more people are living in urban settings. As urban people are much less likely to grow their own food, this implies that commercial surplus has increased significantly over the last ten years. Using some reasonable estimates on consumption, 67,000 additional truck loads (of 7.5 tons) or 670 full-time cereal trucks would yearly be needed to feed that additional population.

Third, the government has invested heavily to improve road infrastructure in the last decade. This has led to a reduction of travel times between wholesale markets by 20 percent.

[21] Such as the ALDI (Agricultural-Led DevelopmentIndustrialization) and PASDEP (A Plan for Accelerated and Sustained Development to End Poverty).

However, it seems that travel costs have even fallen further—as they dropped to half the costs of a decade ago—possibly driven by more competition and a shift to better and bigger trucks.

Fourth, cell phones are now universally being used by brokers and traders alike. While access to mobile phones started early on in Addis Ababa, it was later in rural areas and most of the wholesale markets got access to mobile phones in the middle of the decade. The access to mobile phone changed in important ways price transmission between traders, farmers, and brokers. More deals are also done on the phone and some traders now start bypassing wholesale markets as the center of trade. It is possible that the spread of mobile phones has also led to more entry into trade.

Fifth, the government has strongly supported the establishment of cooperatives in the last decade. At the end of the last decade, they were almost the sole providers of improved inputs in the country. However, while they have been successful in organizing farmers towards the commercialization of export crops such as coffee, they have been less successful in output markets of cereal crops (as is also often the case in other countries). Moreover, they seem to be over their peak and the shares of cooperatives in cereal wholesale markets have seemingly declined in the last couple of years.

It is anticipated that increasing urbanization, marketing by cooperatives, and income growth would lead to more quantities traded, economies of scale and thus lower margins overall. Access to better price information should lead to a more efficient marketing system, lowering margins overall. Changes in food preferences because of income growth might lead to higher quality premia if changes in the supply of quality products do not keep pace with changes in demand. This was tested by looking at price behavior in the last decade. Five price coefficients were looked at.

First, price levels of cereal prices have increased significantly in the second period of the decade. However, while nominal cereal price increased enormously over the studied decade, real prices at the end of the period were at the same level or a little bit above the level at the beginning of the decade. On the other hand, we see differential price changes for different regions, possibly driven by better connectivity over time.

Second, given the heavy dependence of cereal production on seasonal rainfall, cereal markets are also characterized by important seasonality. However, price seasonality is rather small on these markets and shows little changes over time. Quantities traded however change more drastically, dropping often in half in the lean period compared to peak periods.

Third, we find important but rather stable quality premia within cereals. Price premia of white cereals compared to mixed cereals vary between 8 percent and 15 percent nationally and are estimated to be higher in the capital city Addis Ababa, possibly reflecting the increased demand for these economically superior cereals there.

Fourth, spatial variation of prices between wholesale markets has decreased over time. Especially these cities that are located in the cereal deficit regions of the country (Gelan and Dinka 2006) have over time seen a relatively smaller increase in prices compared to the rest of the country. However, it is to be noted that there is still significant variability in the price differences between markets.

Fifth, retail and milling margins declined significantly. Comparing the first part of the decade with the second part, it is estimated that both margins dropped by half. The drop in milling margins is possibly driven by the more widespread availability of mills, as shown in the case of Addis Ababa.[22]

[22] There is no evidence that significant technological shifts or up-scaling has happened over the last decade.

While the better road conditions, the drop in transportation costs, and smaller spatial marketing margins are overall better for the efficiency of the functioning of an agricultural economy, there are however still winners and losers that can be identified from that change. The winners are the suppliers in major production zones as they receive on average higher prices while urban consumers in the big cities benefit from the lower prices. The losers might be those net consumers close to the supplying areas as they might now have to pay higher prices while producers of those crops close to the consuming areas are now facing lower prices. However, it is expected that overall the economy benefits from such marketing improvements as shown through different modeling exercises (e.g. Gardner 1975). Unfortunately, we do not have the data to show these effects.

The paper shows the apparent importance of roads and mobile phones in fostering closer integration of markets, to the benefits of producers as well as consumers. However, more innovative uses of phones could be envisaged, for example for financial service provision, as well as a stimulation towards a better penetration in rural areas, as mobile phone use in rural areas in Ethiopia is still one of the lowest in Africa.[23]

[23] The analysis in this paper points also to a number of areas for further research. First, the analysis is largely a description of changes in the structural characteristics of wholesale markets as well as in the performance of these markets as shown by price behavior over the last decade. Further analysis is planned on the identification of which drivers have had most influence on change and we will further evaluate the exact impact of road infrastructure, mobile technology, and cooperative development on price behavior through the use of multivariate regression analysis. Second, a weakness of the analysis is that we rely on recall questions of focus groups. Two types of errors can potentially be expected from such data: (1) the composition of the focus groups might not have been representative of all traders and (2) recall error. While we have done important efforts to reduce these errors through triangulation of information, that possibility can however not be completely ruled out. More attention should thus be paid to collection of other market data on top of prices. Third, to evaluate the presence of structural change, we rely on an ad hoc division in the middle of the period for which we have data, i.e. 2001–2005 and 2006–2011. Further tests can be done to allow for flexibility in this cut-off date.

Appendix

Appendix A.1—Literature review

We give below an overview of the different strands in that literature and the main findings coming out of it.

First, several authors have looked at trends and variability of food prices over time and have tried to explain these in light of price increases internationally and of local phenomena (Rashid and Assefa 2007). Jayne, Negassa, and Myers (1998), Dadi, Negassa, and Franzel (1992), and Negassa (1998) showed that margins at the end of the 90s had decreased substantially since market liberalization in the beginning of the 1990s. Rashid and Taffesse (2009) show that there is convergence of price over time but that the introduction of the Productive Safety Net Program (PSNP) is not a major driver of those. They argue that it is most likely caused by other factors, such as infrastructure improvements. Loening, Durevall, and Birru (2008) try to link food price inflation to several factors, including monetary explanations. Tadesse and Guttormsen (2011) show that temporal arbitrage in Ethiopia, which is the gross return from speculative storage, appears to be modest. Rashid and Assefa (2007) and Rashid (2010) further look at options that could reduce price variability in a country such as Ethiopia.

Second, other authors have looked at price integration of food crops in Ethiopia (Dercon 1995; Getnet, Verbeke, and Viaene 2005; Getnet 2007) and of transmission of prices from one crop to the other (Rashid 2011). The results mostly indicate that markets have become more integrated over time, often linked to policy reforms and improved infrastructure. Rashid (2011) finds that maize is most significant in exacerbating price variability with respect to the persistence of shocks, implying that focusing on maize, instead of wheat, will not only help better stabilize prices but also reduce costs of stabilization. Negassa and Myers (2007) and Negassa, Myers, and Gabre-Madhin (2004) show that grain marketing reforms seem generally to have had little effect on the spatial efficiency of Ethiopian grain markets.

Third, researchers have done studies of the cereal sector, looked at cereal value chains, and studied especially the role that intermediaries play in the build-up of market prices (Gabre-Madhin 2001a, 2001b; Dessalegn, Jayne, and Shaffer 1998). Gabre-Madhin (2001a) finds that brokers are very important in the functioning of the cereal markets in Ethiopia. They deliver a significant number of services (especially on search and aggregation functions) and farmers might or might not select to use them based on the type of services they deliver. Rashid and Negassa (2011) show that the performance of grain markets improved significantly over time.

Fourth, authors have looked at the effect of international prices and of food aid on local price trends (e.g. Tadesse and Shively 2009). A major finding is that if not well targeted in time, food aid might lead to important disincentives for local production and it is shown to have been an important issue in Ethiopia. Food aid shipments that constitute less than 10 percent of domestic production appear to be benign, but shipments above this level show signs of being disruptive to local markets. Rashid (2010) and Dorosh and Ahmed (2009) find that cereals were mostly within acceptable range for non-tradables and were imported when prices were reaching higher levels than import parity, except in the period when Ethiopia was characterized by significant foreign exchange problems at the end of the first decade of the 2000s. Rashid, Assefa, and Ayele (2006) further illustrate a number of distortions in the food system in Ethiopia.

Fifth, research has also been done on the impact of food price increases on the poor. While the general perception is that these are generally bad for the poorest (Ulimwengu, Workneh,

and Paulus 2009; Tefera, Rashid, and Taffesse 2009; Klugman and Loening 2007), these results have been challenged by Ticci (2011). Bellemare, Barrett, and Just (2011) show that the welfare gains from eliminating price fluctuations would especially be concentrated in the upper tail of the income distribution. Tefera, Rashid, and Taffesse (2009) argue that the short-run distributional effects more likely benefit surplus producers and net sellers whereas adversely affect the majority of net buyer smallholders with low income.

Finally, authors have looked at different institutional set-ups that might improve price realization at the producer level. Several authors have looked in particular at how cooperatives and farmers' organizations might help farmers obtain better prices. For example, Bernard et al. (2010) and Bernard and Spielman (2009) find that it is especially the mid-level level farmers that are able to obtain better prices by being member of a cooperative. Francesconi and Heering (2010) show that cooperatives might especially be useful in situations where commodity exchange are functional, such as in Ethiopia.

Appendix A.2—Set-up of focus groups in different wholesale markets

MKT CODE	Market Name	Sections of the questionnaire					
		Section 1. GENERAL	Section 2. MAIZE	Section 3. SORGHUM	Section 4. TEFF	Section 5. WHEAT	Section 6. BARLEY
1	Addis Ababa	YES	YES	YES	YES	YES	YES
2	Adet	YES	NO	NO	YES	NO	NO
3	Ajie	YES	YES	NO	NO	NO	NO
4	Alaba	YES	YES	NO	NO	NO	NO
5	Ambo	YES	NO	NO	YES	NO	NO
6	Arsi Negele	YES	NO	NO	NO	YES	NO
7	Assela	YES	NO	NO	YES	YES	YES
8	Bahir Dar	YES	YES	NO	YES	NO	NO
9	Bale Robe	YES	YES	NO	YES	YES	NO
10	Bedele	YES	YES	NO	NO	NO	NO
11	Bichena / Bitche	YES	NO	NO	YES	NO	NO
12	Chagni	YES	YES	NO	NO	NO	NO
13	Dangila	YES	NO	NO	YES	NO	NO
14	Debre Birhan	YES	YES	YES	YES	YES	YES
15	Debre Markos	YES	YES	NO	YES	YES	NO
16	Debre Zeit	YES	YES	NO	YES	YES	NO
17	Dejen	YES	NO	NO	YES	NO	NO
18	Dessie	YES	NO	YES	YES	NO	NO
19	Dire Dawa	YES	YES	YES	YES	YES	YES
20	Eteye	YES	NO	NO	NO	YES	NO
21	Gondar	YES	YES	NO	YES	YES	YES
22	Hosaena	YES	NO	NO	YES	YES	NO
23	Jiga	YES	NO	NO	YES	NO	NO
24	Jimma	YES	YES	NO	YES	YES	YES
25	Maksegnit	YES	NO	NO	YES	NO	NO
26	Mekelle	YES	YES	YES	YES	YES	NO
27	Nazreth	YES	YES	NO	YES	YES	NO
28	Nekemte	YES	YES	NO	YES	YES	NO
29	Sashemene	YES	YES	NO	YES	YES	NO
30	Woliso	YES	YES	NO	YES	NO	NO
31	Ziway	YES	YES	NO	YES	NO	NO

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