Inflation in Ethiopia: Supply-side drivers

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- This brief explores several dimensions of supply-side drivers of food inflation in Ethiopia. Given the persistence of food inflation in macroeconomic analysis, managing inflationary expectations through effective communication of the country's macroeconomic policy stance and its adjustments is critical.
- On the supply side, marketable surplus of grain has not kept up with the increase in demand and production. Increasing imports in the short-term and production in the medium-term is key.
- Recent analysis of several food supply chains (teff, dairy, vegetables) shows they are more efficient than anticipated, with farmers receiving a relatively high share of urban prices (and less for middlemen than commonly assumed).
- Facilitating supply chain development in fruits and vegetables can support the seasonal increase in high-value food items. Rationalising location and seasonality of the urban distribution infrastructure could decrease transaction costs at the retail level.
- The growing telecom network can be leveraged to make it easier to share real-time market data among farmers to reduce monopoly power and, hence, the margin between farmgate and market prices.
- Geographic price dispersion has been increasing in line with inflation. Maintaining improved transport to increase integration and decrease dispersion is critical.

POLICY BRIEF ETH-21091

AUGUST 2022

This project was funded by IGC Ethiopia
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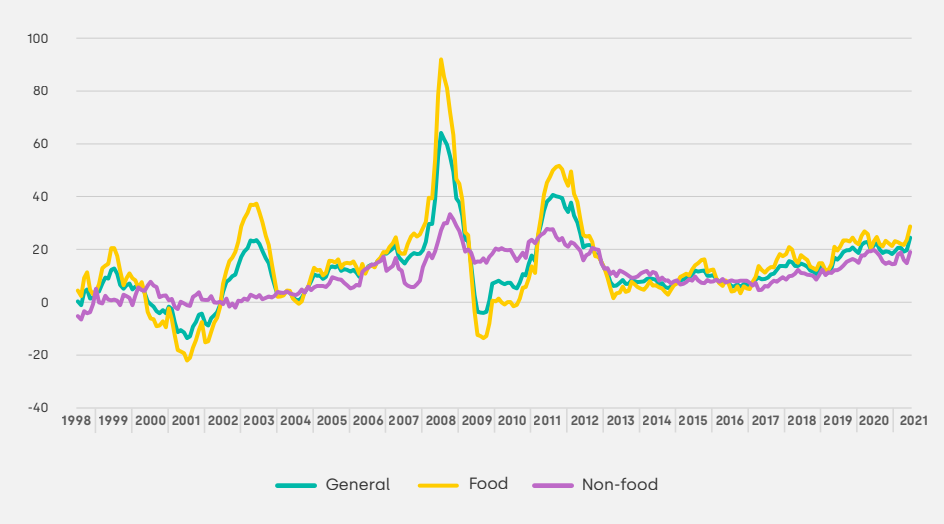
Overview

Since its unprecedented rise in 2006, inflation in Ethiopia has been a subject of macroeconomic policy. Over the past two decades, we have seen three episodes of high inflation. Ethiopia experienced drought in 2002/03 which led to high food inflation, and in turn meant high general inflation given the substantive weight of food in household expenditure. In 2007/08 and 2011/12, studies show that a combination of global food prices and demand-led growth policies explained the sharp rise in food price that drove overall inflation. Since early 2017, general inflation has witnessed a persistent upward trend, reaching 33% in June 2022. An IGC-funded research project took a macroeconomic approach to understanding drivers of recent trends. The research noted persistence in food inflation. Hence, to manage inflationary expectations and mitigate against this, it will be critical for authorities to clearly communicate the macroeconomic policy stance and any adjustments. While demand-side factors anchor core inflation, the analysis also found that supply-side factors including yield variability and international price arbitrage play a major role in determining domestic food inflation[1].

Figure 1: Inflation has become increasingly challenging in recent years



Source: Central Statistical Agency

This and other concerns have raised questions surrounding the food market and drivers of food inflation. Hence, detailed research was carried out on several dimensions of supply side drivers of food inflation in Ethiopia:

1. Marketable surplus in grains;
2. Value chains notably for high-value food items;
3. Regional price dispersion;
4. Regional market integration within Ethiopia; and
5. Disruptive events.

1 Adam, Beyene and Gebrewolde, Drivers of Inflation in Ethiopia 2000-2020, January 2021

The key findings are summarised below along with policy implications for short-, medium-, and long-term[2].

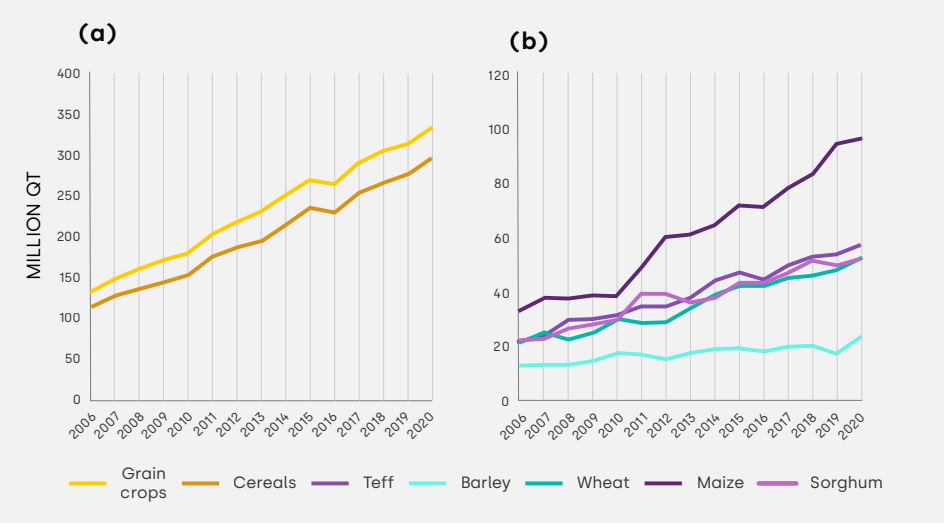
1. Marketable surplus and food prices

According to the Agricultural Sample Survey conducted by the Central Statistics Services of Ethiopia, cereals constitute about 81% of Ethiopia's total grain crop area and more than 88% of total grain production. Teff (24% of total grain area), maize (19%), sorghum (14%), wheat (14%), and barley (6%) are by far the most important staple crops in the country. Production of each of the aforementioned grain crops and cereals has increased by more than 150% over the last decade and a half (2006-2020).

During the same period, production of the major staples also grew considerably with teff (165%), maize (189%), sorghum (142%), and wheat (140%) experiencing more than double growth while production of barley grew by 87%. Similarly, pulses (136%), oilseeds (73%), vegetables (95%), and root crops (281%) also exhibited substantial growth during the same period (not shown in Figure 2).

While these are all impressive growth rates, these rates become less dramatic if we scale them by cumulative growth in population. During the same period, population grew by 46% -- from 78 million in 2006 to about 115 million in 2020 (World Bank, 2021).

Figure 2: Grain production has grown considerably between 2006-2020



Source: Based on CSA's AgSS data (2006-2020)

Despite the increased production over the 2006-2020 period, the largest share of production is still auto-consumed by the smallholder producers that account for about 95% of overall grain production in Ethiopia. Over the 2009, 2015, and 2020 period, 66% of cereal production is auto-consumed with no change over the period. Farmers seem to take a relatively small proportion (16-18%) of what they produce to the market

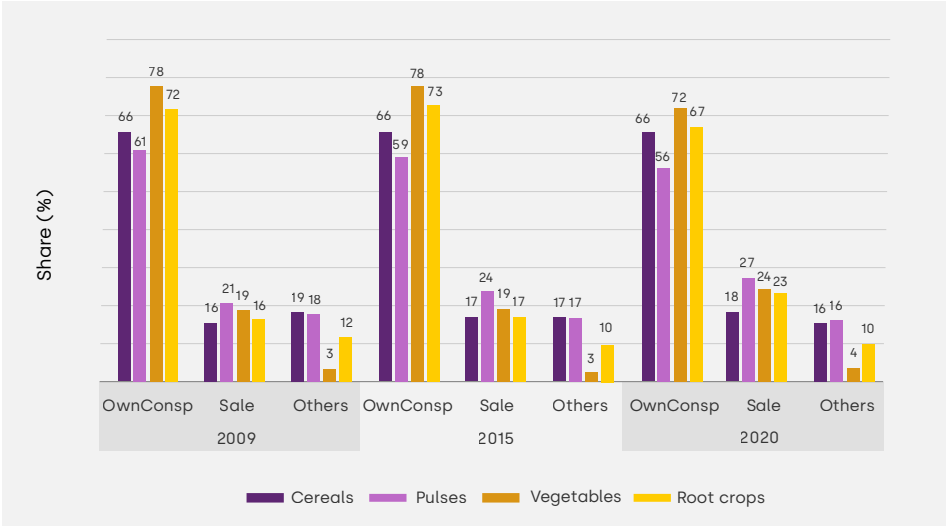
2 Beyene et. al., Supply Side Price Drivers Analysis – Summary, October 2021

with the remaining proportion utilised for other purposes (e.g., seed, in-kind wage, and animal feed).

While marketable surplus increased overtime in absolute terms, the share of marketable surplus for the major staples has showed little change. In 2020, only 30% of what is produced was marketed in the case of teff, 22% for wheat, 13% for maize, 16% for barley, and 14% for sorghum (see Figure 3b).

Figure 3: Biggest share of production is auto-consumed, and marketable surplus (sale) share remained small and flat

(a)



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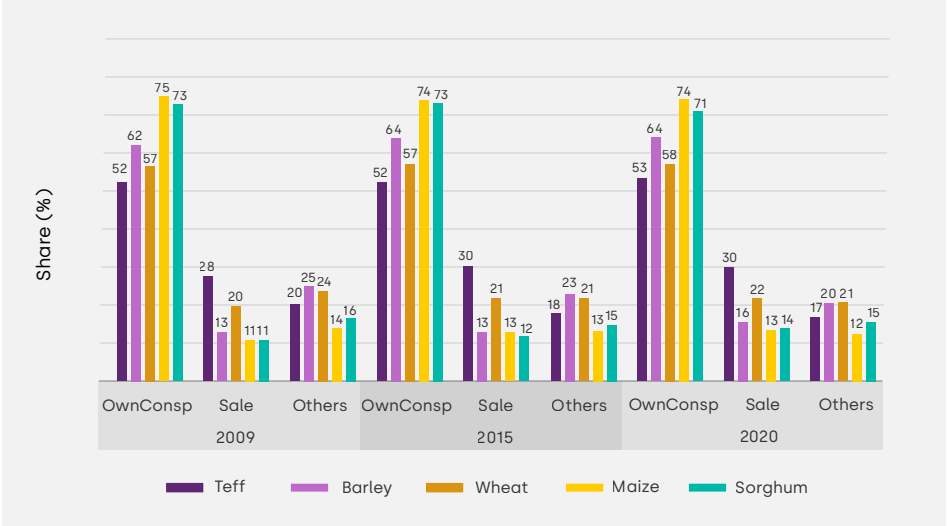


Source: Based on CSA's crop utilization data (2009-2020)

More recently, massive amounts of food items were imported to close the gap between production and demand. In 2020/21, cereal imports were $1.34 billion , 59% higher than the imports in 2019/20, and imports of 'other foods' such as cooking oil in 2020/21 reached $843 million, 56% higher than the previous year.

In 2020/21, the government initiated a programme aimed at substituting wheat imports with domestic production within three years. In the first

year (2020/21), the government has largely been able to increase the share of land under irrigation beyond 'Meher' (the major production season) and produced 15 million quintals of wheat. Nonetheless, the lack of an increase in marketable surplus from smallholder production has been an important supply-side factor for food inflation.

Policy implications

- Increasing imports in the short-term and production in the medium-term is key. Government efforts regarding wheat imports will continue to have important short-term effects, as will the role of price considerations in strategic grain reserve policy. For the medium- and long-term, commercial investment in food production might be the way forward.

- Other studies have identified a number of steps that could be taken to increase commercial food production which would be by and large marketable surplus with the exception of supply for seeds.

- Productivity of arable land and support for the rural economy can also increase marketable surplus in the medium-term. Other studies have identified projects and policies aimed at enhancing productivity of arable land that could be accelerated.

- To further address the stagnant marketable surplus in the long-term, rural population growth needs to be examined. A major factor preventing smallholder producers from marketing more of their grain production is growth in the rural household population. Despite a commendable effort in expanding family planning services, rural fertility rates remain high, thereby putting pressure on both rural and urban populations through migration.

2. Supply chains

Within food inflation, a subset of high-value food items has seen a higher price increase than traditional grains. Preliminary results indicate that high-value food items such as fruits, vegetables, and animal-sourced foods such as meat and dairy have high income elasticity, changing the composition of food expenditure from grains towards a higher share for those high-value items. Within grains, food expenditure has been shifting towards higher value types such as for teff. This would explain some of the higher price increases in these high-value food items.

These price increases would be expected to be transitory as supply chains develop, and supply expands to meet the increased demand. Identifying the policy agenda that accelerates the development of efficient supply chains is important, both upstream at the production level and downstream at the marketing and distribution level.

Research to date on select value chains has shown variance in degree of efficiency at the downstream level. For several commodities including teff and dairy, the supply chain is more efficient than expected, including the role of middlemen. This is an important finding given the blame often placed on traders and brokers. For example, for the teff

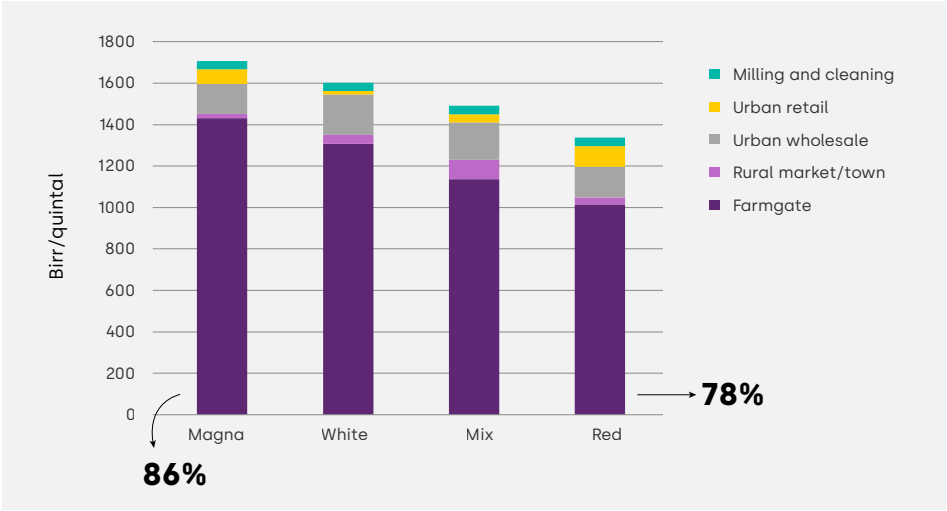
supply chain from the major teff-producing areas to Addis Ababa, the number of middlemen is relatively small: in 85% of the cases, there are only two actors between rural producers and urban retailers, and in 32% of the cases, even less with urban retailers directly procuring from rural areas (Minten et al., 2016).

For fresh milk, the role of middlemen is minimal as 60% of urban retailers directly purchase from rural producers and/or their own farms. In 30% of the cases, the value chain involves only one middleman and about 10% involve two middlemen. This is a sign of a well-functioning value chain. However, the pasteurized milk value chain is longer (Minten et al., 2020).

In the value chains researched, rural farmers receive a relatively high share of retail prices in urban areas, again contrary to conventional wisdom. Minten et al. (2016) show that rural teff farmers receive 78% in the case of red teff and 86% in the case of 'magna', with middlemen receiving a small share of final price. The study also provides evidence that few farmers (about 10%) now engage in distress sale. The majority of the farmers pile up postharvest (November-March) and rather smoothly release their stock (see Figure 4).

Figure 4: High share of farmgate price and less distress sale

(a)



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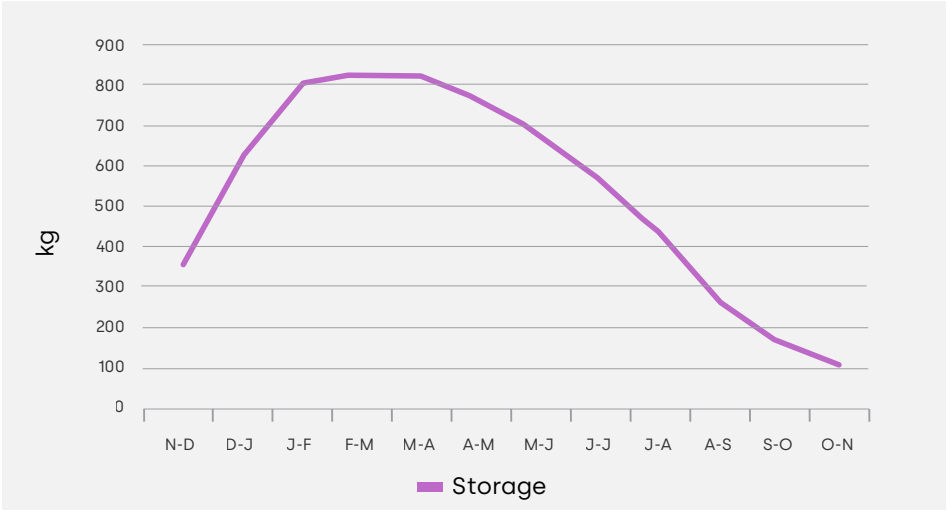


Source: Minten et al., 2016

Likewise, for vegetables, the gross margins at wholesale level are generally small relative to farm gate prices and to the gross margins in the urban retail sector (ranging from near zero for green peppers to 14% for onions). Figure 5 presents vegetable price structure before and during the pandemic, by vegetable type. The figure shows marketing margins at different stages of the value chain as percentages of the final retail price. Strikingly, the observed changes in retail (consumer) prices during the pandemic are largely driven by increases or decreases in farm gate prices and not by wholesale or retail cost margins. It seems then that the various disruptions associated with the pandemic have not led to substantial increases in marketing margins (Hirvonen et al., 2021). Rather increases in consumer prices in Addis may have stemmed from an increased reliance on more costly vegetables produced in the Central Rift Valley due to reductions in both international trade (e.g., onions from Sudan) and domestic trade between the Oromia and Amhara region.

What appears to increase the retail margins is the location of the wholesale markets relative to producing areas. For example, roughly three-quarters of vegetables are produced in the Rift Valley where the current Addis market is conveniently located. However, the other quarter of vegetables coming from the north have additional transport costs to reach that wholesale market. Loading charges are also a factor, at times comparable to the total transport cost. Further analysis could be done to ascertain whether another wholesale facility (seasonally adjusted) could be located in the northern part of Addis. It also will be important to consult with the retailers in making market location decisions to have a more comprehensive understanding of their incentives and increase the likelihood that retailers will avail themselves of the new markets.

Figure 5: Vegetable value chain marketing margins as a percentage of final retail price, by vegetable type

Source: Hirvonen et al., 2021

Policy implications:

- Downstream/supply chains for high-value food items can be improved through policy action. In particular, rationalising the urban distribution infrastructure could result in decreased transaction costs at retail level.

- There may be scope for rethinking policy on loading and reloading mandates. The expected increased access to and lower price of mobile phone services as part of telecom reforms provide an opportunity to markedly increase farmers' access to price information, thereby strengthening their bargaining position vis-à-vis traders, as well as retailers' ability to shorten the supply chain.

- Nonetheless, the share of high-value food items in the price index remains relatively small. In total, high-value vegetables (tomato, onion, green pepper, cabbage, lettuce, spinach) and fruits total 4%, 2%, and 3% in Addis, Amhara, and Oromia, respectively.

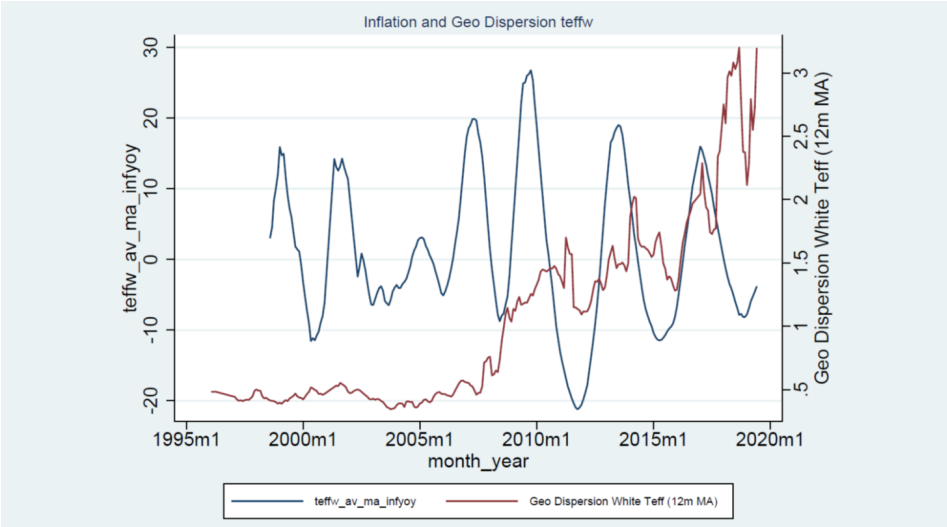
3. Regional food price dispersion and market integration within Ethiopia

Commodity prices can differ from one place to another for various reasons. In addition to the cost of getting goods from one place to another and income factors, some studies consider inflation as a factor that affects price dispersion dynamically. Hence, we characterise the relationship between geographic price dispersion and respective inflation rates for selected food crops in Ethiopia. As food inflation drives overall inflation, the two major food categories are bread and cereals, and fruits and vegetables with the bread and cereals category having a higher household expenditure share.

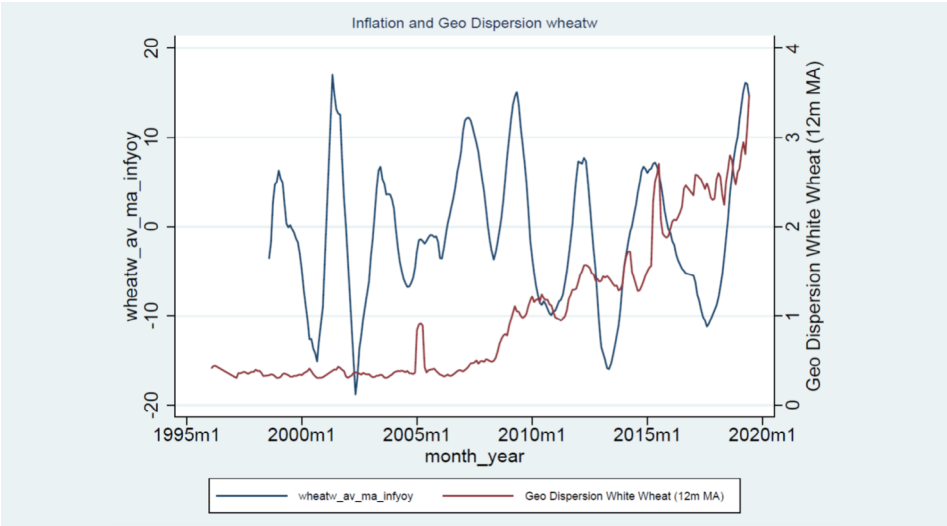
Figure 6 presents trends in inflation and price dispersion for teff, wheat, maize and sorghum. Teff prices mainly follow general food inflation trends ending at around 10% in September 2020 while wheat showcased high inflationary trends ending at around 32% in September 2020. Towards the end of the time series, we see a sharp increase in geographic price dispersion reaching above three standard deviations. This can be due to geographic factors that caused friction in price integration. This is exemplified by the stronger relationship between inflation and dispersion in the post-2015 period. Table 1 indicates that the correlation between inflation and price dispersion was more than double compared to the period before 2015.

Figure 6: Notable differences in the recent episode of price inflation from the other episodes in 2008 and 2011 for selected crops

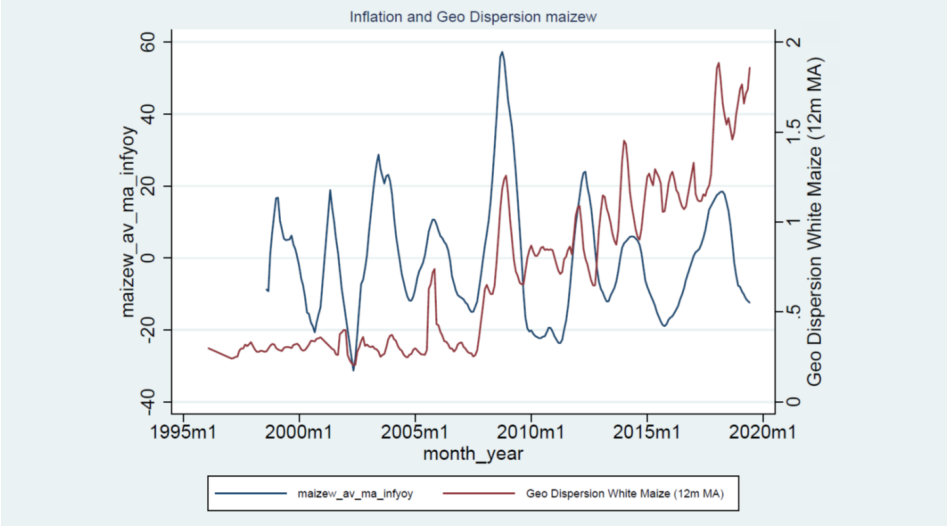
Teff



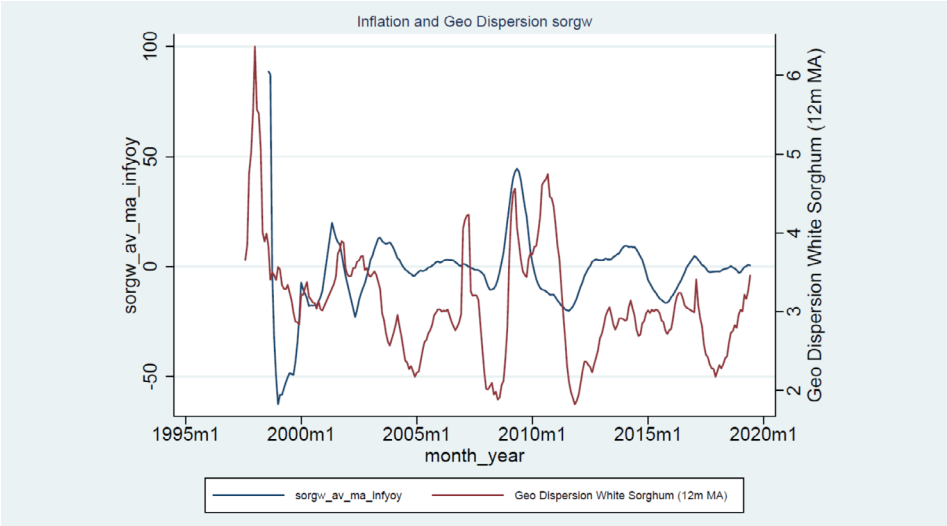
Wheat



Maize



Sorghum



Source: Retail price and own computation

Table 1 also confirms that for most of the major crops, inflation and price dispersion are positively correlated in similar vein to what has been documented in the literature. In particular, the correlations show positive trends in the post 2015 period. Although it is difficult to surmise that price dispersions directly affect inflation, one hypothesis is that factors that disproportionately affect different regions (such as transport and logistics conditions) are accountable for variations in both inflation and price dispersions. However, data on time and geographic price determinants like income, transportation cost, and other variables are not available for the geographic level and time series price data that we are analysing.

Table 1: Correlation between inflation and dispersion for selected crops

	Nominal Prices		Real Prices	
Crops	**Before 2015**	**After 2015**	**Before 2015**	**After 2015**
Teff White	0.168	0.266	0.0089	0.0071
Teff Mixed	0.219	0.448	0.0458	0.1564
Teff Black	0.198	0.611	0.0917	0.2906
Wheat White	0.179	0.375	0.1017	0.2483
Wheat Red	0.315	0.619	0.0516	0.4302
Wheat Mixed	0.344		0.0366	
Maize White	0.301	0.52	0.1768	0.383
Barley White	0.273	0.622	0.1705	0.1131
Barley Mixed	0.33	0.647	0.2066	0.077
Sorghum Yellow	0.274	0.867	0.3378	0.5862
Average	**0.253**	**0.563**	**0.1228**	**0.254656**

Source: Retail prices and own computation

4. Food market integration

By indirectly measuring transactions costs, we also explore trends in market integration across different markets within Ethiopia in recent years.

For this study, we primarily used wholesale-level price data of the Ethiopian Grain Trade Enterprise (EGTE). The data is organised monthly, running from July 2001 to March 2020. We focused on the major staple crops: three types of teff (white, mixed, and red), white wheat, and maize[3].

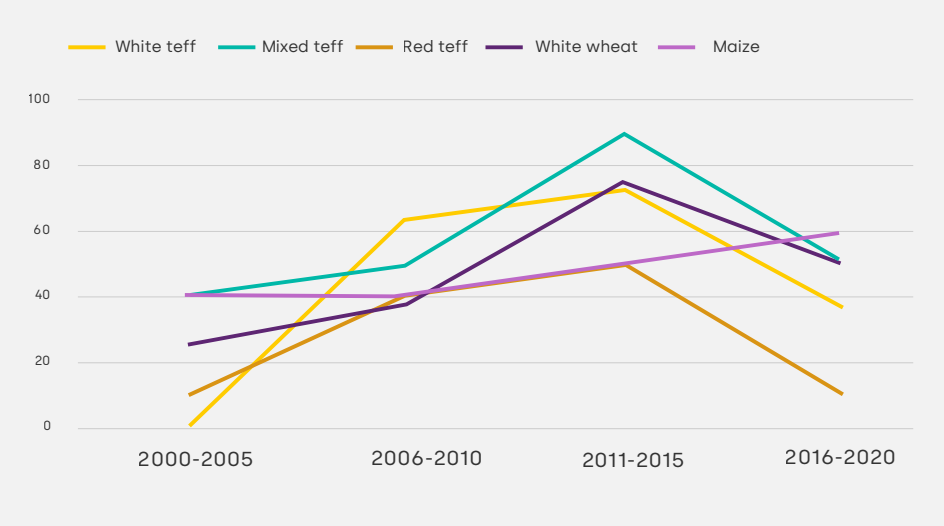
One dimension is whether there is a price transmission between the traditional clearing hub (Addis Ababa market) and select regional markets between July 2001 and March 2020. The number of markets paired with Addis Ababa varies between 8 (white wheat) to 11 (white teff)[4]. For a reasonable analysis, we categorised the markets into the following three: surplus (crop-wise, amongst top-5 producing area), deficit (crop-specific low-producing area), and major hubs (non-deficit and big/secondary towns). About 50% of the selected markets are from the surplus areas, about 20% from deficit areas while the remaining represent major hub areas.

To measure the extent of market integration, we used a modified version of the Threshold Autoregressive (TAR) Model[5] as is used in Van Campenhout (2007). Markets would be integrated if price differences are fully explained by transaction costs of moving grains between one market and the other. In the absence of transaction cost data, this model allows us to estimate market integration using only available price data by introducing dynamics of the arbitrage process underlying interconnected markets (making assumptions regarding traders' arbitrage process and speed of adjustment over time) and measuring extent to which prices move back into a given threshold band. A major caveat is that the model cannot capture changes in transaction costs over time.

Relying on the TAR model, Figure 7 below presents a summary of spatial market integration between Addis Ababa and regional markets. The analysis is performed for four periods: 2000-2005, 2006-2010, 2011-2015, and 2016-2020. For each of the four periods, the figure displays the proportion of regional markets that are found to be integrated with Addis Ababa. Between 2000 and 2015, estimates show that more and more regional markets have been integrated with Addis Ababa. However, since 2015, except for maize markets, regional markets for the other staples seem to have become less integrated with the capital city.

3 Results for white barley and white sorghum can be accessed upon request
4 The markets were selected based on two criteria: (i), markets with relatively more number of observations -i.e., 10 percent or less missing values, and (ii), based on a test of stationarity.
5 More detailed descriptions on the model and on alternative models can be found in Van Campenhout (2007)

Figure 7: Regional markets have been increasingly integrated with Addis Ababa up to 2015

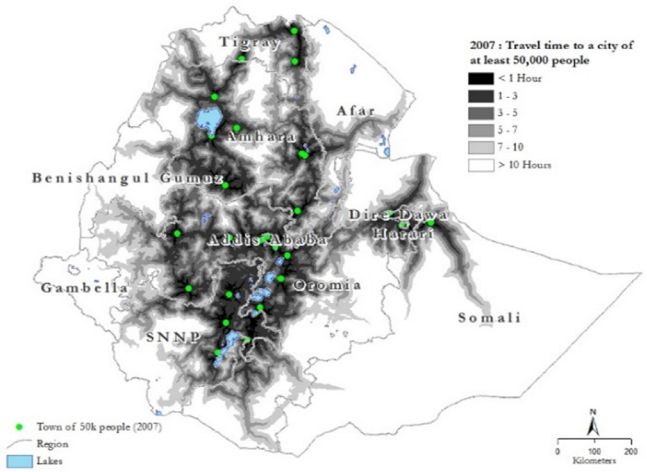


Source: TAR estimates based on EGTE's data

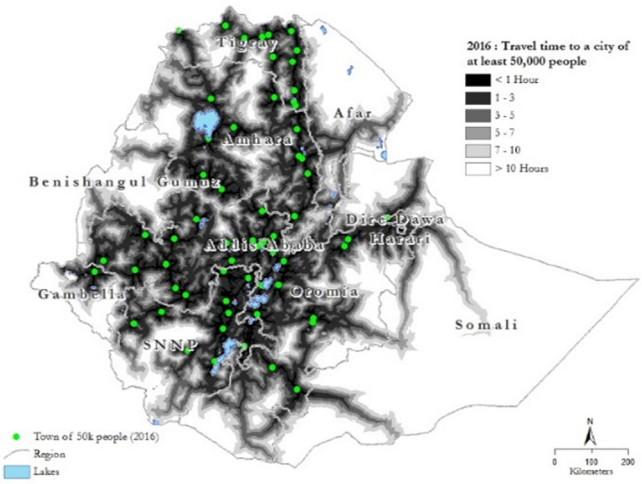
One possible explanation for the decline in market integration between the regional markets and Addis Ababa could be the recent considerable improvement in road infrastructure between regional towns/cities. Up until recently, Ethiopia had seen massive road infrastructural improvements based on radial configuration (Addis Ababa as a focal point). With better access to roads (asphalted or all-weather roads) and rapid urbanisation of regional towns/cities, trade among these regional markets might have increased in lieu of going through Addis Ababa, a market that has traditionally been the major clearing hub (see Figure 8 below). This has yet to be empirically examined.

Figure 8: Rapid infrastructural improvements might have affected spatial market integration

2007



2016



Source: IFPRI GIS

Policy implication

- It will be critical to maintain improved transport infrastructure which presumably increased integration and decreased dispersion. However, more analysis of recent trends including integration among regional markets is needed before being more definitive on the role of trunk vs regional infrastructure.

5. Disruptive events

Another possible explanation for the pause in regional integration of grain markets could be the role that nationwide political events (roadblocks, demonstrations, civil unrest, etc.) may have played in spatial market integration. In recent years, events like political instability, armed conflict, and violent protests have become common and they are expected to affect food prices through the supply chain. Ethiopia faced significant escalation in the number of incidents representing political instability especially since 2015/16. The number of incidents considered in this study increased from 9 incidents in 2010 to 237 in 2018. This started with continuous protests in the Oromia region dubbed the 'Oromo Protests'. This eventually led to the resignation of Prime Minister Hailemariam Desalegn and the coming to power of Prime Minister Abiy Ahmed, ushering a period of political and economic reforms.

Significant number of the events have continued to occur during the transition and until recently, with the situation being aggravated by the eruption of armed conflict in the Tigray region that led to significant damages in Tigray and neighbouring regions. The impact of political instability, in the form of different types of unrests, on prices needs to be investigated, especially in the context of supply-side analysis since unrests tend to be localised with significant implications for food supply.

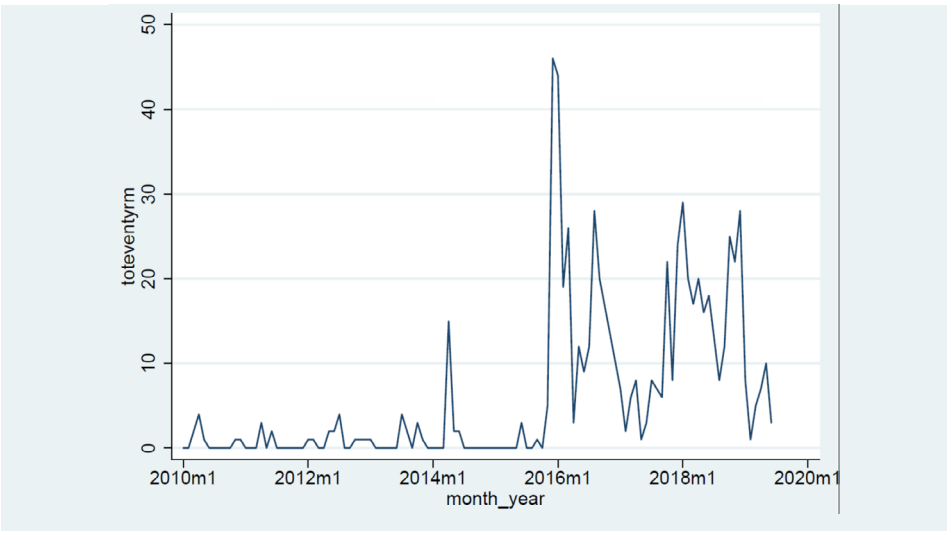
We document the number and characteristics of political incidents that have occurred over the past 10 years and conduct analysis relating to prices at the zonal level for various food products in the consumer price

baskets. We conduct a descriptive analysis and use impact evaluation methodology – a difference-in-difference estimation to assess the impact of incidents on prices. The following indicates the definition and source of data focussing on event measurement. We then follow with the descriptive analysis and the preliminary results of a difference-in-difference estimate of the impact of events on prices.

Using event data from Armed Conflict Location & Event Data (ACLED)[6] and production and price data at zonal level we can observe link between events and inflation. ACLED currently categorised six types of events and twenty-five types of sub-events, both violent and non-violent, that may occur during a period of political violence and disorder. According to data from ACLED, the top three event types are peaceful protest (32.5%), armed clash (19.5%), and attack (14.9%). Excessive force against protestors accounts for 9%, violent demonstration 7.8%, mob violence 4.5%, and protest with intervention 3.9%. The percentages for the remaining events are insignificant, nearly close to 1%.

For this study, we aggregate events that we assume had escalated enough to cause disruptions. These include armed conflicts (19.5% of total), peaceful protests (32.5%), attacks, excess force against protesters (9%), violent demonstration (7.8%), protests with interventions (3.9%), mob violence, and looting and destruction, representing the bulk of total incidents. Accordingly, total number of incidents increased from 9 in 2010 to a high of 237 in 2018. It is important to note that in this analysis, we are looking at the number of incidents and not the duration. The duration of the events can further affect an incident's impact on disruptions that lead to price instability but data is unavailable. In addition, the data does not indicate the intensity of disruption, particularly on economic institutions, and thus for this study we assume that incidents affect prices equally. We try to account for intensity using different incidents. Figure 9 shows trends in the number of events. Number of incidents had a peak of around 45 in a month in 2016, but in general show elevated number of events through up until 2019.

Figure 9: Trend in number of political incidents (2010-2019)

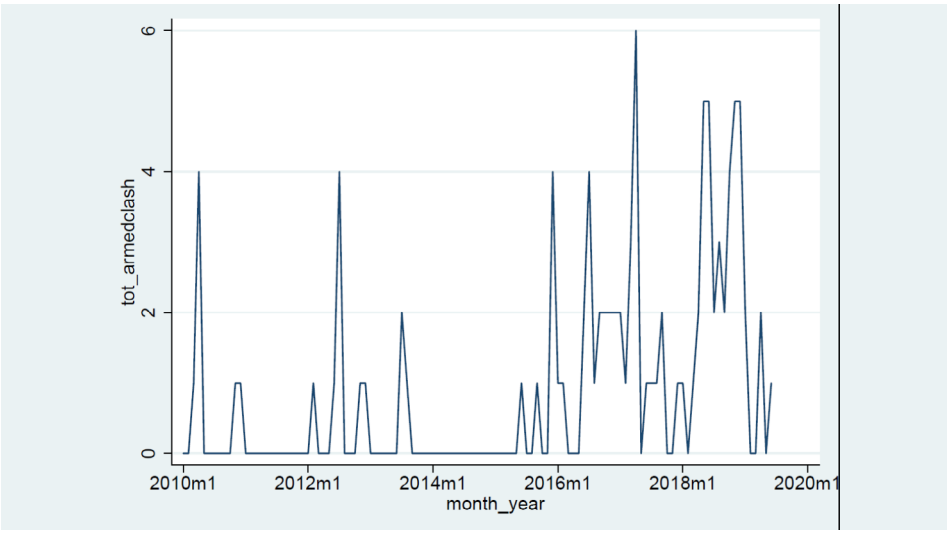


Source: ACLED and authors own computation

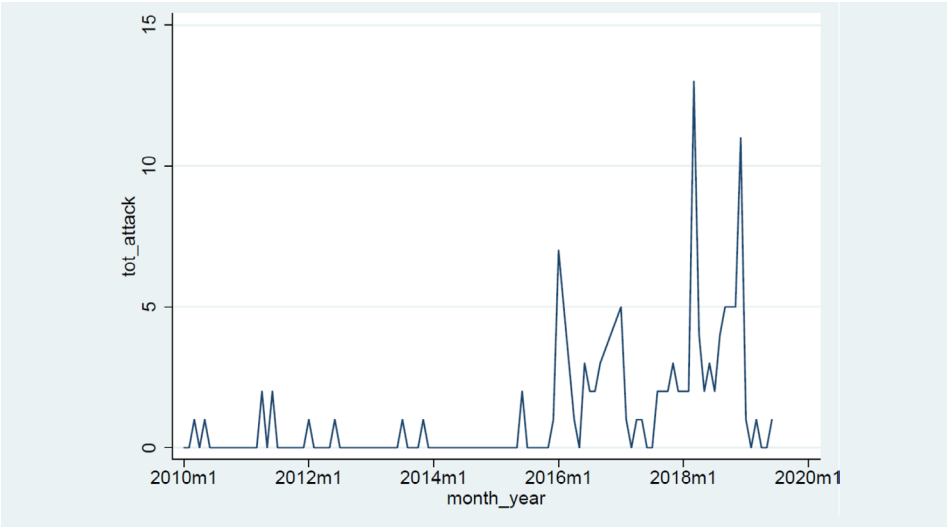
6 Data Export Tool | ACLED (acleddata.com)

Figure 10: Number of events by category (2010-2019)

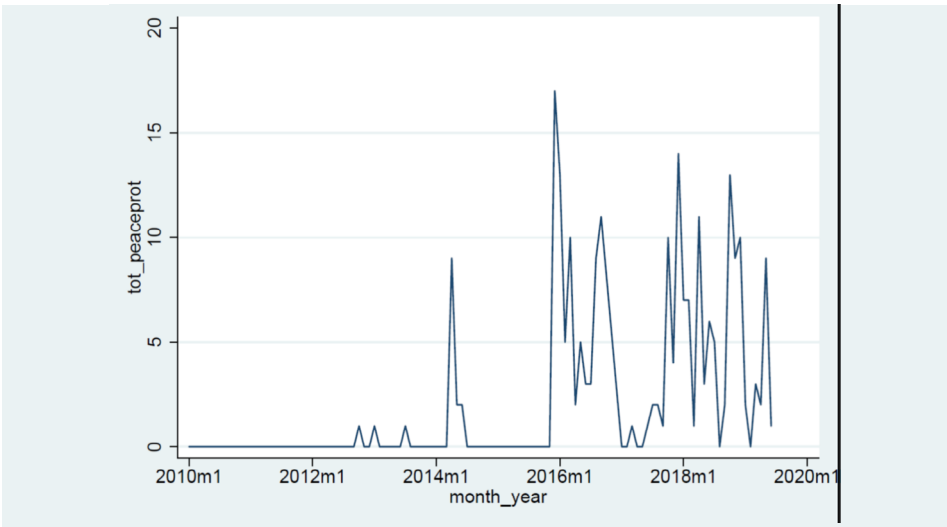
Armed clash



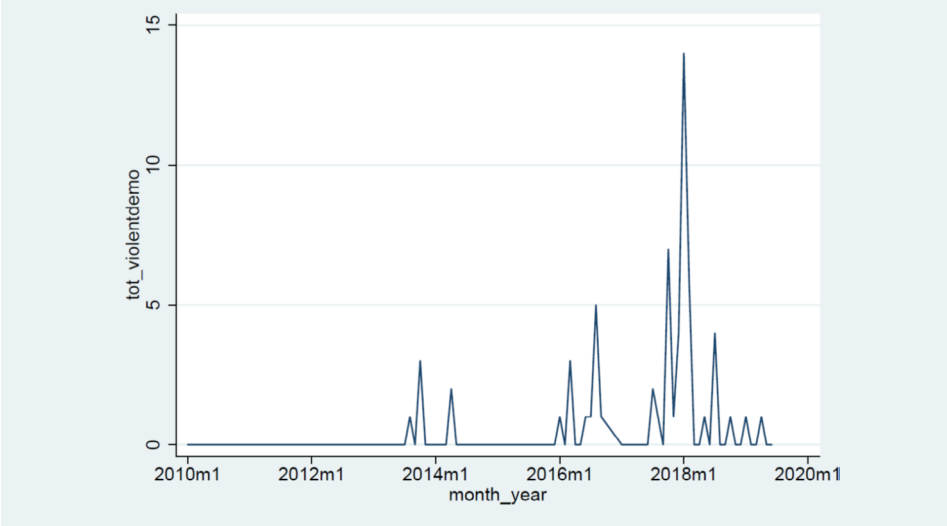
Attack



Peaceful protest



Violent demonstration



Source: ACLED and authors own computation

We can see that the incidents show significant escalation in the post-2015 period due to the protests and transition, although the number declines in 2019 with relative stability despite still remaining high. The majority of incidents are peaceful protests. These are peaceful in general but can signal instability, which may disrupt prices. Attacks followed by armed clashes and violent demonstrations may follow with, as expected, more serious consequences on prices. In areas with these events, it is expected that there will be transport disruptions making it difficult to get food items to the market. In addition, consumers tend to purchase more in anticipation of shortages when there are political events. Therefore, events affect both the supply and demand sides.

Policy implications

- Macroeconomic policymakers should monitor inflation in a disaggregated way. Surprisingly, events in select regions of the country appear to exacerbate inflation in rest of the country rather than in the source zone when events are in surplus regions. It would be helpful to isolate those local inflationary developments and how they link to the broader economy through the transport and marketing of production surpluses.

- As noted above, markets for traditional grains – the bulk of the food consumption basket – have integrated over time. This highlights the importance of trying to mitigate such kinds of events, whether in the political, securityor economic sphere. This could include minimising disruptions along supply routes, notably when events are in net producer areas, and improving broad-based dialogue and communication to preserve confidence in the state's capacity to secure economic activity.