

Intraregional and Interregional Price Transmission in Ethiopia's Staple Food Market: Evidence from Asymmetric Vector Error Correction Modeling

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Abstract
This study is undertaken to find out the presence short and long run relationship among producer and consumer prices and analyze the asymmetric nature of price transmission in staple food cereals namely: Teff, Wheat, and Maize in Ethiopia. Twenty years monthly producer and consumer price data were used in the analysis. Central Statistical Agency of Ethiopia was the primary sources of the data and it was collected from representative zones of three regional states and one city administrations of the country. Results from Asymmetric Vector Error correction model revealed that there are both short and long run two way price transmissions in consumer and producer prices. It is proved that there is asymmetric price transmission from consumer to producer in all sampled regions. But the speed and magnitude in producer price is much pronounced than the consumer prices that supports upward stickiness of producer prices because of asymmetric price transmission. The implication is that price shock in one region affects another region regardless of their differences. Therefore, price stabilization policies during time of disaster and food shortage in different regions need to consider unaffected regions in the country. More importantly, producers are found to be victims of price decreases but not beneficiaries of an increasing price. Therefore, an intervention trough availing market information instantly helps to prevent upward stickiness of producer prices in agricultural products.
Keywords: Price transmission, Staple food, agriculture

1. Introduction

Agriculture is the principal driver of Ethiopian economy. About eighty four percent of the population directly depends on this sector. It comprises 39 percent of the Gross Domestic Product (GDP), about 80 percent of total export values, and receives 15-17 percent of government expenditure each year (CSA, 2014, MoFED, 2014).
Of the total agricultural production, cereal production and marketing plays quite a significant role in Ethiopian economy. Specifically, it caters for 60 percent employment among the rural households, 80 percent of total cultivated land, more than 40 percent of a typical household's food expenditure, and more than 60 percent of total caloric intake (on average 1858 kilocalories/day). Moreover, 65 percent of the contribution of agriculture to GDP comes from cereals (Rashid and Asfaw, 2013). Hence a shock in this sector is expected to have significant economic wide effects. Prices are the signals and final revelation of shocks either they are natural or policy born.

Because cereals are the largest sub-sector within Ethiopia's agriculture, all the three regimes in the past half a century focused on stabilizing this sector regardless of their ideological and political system differences. The monarchic regime instituted grain marketing board, where output prices were mainly determined by marketing forces. The command economic policy regime (1974-1991) reframed the grain marketing board in to Agricultural Marketing Corporation (AMC) and its scope was expanded to control and administer the supply and pricing policies in the major staple food markets. The current government implemented substantial reforms including market liberalization of the market and privatization of large scale state farms. However, interventions at times of emergency as a result of drought, flood or unprecedented high food prices has been maintained (Rashid, 2010).

Of the total cereal production in Ethiopia, Maize, Wheat, and Teff account 53.9 percent of the daily calorie consumption of households. Specifically, Maize 20.6, Wheat 19.6 and Teff 13.7 are the average percentage share in the kilocalorie basket of daily consumption per household (CSA, 2014). These percentage shares imply that Maize is the first in terms of calorie intake followed by Wheat and finally Teff. These figures are in line with the consumption pattern of Ethiopians; meaning that Teff is the most expensive out of the three and hence being preferred by relatively high income consumers. Since these types of consumers are mostly reside in urban areas where only 15 percept of the population reside. On the other hand, Maize is the cheapest and is likely being consumed by relatively low income consumers those are majorities and reside in the rural area. Generally, the three cereals are the most important crops in the consumption basket of both rural and urban dweller. Hence the

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focus of the study is on these economically significant agricultural produces.

Special and co-temporal integration of producer and consumer prices of Ethiopian's cereal market exhibited remarkable integration over the last decade (Dercon and Hill, 2009). However, transaction cost of within and between different regions remain significant. As a result of this farmers receive significantly lower share of the market price. According to a joint cereal trade survey by EDRI-IFPRI in 2008, farmers receive only 59-69 percent of the capital Addis Ababa market. Moreover, fluctuation of agricultural prices in general and the cereal market in particular are worsening the inherent uncertainty and risk that is already a peculiar characteristic of the agricultural sector (Demeke, et al.,2007; Alexandri, 2011; Dercon and Hill, 2009).

Prices are signals for the level of horizontal and vertical integration among different market levels. The extent of price transmission and its speed of adjustment among various market levels and producers to consumers are crucial to characterize the behavior of market participants at a particular stage. The number of marketing actors at each stage of the market and their characteristic determine the extent of price transmission from producer and consumer as well as among different markets. The type of the product also determines the behavior of the actors and the magnitude and extent of the transmission. Unequivocally, these in turn depends on the existing and perceived factors that affect agricultural production and prices (Acharya et al., 2011; Rezitis and Stavropoulos, 2011).

Price transmission can be viewed from two perspectives. These are vertical and horizontal price transmissions. Vertical price transmission refers to price movement along a given supply chain in a given market, while horizontal price transmission is linkage that occurs between different markets in the same level of supply chain. Horizontal price transmission is also called special price transmission as it deals with integration geographically separated markets. It is transmission across different commodities with in the same supply chain level in a given market (Acharya et al.,2011; Aguiar, 2002). Horizontal price transmission also explains transmission of prices from agricultural to non-agricultural products and producer to consumer prices of the same or commodity (Serra et al., 2008; Hassouneh et al., 2011; Baldi et al., 2011). Therefore, the working definition of price transmission in this study comprises both definitions. Intraregional (Within a region) and Interregional (between regions) price transmission in producer and consumer prices of major staple cereals.

In spatial price transmission, spatial arbitrage condition becomes a key working theoretical concept. Spatial arbitrage is a concept based on the "Law of One Price (LOP)" Pioneered by Marshal, (1920). It refers to the difference between prices in different market equals the transaction cost involved in marketing. Marshal 1920, in his book "principles of economics" argued that "if markets are linked by trade and arbitrage, homogeneous goods will have a unique price, when expressed in the same currency; that is net of transaction costs." Market efficiency and integration are the two theoretical concepts that augment the theory of LOP. Market efficiency refers to the capacity of markets to minimize marketing costs in the process of equilibrating the market (demand = supply). This means that in a competitive market, arbitrage will ensure that price differences will reflect all marketing costs. The concept of market integration refers to the possibility of trade and similar long run movements of prices regardless of spatial market equilibrium and efficiency (Barrett and Li, 2002; Thompson et al., 2002).

2. Data and Methodology

The study employed secondary data mainly on producer and consumer agricultural prices of major staple food crops: Teff, Wheat and Maize. The time frame ranges 1996-2015. The series is for sampled the three regional states: Amhara, Oromiya, and Somali, and one city administration Addis Ababa. The four regions were selected purposively based on potential of production and location in order to have a representative sample for the country. Addis Ababa district is chosen because it is the center of all regions and it is expected that price signals arise from this region to reach the entire regions of the country. Oromiya and Amhara regions cover 2/3 of the country's total area coverage and about 85% of cereal production (CSA, 2014; MoA, 2015). Somali region is arid and exhibits limited production.

Price data were sourced mainly from Central Statistical Agency (CSA). Also it was augmented from National Bank of Ethiopia (NBE), Ethiopian Customs Authority (ECA), Ethiopian Commodity Exchange (ECX) data from the FAO STAT and World Bank databases. Appropriate econometric and data management techniques were also applied to solve problem of missing data and structural gaps.

2.1 Test for Unit Root (Test of Stationerity)

The most important, mandatory and first task of most time series analysis framework is testing for Stationarity property of the series. This is because non-stationarity of prices series is widely accepted feature of over time observations. There are various methods of testing stationerity of a series. The Augmented Dickey–Fuller (ADF) Test and Phillips–Perron (PP) Unit Root Tests are the most widely used techniques.

The generic ADF method considered for this study is give as (Green, 2012):

$$\Delta Y_t = \alpha_0 + \gamma t + \beta_1 Y_{t-1} + \theta_1 \Delta Y_{t-1} + \cdots \theta_{p-1} Y_{t-p+1} + \varepsilon_i \quad (2.1)$$

The reduced form can be given as:

$$\Delta Y_t = \alpha_0 + \gamma t + \beta_1 Y_{t-1} + \sum_{i=1}^{n} \theta_i \Delta Y_{t-i} + \varepsilon_i \quad (2.2)$$

$$\Delta Y_{t-1} = \left(Y_{t-1} - Y_{t-2} \right)$$

Where :

$\Delta Y_t =$ Differenced value of observation *Y* at time t,

t = Time

$Y_{t-1} =$ laged value of observation series *Y*

ΔY_{t-i} = lagged differenced series of *Y*

$\gamma, \theta, and \beta$ = are coefficients to be estimated

Therefore, the test statistics for consumer and producer price series, average regional temperature, and precipitation is specified indipendantly for each variable as:

$$\Delta PP_{tij} = \alpha_0 + \gamma t + \beta_1 PP_{tij-1} + \theta_1 \Delta PP_{tij-1} + \cdots \theta_{p-1} PP_{tij-p+1} + \varepsilon_i \quad (2.3)$$

$$\Delta CP_{tij} = \alpha_0 + \gamma t + \beta_1 CP_{tij-1} + \theta_1 \Delta CP_{tij-1} + \cdots \theta_{p-1} CP_{tij-p+1} + \varepsilon_i \quad (2.4)$$

Where:

ΔPP_{tij} : is differenced average monthly producer price of commodity *i* (Teff, wheat and maize) region *j* at time *t;*

ΔCP_{tij} : is differenced average monthly consumer price of commodity (Teff, wheat and maize) at time in region *j* at time *t;*

ε_i : is white noise error term

$\theta, \gamma, and \theta$: are coefficients to be estimated to test Stationarity properties of each series

n: is maximum lag length determined using Schwarz Information Criterion (SIC)[1]

The testable hypothesis is:

H_o: Both β_1 and θ_i are equal to zero (i.e. β_1 *and* $\theta_i = 0$)

H_1**:** β_1 and θ_i are less than 0 (i.e. β_1 *and* $\theta_i < 0$)

If we reject H_0, we conclude that there is no unit root in the series.

Stationarity of the variables determines the type of co-integrating regressions technique applied. For instance, if these variables satisfy Stationarity conditioms, the Vector Error Correction (VEC) approach of becomes appropriate. On the other hand, if the test fails to reject the H_o, it is convenient to view long-run relationship among unit root variables. In statistical terms, this means that these variables are non-stationary in the sense that they tend upwards or downwards overtime. This common drifting of variable makes linear relationships between these variables exist over long periods of time, thereby giving us insight into long-run equilibrium relationships of these variables. However, if non Stationarity is found it would be a classic behavior of price series. Therefore, it is important to note that Granger Causality must be tested before using both the ECM and Houck approaches (Green, 2002; Frey and Manera, 2007).

2.2 Measuring Asymmetric Price Transmission

The empirical literature on price transmission goes back to Farrel (1952). This was the pioneer and foundation of empirical investigation of market integration. After a decade from the first attempt, quite a good number of studies on price transmission were undertaken and most of them were mainly based on agricultural prices. Tweeten and Quance (1969) is the most frequently referred investigation of the relationship between amount of output and the input-output ratio in agricultural sector using the ECM approach. Wolffram (1971) then proposed variable splitting technique as an improvement on the ECM. In his modification of the ECM included the first difference of the dependent variable in the right hand side of the equation. Houck (1997) adopted Wolffram's

[1] SIC parsimonious model to select the smallest possible lag length. It uses (p+1)k number of regression in order to find optimal lag length, where p is the maximum number of lags to be used k is the number of variables in the equation, this criteria will help us to arrive at a given fit with smallest number of parameters per observation (Green, 2002).

specification except that he omitted the first observation of the series. The justification was that the first observation will not have explanatory power because of the differential effects.
Based on the above narration, static asymmetric model can be written as:

$$Y_{ti}^{*} = Y_{ti} - Y_{0i} = \alpha_{0i} t + \beta_0^{+} \sum_{t=1}^{T} \Delta x_{tj}^{+} + \beta_0^{-} \sum_{t=1}^{T} \Delta x_{tj}^{-} + \varepsilon_{ti} \quad \text{.................. (3.7)}$$

Where :
Y_{ti} is the price the commodities under investigation in region i at time t;
X_{tj} is the price the commodities in region j at time t and is specified as:

$\Delta x_t^{+} = x_t - x_{t-1}$ If $x_t > x_{t-1}$

$x_t^{+} = 0$ If $x_t < x_{t-1}$

$\Delta x_t^{-} = x_t - x_{t-1}$ If $x_t < x_{t-1}$

$\Delta x_t^{-} = 0$ If $x_t > x_{t-1}$

$\beta_o^{+}, \beta_o^{-}, \alpha_o$ are coefficients and T denotes the current time period.
Ward (1982) extended Houck's specification by including lags of exogenous variables as:

$$Y^{*} = \alpha_0 t \sum_{t=0}^{k} \beta_t^{+} \Delta X_{t-1}^{+} + \sum_{t=0}^{l} \beta_t^{-} \Delta X_{t-1}^{-} + \varepsilon_t \quad \text{.. (3.8)}$$

The number of lags (k, l) in equation (3.8) can be different, because there is no a priori reason to expect equal lag length for rising and falling phases of the right hand variables (prices in market j). As such, a formal test of the symmetry hypothesis is: The number of lags (k, l) in equation (3.8) can be

$$H_0 : \sum_{t=1}^{k} \beta_t^{+} = \sum_{t=1}^{t} \beta_t^{-} \quad \text{... (3.9)}$$

If region i and j are cointegrated, then by the Engle-Granger (1987) representation theorem, one may develop an alternative specification for the price transmission process, which in standard notation, takes the form:

$$\Delta Y_t = \Delta Y_t - \Delta Y_{t-1} = \varphi_1 + \sum_{t=1}^{k} \alpha_t \Delta Y_{t-1} + \sum_{t=0}^{t} \beta_t \Delta x_{t-1} + \varphi_2 ECT_{t-1} + \varepsilon_t \text{------------------------- (3.10)}$$

Where $ECT_{t-1} = U_{t-1} = Y_{t-1} - \alpha_{o} - \alpha_1 X_{t-1}$(residuals from the cointegration relation between the j^{th} and the i^{th} region).
Following Granger and Lee (1989) proposition, a modification to equation (3.10), the lagged cointegration equation residuals " U_{t-1}" are split into positive and negative components:

$$\Delta Y_t = \varphi_1 + \sum_{t=1}^{k} \alpha_t \Delta Y_{t-1} + \sum_{t=0}^{t} \beta_t \Delta x_{t-1} + \varphi_2^{+} ECT_{t-1}^{+} + \varphi_2^{-} ECT_{t-1}^{-} + \varepsilon_t \quad \text{.......................... (3.11)}$$

Since $ECT = ECT_{t-1}^{+} + ECT_{t-1}^{-}$
In equation (3.11), the null hypothesis of symmetry therefore becomes:

$$\varphi_2^{+} = \varphi_2^{-} \quad \text{.. (3.12)}$$

The standard classical methods of estimation strictly assume the mean and the variance are constant and independent of time. The implication of this assumption is that a price series does not exhibit unit root properties. Nonetheless, applications time series analysis all over the world attest the non stationarity property of prices series. Meaning that, the mean and variance of a price series are time dependent and exhibit different values at different time period. To conform to the assumptions, it is important to make the series free from unit root. This can be achieved by testing the Stationarity property of each series and differencing it until it becomes stationary.

3. Result and Discussion

Stationary properties and lag length determination are the priory procedures in time series analysis. Though the autocorrelation and partial autocorrelation functions tell the stationarity property and the lag lengths, it is difficult to tell how significant the stationarity level is and the reliability of the lag lengths. Therefore specific tests for testing stationarity properties of a time series were used. Augmented Dickey-Fuller test is widely applied and appropriate technique in testing unit root test. All the data series were subject to this test. The test was run for each region separately. This helps regional comparison possible and run other models independently. Consistent to the results of the autocorrelation and partial autocorrelation functions, the result (Table 3.1) indicate that all variables in each region are stationary at their first difference at 1% significant level.

Table 3.1.1: Stationarity test for producer prices

Region	Degree of difference	Teff		Wheat		Maize	
		Test statistics	*P-Value*	*Test statistics*	*P-Value*	*Test statistics*	*P-Value*
Amhara	*Level*	0.364	0.980	-0.607	0.870	-1.168	0.687
	1st difference	-13.981	0.000	-14.546	0.000	-16.452	0.000
Oromiya	*Level*	-2.544	0.105	-3.122	0.025	-3.292	-3.292
	1st difference	-28.678	0.000	-23.399	0.000	-21.292	0.000
Somali	*Level*	-0.390	0.912	-1.397	0.584	-1.853	0.355
	1st difference	-15.338	0.000	-16.291	0.000	-18.006	0.000
Addis Ababa	*Level*	0.121	0.967	0.199	0.972	0.514	0.889
	1st difference	-16.725	0.000	-15.432	0.000	-15.880	0.000

Note: Interpolated Dickey-Fuller critical values are: -3.465 at 1%, -2.881 at 5% and -2.571 at 10%. The null hypothesis is that the variable contains a unit root, and the alternative is that the variable was generated by a stationary process.

3.1 Intraregional Price Transmission

Understanding the transmission of shock in producer prices to consumer prices is the gist this study. The conventional VEC model can be applied to reveals the presence of price transmission from one region to another and how fast it is. However, in reality positive changes and negative changes move quite differently (Acharya et al., 2011; Aguiar et.al., 2002). From practical observation, in Ethiopia, once the price of a certain commodity has increased because of any reason, it is unusual to find it goes back or show tendency to decrease. Because of this reason, the asymmetric vector error correction model is found to be more appropriate.

Table 3.2 presents intraregional transmission of producer and consumer prices and their asymmetric nature. The result of asymmetric vector error correction models reveals that there is increase in the negative change of prices than the positive changes. This is represented by the sign of the coefficients on the negative and positive changes ($+\Delta CP$ and $-\Delta CP$). Almost in all the sampled regions, the sign of the positive change is negative tells that the gap between two consecutive years is increasing. For instance in in Oromiya region 46% of a positive shock in producer price transmits within a month while it is 52% for a negative shock (Table 3.2). Over all, the long run transmission coefficient (CP) implies that there is significant transmission between producer and consumer prices in the long run except in price of Teff in Amhara region. Similarly, there is significant asymmetric price transmission with in the same region. The result also reveals negative changes are faster and stronger than positive changes. Regardless of Addis Ababa being a central market, the nature of asymmetric price transmission the same as the other regions. The result in table 3.2 shows only 65% of a positive shock transmits from producer to consumer while it is 180% for a negative shock. This implies that when there is an increase in price only part of it reaches the producer in a month time but it more than two times faster when it comes to price decreases.

Theoretically, agricultural markets are considered to be perfectly competitive where both producers and consumers are price takers. Nonetheless, in developing countries where market failure is inevitable because of a number of intermediaries and inefficient marketing institutions, producers (farmers) are prone to marketing fraud and unusually low price. As a result when prevailing market prices go down, producer prices respond the same direction instantaneously. However, when market prices go up, it is the intermediaries who benefit the lion's share of the increment (Alexandri, 2011; Ben-Kabbia and Gil, 2007). That is why the positive changes are very sluggish as compared to the negative changes.

Table 3.1.2: Intraregional asymmetric price transmission among producer and consumer prices

Region	Variables	Producer price of Teff		Producer price of Wheat		Producer price of Maize	
		Coefficent	Sd.Error	Coefficent	Sd.Error	Coefficent	Sd.Error
Amhara	Consumer Price (CP)	-0.585	0.533	-1.013***	0.150	-0.910***	0.068
	+ΔCP	-113.120***	17.981	29.026***	4.025	9.192***	0.930
	-ΔCP	403.717***	57.670	-24.127***	3.784	-9.020***	0.935
Oromiya	Consumer Price (CP)	-1.259***	0.194	-0.976***	0.193	-0.930***	0.103
	+ΔCP	46.168***	6.516	32.916***	4.635	11.143***	1.327
	-ΔCP	-52.305***	6.689	-70.920***	11.743	-12.525***	1.646
Somali	Consumer Price (CP)	-0.955***	0.014	-1.011***	0.017	-0.915***	0.037
	+ΔCP	4.266***	0.656	-1.487***	0.328	3.318***	0.467
	-ΔCP	-4.490***	0.649	-21.733***	3.434	-3.043***	0.418
Addis Ababa	Consumer Price (CP)	-1.213***	0.257	0.172***	0.541	-0.692***	0.039
	+ΔCP	65.196***	8.994	100.818***	15.444	-3.853***	0.633
	-ΔCP	-180.947***	22.044	174.020***	20.307	-3.480***	0.518

Generally, for all the regions investigated there is strong and significant price transmission among producer and consumer prices in all crops. The negative sign in all coefficients of the consumer prices indicate that consumer prices are higher than producer prices at all times. this implies that consumers are more beneficiaries from decrease in prices than producers.

3.2 Interregional Asymmetric Price Transmission

How shocks in one market transmit to another region show the extent of market integration between two regions. This has important policy implication in such a way that any regional policy that affect the prices affects the other based on their level of integrations. Existence of price transmission between consumer and producer prices of the same crop across different regions was estimated using asymmetric VEC model. The result revealed that there is a significant transmission of consumer prices ($p < 0.01$) level to producers between regions. This implies that the change in consumer prices of one regions leads to a change in producer price of the other region. It is worthy to note that the results presented in Table 3.3 are long run coefficients; that is why coefficients are greater than one.

The coefficients on the positive changes (+ΔCP) and negative changes (-ΔCP) indicate the presence of asymmetry in price transmission between regions. The results are signaling the presence of asymmetric price transmission between producer and consumer prices among different regions. This implies that the negative changes transmit faster than the positive changes or vice versa. The nature of asymmetry differs in different regions and crops. For instance, the negative changes in producer price of all the commodities transmit much faster than the positive changes between Amhara and Oromiya regions (Table 3.3). About 61% of the increase in consumer price of Teff in Amhara region transmits to Oromiya region in one month time. On the other hand, a decrease in the same region transmits to Oromiya region by more than 100% (125%) in the period significantly ($p < 0.01$). In line with previous research results (Alisher and Tsegai, 2012), the result implies the presence of market failure. Meaning that when consumer prices increase, the tendency of producer prices to increase is mostly very low. This can be best explained by upward streaky produce prices in most developing countries; where small holder farmers receive insignificant portion of increase in market prices while they suffer a greater decline when market prices fall (Ben-Kabbia, 2007; Jolejole-Foreman and Mallory, 2011). However, it is misleading to extrapolate this result to all crops and regions because of intervention by Ethiopian Commodity Exchange (ECX) to minimize the margin for selected commodities.

Table 3.3: Interregional asymmetric producer price transmission

Region	Variables	Producer price of Teff					
		Oromiya		Somali		Addis Ababa	
		Coefficent	Sd.Error	Coefficent	Sd.Error	Coefficent	Sd.Error
Amh	Consumer Price (CP)	-1.690***	0.390	-1.156***	0.056	-1.194***	0.167
	+ΔCP	61.254***	9.448	11.326***	1.485	-28.505***	3.678
	-ΔCP	225.663***	32.346	-12.672***	1.662	22.818***	2.819
Orm	Consumer Price (CP)			0.461***	-4.600	-1.961***	0.640
	+ΔCP			86.834***	13.685	24.672***	2.652
	-ΔCP			-23.258***	3.650	-128.478***	16.234
Soml	Consumer Price (CP)					-0.877***	0.058
	+ΔCP					-12.459***	1.546
	-ΔCP					13.658***	1.586
		Producer price of Wheat					
Amh	Consumer Price (CP)	-1.685***	0.344	-1.187***	0.102	0.090	0.734
	+ΔCP	35.393***	5.459	13.328***	1.844	92.350***	14.204
	-ΔCP	-42.153***	6.889	-13.453***	1.972	-70.708***	10.759
Orm	Consumer Price (CP)			-0.983***	0.086	-0.683**	0.264
	+ΔCP			11.103***	1.414	-50.186***	6.276
	-ΔCP			-8.920***	1.146	-44.652***	6.433
Soml	Consumer Price (CP)					-0.824***	0.109
	+ΔCP					-25.336***	3.024
	-ΔCP					42.688***	5.765
		Producer price of Maize					
Amh	Consumer Price (CP)	-10.615	6.884	-0.978*	0.505	-1.331***	0.059
	+ΔCP	perfect		-41.097***	5.677	4.2974***	0.6441
	-ΔCP	-516.394***	79.041	8.493***	1.083	-4.647***	0.686
Oro	Consumer Price (CP)			-0.832***	0.058	-1.059***	0.082
	+ΔCP			-5.459***	0.658	-6.621***	0.972
	-ΔCP			3.515***	0.360	22.964***	3.328
Soml	Consumer Price (CP)					-1.289***	0.163
	+ΔCP					-15.621***	2.434
	-ΔCP					11.703***	1.902

The study exposed the upward streakiness of prices depends on the type of the commodity and the nature of the markets under investigation. The result between Oromiya and Amhara regions are evidence of the existence of upward streakiness of primary agricultural producer prices. This is because there is much similarity between the two regions in terms of socioeconomic, production and consumption patter of producers and consumers.

The result portrays positive changes are much faster than the negative changes when it is measured between regions that are quite different in different aspects. Asymmetric nature of price transmission between Somali and the other three regions augments this argument. Only 8% of the decrease in consumer prices of wheat in Oromiya region transmits to Somali region within one month, whereas it is about 11% when it comes to an increase. The story is consistent among other regions and crops. The implication is when there are limited producers of the same crop in that region, they possibly have market power to affect the prices so that the tendency of producer prices to go up is not as streaky as when there are many producers.

Intensity of asymmetry in price transmission is different from among regions and crops. Because of the fact that Addis Ababa is the capital of the country, access to price information is relatively faster in both producer and consumer prices, -128% and +92% respectively. In terms of the crops, there is relatively less asymmetric transmission in price of maize.

In general, the model outputs revealed that there is asymmetric price transmission in major staple food crops in Ethiopia. Generalization about how fast the negative and positive changes transmit between markets requires a real time investigation. However, if regions exhibit similar socio-economic and production patters, the likelihood of the negative changes to transmit faster is higher.

4. Conclusion

Regional level analysis for the presence of significant price transmission between producer and consumer prices publicized the rejection of the null hypothesis. It is found in all regions there is a price transmission from consumer and producer and vise-versa. Teff if found to have both short run and long run movement with price of wheat but exhibited very less interaction with price of maize. Wheat and maize on the other hand exhibited strong relationship in all regions. In a nut shell Teff is found to be a leader in signaling price changes both in wheat and maize in all regions.

Strong and significant interaction of prices amongst regions was exhibited in all crops under investigation. Not just transmission of price shocks in one region to another rather negative shocks and positive shocks were examined separately. The result from four strategic regions implicate that positive changes consumer prices are less likely to signal the producer prices. On the other hand negative shocks (decrease in consumer prices) are fast and significantly transmitted to producers. This asymmetric nature of price transmission is consistent within in and between regions. This is a good indicator that in most LDCs small holder farmers are not beneficiaries from price increases but victims when price goes down.

The evidenced intraregional and interregional asymmetric price transmission, imply that, the flow of price information is not smooth in Ethiopia's staple food agricultural market. More importantly, it is against the interest of producers who are the majorities. The overall effect is therefore against the welfare of the mass. As a result, an appropriate policy action becomes a necessity than requirement. Hence, a policy direction that asserts quick and reliable price information need to be in place. It can be achieved through establishing responsible bodies to collect analyze and disseminate price information instantly. Empowering producers in accessing reliable information via different media outlets can possible reduce the upward streakiness of producer prices thereby producers are able to get the reasonable share of the final market prices of their produces. Strengthening the existing effort by ECX is also another option to reduce the degree of symmetry in Ethiopia's agricultural markets.

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