

## Producer price and price transmission in a deregulated Ethiopian coffee market

TK Worako<sup>1</sup>, HD van Schalkwyk<sup>2</sup>, ZG Alemu<sup>3</sup> & G Ayele<sup>4</sup>

### Abstract

*Coffee producers in Ethiopia have historically received a very small share of the export price of green coffee. Reasons that are often mentioned are heavy government intervention and high marketing and processing costs. Prior to 1992, government regulation of the domestic coffee market in the form of fixed producer prices and the monopoly power of the Ethiopian Coffee Marketing Corporation put a substantial wedge between the producer price and the world price of coffee by imposing an implicit tax on producers. The domestic coffee marketing system in Ethiopia was liberalised after 1992, which was envisaged to have a positive effect on producer prices and price transmission signals from world markets to producers. This paper, with the help of Cointegration and Error-Correction Model (ECM), attempts to analyse its impact. As findings indicate, the reforms induced stronger long-run relationships among grower, wholesaler and exporter prices. The estimation of the ECM shows that the short-run transmission of price signals from world to domestic markets has improved, but has remained weak in both auction-to-world and producer-to-auction markets. This might be explained by the weak institutional arrangement coordinating the domestic coffee system and contract enforcement. In general, the domestic price adjusts more rapidly to world price changes today than it did prior to the reforms. However, there is an indication that negative price changes transmit much faster than positive ones.*

**Keywords:** Market deregulation; producer price; price transmission; price asymmetry

### 1. Background to the study

Ethiopia is known as the birthplace of *coffee Arabica*. Coffee has been and remains the leading cash crop and export commodity of Ethiopia. It has accounted on average for about 5% of gross domestic product (GDP), 10% of

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<sup>1</sup> Researcher, Ethiopian Development Research Institute, PO Box 2479, Addis Ababa, Ethiopia, and PhD candidate at the University of the Free State in the Department of Agricultural Economics, Bloemfontein, South Africa; E-mail: ktadesse@yahoo.com.

<sup>2</sup> Dean of the Faculty of Natural and Agricultural Sciences, University of the Free State, PO Box 339, Bloemfontein, South Africa; E-mail: hvs.sci@ufs.ac.za.

<sup>3</sup> Senior researcher, Development Bank of Southern Africa, PO Box 1234 Midrand, South Africa; E-mail: alemuzg.sci@ufs.ac.za.

<sup>4</sup> Senior research fellow, Ethiopian Development Research Institute, PO Box 2479, Addis Ababa, Ethiopia; E-mail: ayeleg2002@yahoo.com.

total agricultural production, and 60% of total export earnings for the past three to four decades. The sub-sector affects the livelihoods of approximately one quarter of the population, providing jobs for farmers, local traders, processors, transporters, bankers and exporters. The various taxes on the crop are also important sources of government revenue (CTA, 2002). Ethiopia is the largest coffee producer and exporter in Africa, followed by the Ivory Coast and Uganda. It has been contributing more than 4% of world coffee production and exports since 2000 (ICO, 2006).

About one million small-scale farmers produce over 95% of Ethiopia's coffee on very small plots of land. Farmers in major coffee-producing areas are heavily dependent on coffee income as the main source of their livelihoods. In slack seasons when farmers lack cash income, coffee trees serve as collateral to obtain credit from informal moneylenders. In addition, a large proportion of coffee farmers are food deficit and depend on purchased food grains for family consumption. In years with good prices, farmers are able to purchase enough food for family consumption, pay their agricultural credit and government taxes, and meet other obligations from coffee sales. Good prices also have positive spill-over effects when it comes to input use, consumption of manufactured goods, and access to education and healthcare. Conversely, when coffee income fails to cover cash requirements, farmers sell off their assets such as oxen, land, property, etc. and/or leave their homes in search of work in other places (Oxfam, 2002), which in turn aggravates the status of household food security.

Despite its economic and social importance for the Ethiopian economy, the performance of the coffee sub-sector has remained unsatisfactory. No significant change in mode of production and processing has occurred for several decades. Amongst other things, imperfection in the policy market and the low base of market infrastructure were cited as major causes of weak performance (IFPRI, 2003). During the military regime (1974-1991) the Ethiopian Coffee Marketing Corporation (ECMC), a state monopoly, operated using fixed price arrangements and handled about 80% of the entire coffee trade. Private traders had a limited role in both domestic and export marketing. Similarly, coffee farmers also had very limited power when it came to securing their proper share of the market price.

According to various researchers who studied the performance of this sub-sector prior to 1992 (Gebremariam, 1989; Mulat, 1979; ULG & Food Study Group, 1987), coffee growers in Ethiopia have historically received a very small share of the export price, receiving between 30 and 45% of the free-on-

board (FOB) price, while competitors from Brazil, Colombia, Kenya and India were receiving above 80% of the FOB price (ICO/CFC, 2000).

Since 1992 the Ethiopian government, pressured by the World Bank and the IMF's Structural Adjustment Program (SAP), has introduced various policy measures aimed at encouraging private traders to participate in a liberalised coffee market at all levels. These include the devaluation of the Ethiopian Birr from 2.07 to 5.1 Birr/\$ in October 1992, foreign exchange auctioning, simplification of entry barriers (Pro. No. 70/1993), consolidation of all taxes and duties levied on coffee exports into a single tax family (Pro. No. 99/1998), abolition of the quota system at auction, allowing private traders to trade washed coffees, allowing suppliers (*akrabys*) and exporters to sell coffee domestically at market-determined prices, and so on.

These coffee market reform measures aimed at opening the domestic and export coffee markets were envisaged to present coffee producers with 'right prices' as a means of stimulating productivity and growth, i.e. bringing producer prices closer to international levels and reducing disincentives emanating from policy and non-policy imperfections at the production and marketing levels. It was hypothesised that it would improve transmission of world and auction market price signals to domestic growers, which in turn was expected to improve the supply and quality of coffee.

The deregulation of the marketing system opened up opportunities for the private sector to participate in all tiers of the marketing chain.<sup>5</sup> As a result, the primary coffee marketing chain is characterised by a large number of buyers and sellers with relatively better levels of competition compared to the pre-reform period.<sup>6</sup> In 2005/06 about 1,080 active wholesalers and over 89 active exporters were participating in coffee marketing (AMPD, 2006). This increase in private participation raised the coffee supply to the auction market from 60,000 tons in 1991 to 221,000 tons in 2005/06. However, as some anecdotal information on the post-reform coffee marketing system in Ethiopia shows, this has resulted in the concentration of power at the export market,<sup>7</sup>

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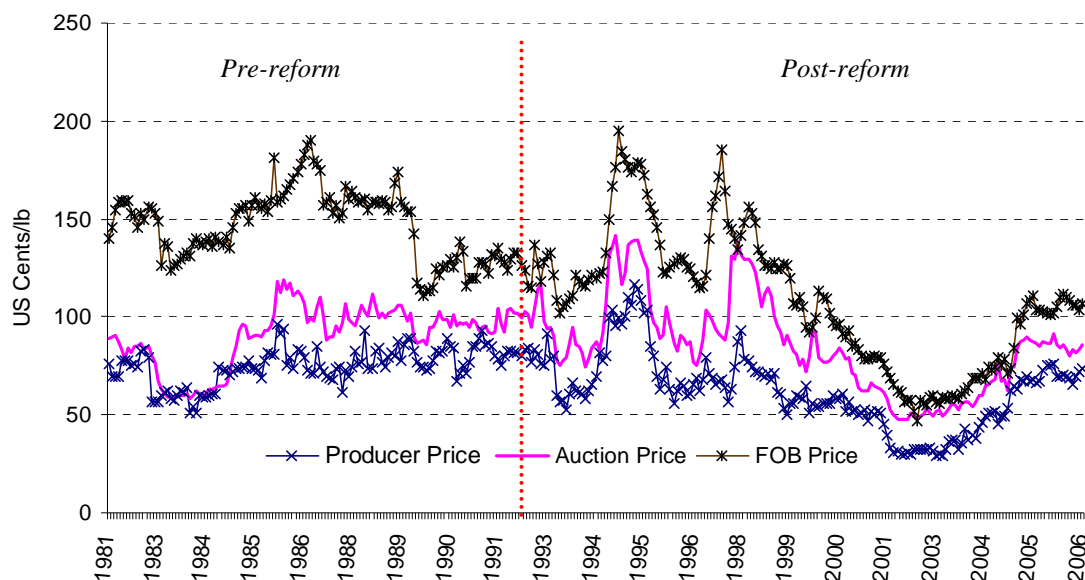
<sup>5</sup> *In the current domestic coffee marketing chain, the coffee bean passes through the hands of several market players before reaching the auction market and being exported. Small amounts of coffee are produced by an estimated 1.3 million farming households (Agrisystems Ltd, 2001) dispersed over a wide geographical area. It is then collected at dispersed primary market centres by thousands of licensed or unlicensed collectors (sebsabys) or village traders and delivered to private or cooperative wholesalers (akrabys) or to their agents. These small lots are bulked and transported to processing centres, from where they are delivered to the central auction markets in Addis Ababa and Dire Dawa. Eventually exporters purchase the coffee from the auction centre, process it to export standard and then export it to overseas markets.*

<sup>6</sup> *In 1991, prior to reform, only 14 private exporters and fewer than 200 wholesalers were involved in the primary and auction markets.*

<sup>7</sup> *For instance, of the 89 companies registered as exporters, the top 10 companies accounted for 53% of the market share in 2005/06.*

mounting illegal trade across borders, unhealthy competition in the primary and auction markets, and high transaction costs (AMPD, 2006; Petit, 2007).

The coffee price is among the most volatile of agricultural commodity prices. Figure 1 depicts the average nominal price movement of producers, wholesalers and exporters of Ethiopian coffee from 1981 to 2006. The average coffee price remained high in the post-reform period (1981 to 1991), mainly due to the International Coffee Agreement (ICA) quota system. The price showed slight improvement in the initial post-reform period (i.e. 1992 to 1998) before dropping drastically due to the increase in world coffee production. It approached its lowest level in 2001/02 – known as the ‘coffee crisis’ period, which had serious repercussions for smallholder producers (Daviron & Ponte, 2005).



**Figure 1: Average producer, auction and FOB price movement**

Despite the drastic decline in general price level, the flow of coffee to official channels (auction market) and the volume of export increased more than threefold between 1992 and 2006.<sup>8</sup> This might have been due to reform measures such as devaluation of the local currency, removal of all taxes on coffee exports, and improved roads and other marketing infrastructure. Although it is difficult to obtain an accurate estimate of the volume of coffee smuggled through parallel markets, sketchy evidence indicates that it is quite substantial. According to 2006 estimates by the Agricultural Market Promotion Department (AMPD) in the Ministry of Agriculture and Rural Development

<sup>8</sup> As indicated by coffee statistics released by AMPD in MoARD, coffee supply to the auction market increased from a mere 60 thousand tons in 1991/92 to 221 thousand tons in 2006. In that same period, export increased from 44,000 tons to 160,000 tons.

(MoARD), about 15% of coffee produced in the south-western and western zones is smuggled via Sudan. The average quantity of coffee smuggled annually via Djibouti was estimated to be more than 1,000 tons in the 1990s (EDE Consulting for Coffee, 1997). When we consider domestic consumption, estimated to account for 48% of national production, less than 40% of total national production of coffee is directed to official export markets.

As stated by Goletti and Tsigas (1995), knowledge of the extent to which markets are integrated is crucial for the success of market liberalisation policies and for investment decisions on marketing infrastructure by government. Indeed, the success of the reform process could be constrained by numerous structural deficiencies in the local markets, while the availability of marketing infrastructure, as well as transaction and transportation costs, action of traders, government policies on export taxes and exchange rates, have a paramount effect on price transmission. The exchange rate misalignment plays a major role in the rate of transmission. An increase in the world price may not pass to producer price due to the overvaluation of local currencies (Abdulai, 2000; Baffes & Gardner, 2003; Goletti & Tsigas, 1995). However, following on other similar market integration studies, this study uses the nominal exchange rate instead of the real exchange rate to calculate the price of coffee in US cents per pound (Krivonos, 2004).<sup>9</sup>

As indicated earlier, although there have been promising achievements in the volume of production and export, very little is known about the integration and transmission of price signals between different levels of coffee markets in the years following the reforms. Therefore, principal questions addressed by this study are whether the reforms in the Ethiopian coffee market have resulted in a closer relationship between world (FOB), producer and auction market prices and whether the market reforms have improved the producer share of the export price by area and type of coffee. The study utilises the cointegration approach, specifically employing the autoregressive distributed lag model (ARDLM) and error-correction model (ECM) to answer the above questions.

The paper is organised as follows: Section 2 presents the methodology and data sources; Section 3 discusses the results of the estimates of the cointegration analysis and error-correction model; and finally Section 4 presents the conclusion and policy recommendations.

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<sup>9</sup> *The following methods were followed to arrive at the price of coffee: Using a common method, the various coffee types were converted to their clean coffee equivalent. Next, the average monthly coffee price reported by the government and the prevailing exchange rate were used to calculate the price of coffee in US cents per pound. In general, it is a common trend to use nominal prices instead of real prices in market integration studies (see Krivonos, 2004).*

## **2. The model and data sources**

### **2.1 The model**

Earlier studies on cointegration (e.g. Richardson, 1978) relied on simple correlation between prices in the pairs of markets. Later, Stigler and Sherwin (1985) considered the correlation of price differences. Gupta and Mueller (1982) also employed Granger causality to measure the price relationship between markets, while Delgado (1986) used a variance decomposition approach to evaluate integration between markets. The seminal work by Ravallian (1986) was considered the most prominent innovation and progress in time series modelling (Barrett, 1996). The cointegration together with error-correction model (ECM) of Engle and Granger (1987) has received important recognition for the specification and estimations of dynamic economic models. Unlike the static framework, the ECM includes a dynamic component that captures the effect of adjustment of the dependent variable when it deviates from its long-term equilibrium level. Hence in this study an ECM is specified to account for the dynamic nature of price adjustment. Short-run price transmission, the speed of adjustment and the equilibrium producer price share are estimated before and after the reforms. Asymmetric price transmission is tested in both periods to check whether price increases are passed through to producers as rapidly as price decreases and whether the nature of the asymmetry has changed following the reforms. Using the estimated parameters, we can compare how long it would take the domestic price to adjust to a one-time change in the world market price.

Methodologically, this study is substantially different from earlier works. Firstly, since Ethiopian coffee varieties are often differentiated by agro-ecology, locality, shape, acidity, body, flavour, aroma, processing method and demand by importing countries, they are separately auctioned by their respective origins. In contrast to many coffee-exporting countries, coffee from Ethiopia is traded separately in the world market based on the origin of production (i.e. as Sidama, Yirgachefe, Harar, Wollega, Jimma or Limu coffee). Recently, Ethiopia secured exclusive trademark rights for Sidama, Harar and Yirgachefe coffees, which serves to further highlight the differences between Ethiopian coffee types. Each coffee type fetches a different price at the producer, auction and export (FOB) level of the market. For instance, between 1992 and 2006, Harar, Wollega, Yirgachefe, Sidama and Jimma coffee fetched on average 143, 108, 106, 104 and 92 US cents per pound respectively – which clearly depicts the differences in the quality and price of these coffee types. Thus the study disaggregates the analysis into major commercial coffee types to evaluate whether there are differences in price transmission and level of integration. Secondly, since most producers in developing countries –

including Ethiopia - are linked to the world market through domestic intermediary markets (e.g. auction markets), this study includes the Ethiopian Coffee Auction Market (ECAM) as an intermediary market.

The inclusion of the auction market is motivated by the literature, which reflects that intermediaries are better positioned than coffee growers in terms of access to world price information. It is hypothesised that there is a strong tendency for much of the benefit from positive world price changes to be appropriated by intermediaries rather than coffee growers, which may defeat the very objective of the coffee sector reform. Therefore, the price transmission analysis is at three distinct levels: (1) world market to auction, (2) auction to producers, and (3) world market to producers.

The model specification of this study follows the dynamic approach adopted by Baffes and Gardner (2003) and Krivonos (2004). An autoregressive distributed lag (ARDL) model includes the lagged value of the domestic price and world price as independent variables specified as follows:

$$P_t^d = \alpha + \beta_1 P_t^w + \beta_2 P_{t-1}^d + \beta_3 P_{t-1}^w + \varepsilon_t \dots\dots\dots (1)$$

This can be rearranged to yield an error specification

$$P_t^d - P_{t-1}^d = \alpha + \delta(P_t^w - P_{t-1}^d) + \theta(P_{t-1}^d - \gamma P_{t-1}^w) + \varepsilon_t \dots\dots\dots (2)$$

where  $\delta = \beta_1, \theta = (1 - \beta_2)$  and  $\gamma = \frac{\beta_1 - \beta_2}{1 - \beta_2}$

Equation (2) describes the variation of domestic price  $P^d$  in terms of its reaction to fluctuations in the world price  $P^w$  and adjustment to own long-term equilibrium.  $\delta$  captures the immediate responsiveness of the domestic price to changes in the world price, and  $\theta$  is an error-correction term, which measures the speed of adjustment of  $P^d$  to the long-run equilibrium  $\gamma P^w$ .

To capture the impact of the reforms on the parameters and to test asymmetric price transmission, two sets of dummies are used. One is a set of policy dummies,

$$D_t^{ref} = 1 \text{ if a period prior to reform,}$$

$$D_t^{ref} = 0 \text{ if a period after reform.}$$

The other is a set of dummies that describes whether a price increase or price decrease has occurred:

$$D_t^\Delta = 1 \text{ if } \Delta P_t < 0 \text{ (for increase in price),}$$

$$\text{and } D_t^\Delta = 0 \text{ if } \Delta P_t \geq 0 \text{ (for decrease in price) where } \Delta P_t = P_t - P_{t-1}$$

The policy dummies interact with all independent variables, and the dummies that denote the sign of the price change are interacted with the short-run elasticity of transmission  $\delta$  to test for the presence of short-run asymmetric price transmission.

For the ECM to be valid, we first need to ensure that the time series used in the estimation is stationary. The stationary properties of the price-time series (both levels and first differences) are tested using the augmented Dickey-Fuller (ADF) procedure. In each case the hypothesis tested is that the time series follows stationary processes with the unit root. Rejecting the null hypothesis allows the time series to be tested as stationary. In addition, the existence of a long-term cointegration relationship between world (FOB), auction and domestic prices is tested in order to check the validity of the error-correction part equation (2). The basic long-run model without a structural break is

$$P_t^d = \gamma P_t^w + v_t \dots\dots\dots (3)$$

The constant is restricted to zero, so that  $\gamma$  can be interpreted directly as the share of producer price in world market price. Three OLS regressions are estimated: separate regression before and after the reforms and pooled regression with structural break. The latter model allows estimation of two different slope coefficients while utilising all available data:

$$P_t^d = \gamma P_t^w D_t^{ref} + \gamma P_t^w (1 - D_t^{ref}) + v_t \dots\dots\dots (4)$$

In each case, an ADF test on the residuals is performed to determine whether the OLS results adequately describe the cointegrating relationship among three categories (i.e.  $P_t^d$  &  $P_t^w$ ,  $P_t^a$  &  $P_t^w$ , and  $P_t^d$  &  $P_t^a$ ). The residual  $v_t$  from pooled regression (4) is then used to estimate the ECM for each coffee price by area, given that the ADF test supports the validity of the model:

$$\Delta P_t^d = \delta_1 \Delta P_t^w D_t^{ref} D_t^\Delta + \delta_2 \Delta P_t^w D_t^{ref} (1 - D_t^\Delta) + \delta_3 \delta \Delta P_t^w (1 - D_t^{ref}) D_t^\Delta + \delta_4 \Delta P_t^w (1 - D_t^{ref}) (1 - D_t^\Delta) + \theta_1 v_{t-1} D_t^{ref} + \theta_2 v_{t-1} (1 - D_t^{ref}) - \varepsilon_t \dots\dots\dots (5)$$

The  $\delta$ s describe the short-run responsiveness of domestic price to world price increases and decreases after and before reforms. The  $\theta$ s are parameters capturing pre- and post-reform speed of adjustment to long-term equilibrium in domestic price. The estimated coefficients can be used to calculate how long it would take the domestic price to fully adjust to a one-time change in the



world price. With a change in the world market price occurring at time  $t = 0$ , the new long-term equilibrium level of the domestic price is  $\gamma(p^w + \Delta p^w)$ . In the initial period, the domestic price changes by  $\delta \Delta p^w$ . In the subsequent period an error-correction component is added. The degree of adjustment of the domestic price relative to full adjustment  $n$  periods after the change in the world price equals

$$m_n = 1 - \frac{(\gamma - \delta)(1 + \theta)^n}{\gamma} \dots\dots\dots (6)$$

The model specification for cointegration between auction and world price and for auction and producer price employs the same approach.

**2.2 Data and sources**

The producer, auction and free-on-board (FOB) prices are the three major time-series prices on which the analysis centres. Each price series is based on monthly prices that extend from October 1992 to September 2006. The price data includes four major Ethiopian coffee types by origin of growing region (Sidama, Harar, Wollega and Jimma), each with three distinct price series (producer, auction and FOB). As the fifth category, the analysis includes national average price (average of all coffee prices). All data used in this study was obtained from published and officially compiled government coffee statistics.

Producer price was obtained from the monthly published survey reports (Bulletins Nos. 44 to 377)<sup>10</sup> of the Central Statistical Agency (CSA). Auction and FOB<sup>11</sup> prices were obtained from the Agricultural Market Promotion Department (AMPD) in the Ministry of Agriculture and Rural Development (MoARD) from unpublished coffee statistics bulletins compiled for the period 1981 to 2006.

To facilitate the comparison, all price data has been converted to clean coffee equivalent and then to US cents per pound (US cents/lb), which is the standard international unit of measurement used by the International Coffee Organization (ICO) and others. The official exchange rate from the National

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<sup>10</sup> The CSA has been conducting a monthly survey on “Average Producer Price of Agricultural Commodities (APAC)” and reports are published monthly since 1981. The following bulletins of producer price survey reports were used to compile producer price data for coffee: Bulletins Nos. 44, 59, 65, 105, 116, 122, 137, 138, 139, 141, 148, 149, 155, 162, 166, 173, 176, 181, 188, 190, 211, 273, 277, 291, 292, 293, 294, 298, 300, 306, 311, 341, 343, 344, 346, 374 and 377.

<sup>11</sup> FOB price here refers to the price of each coffee type, which includes value of coffee, cost of transportation to port, plus cost of loading onto ship. In other words, it is payment made in foreign currency to the exporter.

Bank of Ethiopia (NBE) has been used to convert producer and auction prices that are reported in terms of local currency. Finally, all the prices have been transformed into natural logarithms in order to mitigate the fluctuation of individual series, to increase the likelihood of stationarity after first differencing and to ease interpretation of the coefficients.

### 3. Results of estimation

#### 3.1 Results of stationarity tests

The results of the stationarity tests conducted for the price variables are reported in Table 1. The properties of each price time series are analysed firstly in terms of their descriptive statistics, including a normality test. At the level of all producer prices, the ADF test does not reject the null hypothesis that the price series follows a unit root process or is found nonstationary for all prices. However, testing the same hypothesis for first differences allows the rejection of the unit root hypothesis at 1% level of significance for all 15 types of coffee prices at three different levels. This leads to the conclusion that price differentials can be used in the ECM.

**Table 1: Stationarity of producer, auction and world prices**

| Coffee type  | ADF test statistics (without trend) |                  |               |                  |                 |                  |
|--|-------------------------------------|------------------|---------------|------------------|-----------------|------------------|
|  | Producer price                      |                  | Auction price |                  | FOB/world price |                  |
|  | At level                            | First difference | At level      | First difference | At level        | First difference |
| Harar coffee   | -2.300                              | -7.429***        | -1.740        | -6.560***        | -0.707          | -7.108***        |
| Jimma coffee   | -2.382                              | -6.265***        | -2.307        | -6.570***        | -1.885          | -6.489***        |
| Sidama coffee  | -1.936                              | -6.371***        | -2.387        | -8.820***        | -1.451          | -7.286***        |
| Wollega coffee   | -2.062                              | -7.220***        | -1.645        | -6.444***        | -1.581          | -6.468***        |
| National average   | -2.222                              | -6.395***        | -1.007        | -6.880***        | -1.052          | -6.323***        |
| Null of unit root rejected at 1% *** Null of unit root rejected at 5% ** |                                     |                  |               |                  |                 |                  |
| Null of unit root rejected at 10% *                                      |                                     |                  |               |                  |                 |                  |

#### 3.2 Cointegration between prices

Turning to the long term, cointegration between the producer and auction, auction and FOB and producer and FOB prices is estimated using equation (4) for three different periods (pre-reform, post-reform, and pooled regression with structural break). The two-step Engle and Granger approach is followed to estimate the series. To evaluate the long-run relationship, the residual from two single series (linear combination of series) is tested using the ADF test. The null hypothesis of no cointegration is rejected when the ADF test for unit root is brought about at order of zero I(0) (see Table 2).

When the cointegration between auction and producer prices is evaluated, it is found to be highly significant for Wollega and national average prices for pre-reform, post-reform and pooled regression with structural break. This may account for the fact that although producer prices were highly regulated by the government prior to reform, it was continuously adjusted with auction price movement. In the later period (after deregulation) there was relatively better competition due to private sector participation in both producer and auction markets. The significance of the Sidama producer price in the pre-reform period may be attributed to the reasons mentioned above. However, Harar and Jimma producer and auction prices lack considerable long-run relationships for none of the periods. This may be attributed to the fact that the Harar auction market is historically dominated by a few giant traders, even post-reform. For instance, four top traders accounted for 60% of the Dire Dawa auction trade between 1992 and 2006 (AMPD, 2006). Moreover, collectors and wholesalers in the primary markets also work as agent for exporters – implying the possibility of the distortion of price setting and lack of healthy competition. In the case of Jimma, a weak long-run relationship between producer and auction price results from high transportation and transaction costs. Due to the fact that the Addis Ababa auction market, where Jimma coffee is auctioned, is located on average 450 kilometres away from Jimma's coffee production area, traders face considerable marketing and transaction costs.

**Table 2: ADF test statistics for cointegration between pairs of prices**

| Coffee type      | (1) Cointegration b/n producer & auction prices |         |   | (2.) Cointegration b/n auction and world prices |         |   | (3) Cointegration b/n producer and world prices |          |   |
|------------------|---|---------|---|---|---------|---|---|----------|---|
|                  | Before  | After   | Pooled regression with structural break | Before  | After   | Pooled regression with structural break | Before  | After    | Pooled regression with structural break |
| Harar coffee     | -2.54   | -1.6    | -2.5*                                   | -5.92***  | -3.9*** | -3.84***                                | -2.33   | -3.2***  | -3.80***                                |
| Jimma coffee     | -1.25   | -2.1    | -2.42*                                  | -2.36*  | -1.72   | -2.15*                                  | -1.42   | -2.15    | -2.63*                                  |
| Sidama coffee    | -1.92   | 4.8***  | -2.2                                    | -4.80***  | -5.7*** | -5.69***                                | -1.93*  | -2.67**  | -4.52***                                |
| Wollega coffee   | -6.8***   | -6.7*** | -7.6***                                 | -5.54***  | 5.3***  | -5.32***                                | -2.41*  | -3.21*** | -3.0***                                 |
| National average | -3.9***   | -4.6**  | -4.2***                                 | -5.95***  | 6.4***  | -6.41***                                | -1.72   | -2.54**  | -4.4***                                 |

Null of unit root rejected at 1% \*\*\* Null of unit root rejected at 5% \*\* Null of unit root rejected at 10% \*

In contrast to the above, the results of the estimation for world and auction price cointegration have shown a considerable long-run relationship between two prices in almost all of the cases. The ADF test rejects the null hypothesis at 1% level of significance. This finding is consistent with prior expectations and is due to the intermediaries (i.e. wholesalers and exporters) in the auction and export markets being better positioned in terms of access to world price

information than coffee growers who are at the beginning of the marketing chain. In most cases, wholesales, exporters and foreign importing companies maintain long-term relationships and close information exchange.

The estimate results for producer and world prices for each type of coffee indicate that none of the prices has shown significant cointegration for the pre-reform period. However, in the post-reform period, with the exception of Jimma coffee, the other four categories have shown an acceptable level of relationship. Interestingly, the result of the pooled regression with structural break was found significant at 1% for Harar, Sidama, Wollega and national average price – implying convergence of all prices to equilibrium in the long run.

### 3.3 Producer share of prices

The estimates of the pre- and post-liberalisation share of the producer price in world price are reported in Table 3. In most cases, the reform measures have increased the target share of producer price in world price. In the post-reform period, the percentage share of producer price in world price has increased in that the national average has grown from 48% to nearly 59%. This varies with the type and quality of coffee. However, compared to competing countries, the producer share of the world price remains low.

**Table 3: Producer share of FOB (world) price by coffee type**

| Type of coffee   | With structural break |                 |
|------------------|-----------------------|-----------------|
|                  | Pre-reform (%)        | Post-reform (%) |
| Harar coffee     | 48                    | 65              |
| Sidama coffee    | 45                    | 56              |
| Jimma coffee     | 49                    | 57              |
| Wollega coffee   | 50                    | 64              |
| National average | 48                    | 59              |

Multiple factors are contributing to this low share. Transport costs and government-related taxes account for 35 to 45% of the price spread between producer and auction. Most wholesalers depend on rented trucks in the peak supply seasons. Although there has been enhanced competition since market liberalisation in the primary market compared to the pre-reform period, wholesalers retain some monopoly power.<sup>12</sup> When there is a slight drop in the coffee price at auction or in international markets, wholesalers – mainly in the remote markets – further depress prices at local markets and withhold their supply when there is a price increase. At present, government-related coffee

<sup>12</sup> In the current coffee marketing chain about 40% of wholesalers from major coffee-growing zones are estimated to have a vertical relationship with exporters.

marketing costs include regional sales tax (for washed coffee Birr 0.60 and for unwashed coffee Birr 0.30), municipality tax (Birr 0.20), a parking fee at quality-inspection areas (Birr 0.08), a liquoring fee (Birr 0.03) and export tax (Birr 1.41 per kg of export coffee). This adds up to an average of Birr 2 per kg or about 20% of producer price.

### 3.4 Results of price asymmetry

The results of the ECM are reported in Table 4. Since no long-run cointegration was detected for Jimma coffee in any of the three periods, no ECM is estimated for the Jimma coffee price. The conclusion in this case is simply that the reforms did not produce greater integration of domestic and world prices for all types equally, and therefore Jimma coffee prices remain isolated from international prices. However, as indicated in Table 2, most of the prices are better integrated in the post-reform period compared to the pre-reform period.

**Table 4: Error-correction model with asymmetric price transmission**

| Coffee type            | Price          | Pre- and post-reform       | Harar coffee | Sidama coffee | Wollega coffee | National average |
|------------------------|----------------|----------------------------|--------------|---------------|----------------|------------------|
| Short-run transmission | Price decrease | Pre-reform ( $\delta_1$ )  | 0.29**       | 0.19          | 0.16           | 0.17             |
|                        |                | Post-reform ( $\delta_3$ ) | -0.15        | 0.34*         | 0.12           | 0.31*            |
|                        | Price increase | Pre-reform ( $\delta_2$ )  | 0.51***      | 0.17          | 0.15           | 0.43*            |
|                        |                | Post-reform ( $\delta_4$ ) | 0.001        | 0.16          | 0.028          | -0.03            |
| Speed of adjustment    |                | Pre-reform ( $\Theta_1$ )  | -0.24***     | -0.07*        | -0.10***       | -0.10**          |
|                        |                | Post-reform ( $\Theta_2$ ) | -0.16***     | -0.15***      | -0.14***       | -0.11**          |

Short-term transmission of the price decrease from world to producer, both pre- and post-reform, is indicated in  $\delta_1$  and  $\delta_3$  respectively. It is found higher and significant for the national average coffee price in the post-reform period compared to the pre-reform period (Table 4). Similarly, the short-term transmission of the price decrease for Sidama coffee is highly significant in the post-reform period, because in the pre-reform period the government set floor prices to protect producers from negative price shocks, but the role of government was diluted with market liberalisation policies. Conversely, such transmission was higher for Harar in the pre-reform period compared to the post-reform period. As explained earlier, this can be attributed to dominance of the Harar auction market by a few traders in the pre-reform period.

Short-term transmission of the price increase from world to producer, both before and after the reforms, is depicted in  $\delta_2$  and  $\delta_4$  respectively. The transmission in this case was far better prior to the reforms than after the reforms. For instance, prior to the reforms, a one-dollar increase in the world price caused an increase of 0.51, 0.17, and 0.15 cents in Harar, Sidama and Wollega producer prices respectively. However, after the reforms, it decreased

to close to zero transmissions for Harar and Wollega and 0.16 for Sidama. There are no cases where price increases were transmitted more fully than price decreases. This finding is consistent with Krivonos (2004), who found that producers now bear the entire cost of price decline, while the transmission of price increase remains minimal.

To understand how the reforms affected the speed at which domestic prices react to changes in world prices, it is useful to calculate the degree of adjustment of the internal price to a one-time change in the world price. The results for adjustment 6 and 12 months after a change in the world price are reported in Table 5. All types of coffee mentioned above adjust faster today to changes in world market prices than they used to. The degree of adjustment to price increases after six months has increased for all types in the post-reform period compared to the pre-reform period. Adjustment is relatively higher for Wollega and Sidama coffee.

**Table 5: Degree of adjustment of producer price to one-time change in world price**

| Type of coffee   | Adjustment after ... months | Price decrease |             | Price increase |             |
|------------------|-----------------------------|----------------|-------------|----------------|-------------|
|                  |                             | Pre-reform     | Post-reform | Pre-reform     | Post-reform |
| Harar            | 6 months                    | 40%            | 85%         | 53%            | 45%         |
|                  | 12 months                   | 72%            | 88%         | 67%            | 68%         |
| Sidama           | 6 months                    | 51%            | 76%         | 60%            | 68%         |
|                  | 12 months                   | 69%            | 85%         | 87%            | 83%         |
| Wollega          | 6 months                    | 55%            | 70%         | 52%            | 65%         |
|                  | 12 months                   | 75%            | 86%         | 74%            | 84%         |
| National average | 6 months                    | 58%            | 74%         | 54%            | 45%         |
|                  | 12 months                   | 78%            | 87%         | 70%            | 64%         |

*Source: Calculated using price data from CSA and CTSC Team of MoARD*

#### 4. Conclusions and recommendations

Using cointegration analysis and an error-correction model (ECM), this study examines price transmission from the world coffee market to local markets, auction to producers, and from the world to auction markets. The results show that the share of producer price in the world price has increased substantially for all coffee since reforms were introduced. There is greater integration between the domestic and world markets and world and auction markets (for some) at present than prior to the reforms, and the transmission of world price signals has improved in most cases.

The impact of the liberalisation process seems to have been limited due to lack of an adequate market information system, poor access to credit, high marketing costs (mainly transportation), and high transaction costs related to

searching for potential buyers, collusion, and high market share by a few exporters in the current coffee market. This is justified by the result that some prices have relatively better integration, while others have weak or no integration, which is consistent with initial expectations. Moreover, Jimma coffee has been found to be weakly integrated or not integrated for all three categories of analysis. Wollega and Sidama coffee have also experienced high asymmetric price transmission.

It should be noted that greater price transmission of world market prices may in fact work to the disadvantage of producers in the short run. With world market prices on a steady decline since the early 2000s, fixed domestic prices at a pre-crisis level would have been preferred by producers. Moreover, this study shows that in some cases, the impact of the reforms on price transmission has been somewhat asymmetric, rising more for price decreases than for price increases, meaning that growers now bear the full cost of price drops, while the transmission of positive price shocks has not changed much.

A greater pass-through of price changes at the time of falling prices is unfavourable to producers who may lack resources to cope with price risks. In many post-reform systems, coffee growers are left entirely uninsured against low prices. Artificially high government-supported producer prices are, however, unsustainable in the long run because of the large public outlays such support schemes would require. An alternative approach would be to give growers access to price-risk management instruments, such as trademark licensing, fair and organic coffee marketing, or programmes to stimulate local consumption, at least to insulate the short-term effect.

In general, dismantling market parastatals and removing inappropriate policies are necessary but not sufficient conditions for efficient private markets to evolve. In the absence of appropriate infrastructure, institutions and legal reforms, spatially distributed markets may continue to lack integration. Hence Ethiopia has to shift from merely 'getting prices right' to 'getting institutions right' so as to address market failures arising from imperfect information, contract enforcement and property rights, as well as insufficient provision of public goods in order to improve the lives of primary producers. In addition, Ethiopia has several policy menus on the shelf, but what is lacking is implementation, and hence it is highly important to pay more attention to implementation.

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