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Coffee value chains on the move: Evidence from smallholder coffee farmers in Ethiopia

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Important changes to Ethiopia's coffee sector have happened in the last decade. There has been increasing adoption of improved production, harvest, and post-harvest practices with positive impacts on coffee productivity and incomes. Upstream marketing has improved, and there have been large investments in processing capacity, shown by the extended coverage of wet mills. These changes seem to have been driven by greater availability of extension agents, market reform, and high international prices. However, despite these changes, yield growth has been small. The prevalence of coffee diseases, weather shocks, lack of improved seedlings, and saving constraints has impeded uptake of improved practices with consequent repercussions on farmers' productivity and income.

1. INTRODUCTION

Important changes are happening in global agricultural value chains. However, it is often not clear what the impacts of these changes are on smallholder producers and other upstream stakeholders in the developing countries that supply these goods. Researchers have examined the impact of the increasing importance of modern retail globally and its effect on production and trade patterns in developing countries (e.g. Reardon et al., 2003, 2009; Michelson et al., 2012; Timmer, 2009). Other researchers have looked at the impact of more stringent quality and food safety standards and how the consequent transformation of global supply chains impact production practices and welfare of smallholders (e.g. Swinnen, 2007; Maertens and Swinnen, 2009; Minten et al., 2009; Henson and Reardon, 2005; McCullough et al., 2008; Kersting and Wollni 2012; Kleemann and Abdulai, 2013).

In this paper, we look at the coffee sector in Ethiopia and analyze changes and their drivers upstream in the value chain. The coffee sector is an important sector in which to study this issue for a number of reasons. International coffee markets are changing quickly, driven by liberalization (Russell et al., 2012), but also by increasing demands for standards and the development of a specialty coffee market segment (Lee et al., 2012; Potts et al., 2014). These downstream changes have large effects on the structure of global coffee value chains. This development is important as coffee is one of the most important globally traded agricultural commodities with consumption occurring mostly in developed countries and production in developing ones (ICO, 2014). In this analysis, we look in particular at the case of Ethiopia. Ethiopia is the biggest exporter of coffee in Africa, generating significant export revenues from this leading export product of the country. Moreover, as coffee production is mostly done by smallholders in Ethiopia, any changes in global value chains might have important effects on the livelihood of these often poor farmers.

In this study we focus on three main research questions. First, we study changes in coffee production practices over the last decade and then analyze how these production practices affect coffee productivity. Second, we document changes in harvest, post-harvest, marketing, and processing activities, and analyze their links with improved quality, prices, and incomes of producers. Third, we look at drivers of and constraints to change and transformation at the level of the coffee producer. For the analysis, we rely on a unique recently collected and representative large-scale survey of coffee producers and processors. To our knowledge, no other study comprising such breadth in the upstream sector has been done recently in Ethiopia, or elsewhere.[1]

In contrast with other more negative assessments (e.g., AGRER, 2014), we find that there have been important positive changes in Ethiopia's upstream coffee sector. There has been increasing adoption of improved practices in production, harvest, and post-harvest management. The upstream marketing sector has become more competitive, and improved processing techniques have been on the rise. The adoption of these improved technologies is associated with improved productivity as well as better prices. However, there are growing challenges from diseases in the coffee sector and weather shocks, possibly driven by climate change, lack of access to improved seedlings, and limited access to savings institutions that limit uptake of these improved practices and the impacts they might have on farmers' productivity and incomes.

We also note that these changes have mostly been driven by local public initiatives, such as improved access to extension and local policy reform. This issue is often neglected in the international literature which has concentrated on

[1] There was a large survey done by the World Bank in 1987, but this information is largely outdated.

demand changes by consumers downstream in global value chains as drivers for transformation (e.g., Swinnen, 2007). In the case of Ethiopia, we find that these local policy effects actually are the major driver for change in this area, together with the enhanced incentives of high international prices. However, while progress has been made, coffee productivity and the share of income to farmers of final export prices is still low compared to international standards, and there is still significant room for improvement.

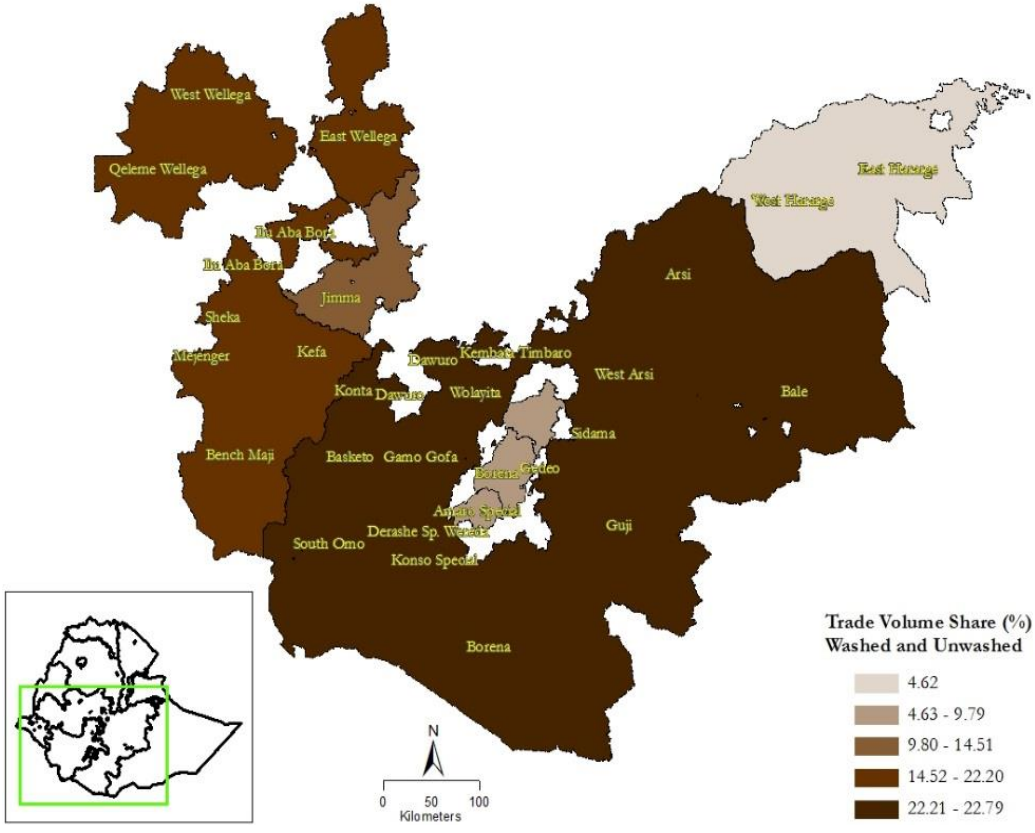
The structure of the paper is as follows. First, we provide some background information on the coffee sector in Ethiopia. In the third section, we describe data and methodology. In sections 4 and 5, we present the findings of changes in the coffee sector at the production level and in harvest, postharvest, and off-farm activities, respectively. We look at drivers and constraints to transformation in section 6, and we finish with the conclusions in section 7.

2. COFFEE IN ETHIOPIA

2.1. Coffee in Ethiopia's economy

Coffee production has an important place in the Ethiopian economy. Coffee is Ethiopia's most important export crop, accounting for 22 percent of Ethiopia's commodity exports in 2013/14 (NBE, 2014). Ethiopia is the biggest coffee exporter in Africa, accounting for 3 percent of the global coffee trade (ICO, 2014). It is estimated that coffee is cultivated by over 4 million primarily smallholder farming households in Ethiopia, and comprises an important source of livelihood for a large number of these often poor producers (CSA, 2013). There are further strong spatial patterns in coffee production as shown in Figure 2.1. Most coffee production is localized in the southern and south-western parts of the country. The eastern part (Harar) produces a premium coffee that is highly valued in the international market, and especially so in Middle Eastern countries, but the quantities that are produced are relatively low.

Figure 2.1: Map of the main coffee selling areas in Ethiopia

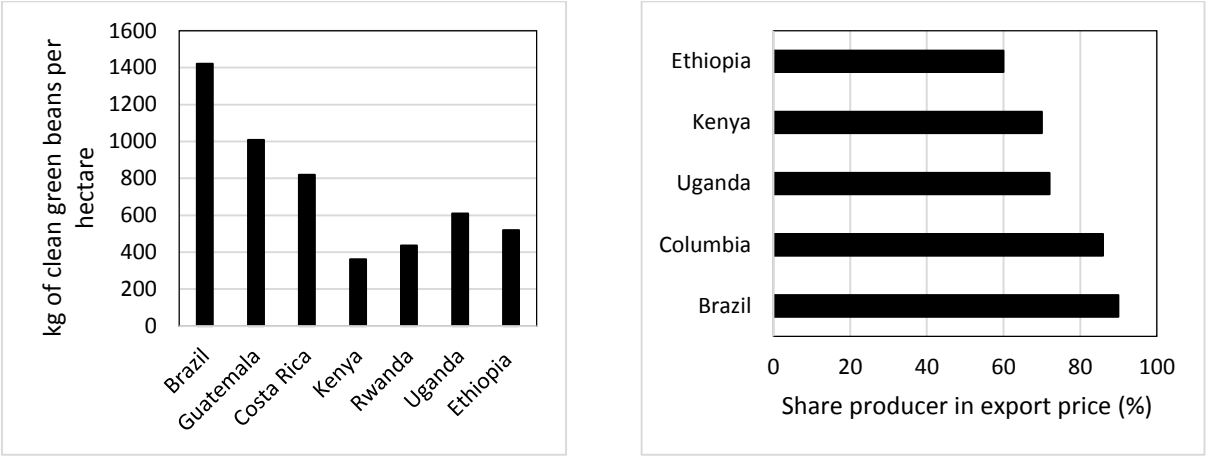


Source: Authors' calculations based on ECX data

In global markets, Ethiopian coffee is valuable because it is of the Arabica type and because of its unique taste (Adugna et al., 2008). However, despite these comparative advantages, certain measures indicate that the Ethiopian coffee sector is underperforming. First, coffee yields are relatively low (Figure 2.2). In the African context, Ethiopian yields are

slightly higher than in Kenya and Rwanda, but lower than in Uganda.[2] However, when compared with major Latin American producers, Ethiopian yields are only one-half to one-third of the level achieved in these countries. Second, Ethiopia's farmers obtain a smaller share of export prices compared to most other countries. In comparison to four other Arabica-producing countries, Ethiopian farmers earn the lowest share of the export price, at 60 percent of the export value. The shares in other countries range from 70 percent in Kenya to 90 percent in Brazil (Figure 2.2).

Figure 2.2: Ethiopia's coffee performance in international context, 2013

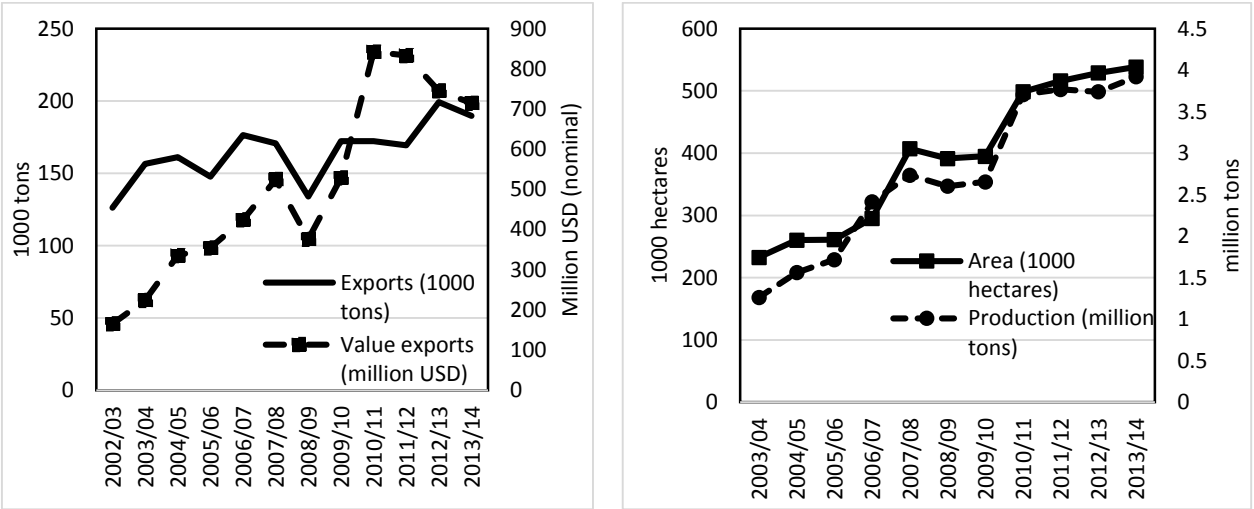


Source: FAOSTAT[3] for yield data and Technoserve (2014) for producer share

2.2. Changes in exports and policy

Coffee exports from Ethiopia have performed well over the last decade. In nominal USD terms, the value of coffee exports in 2013/14 was 113 percent higher than in 2004/05 (Figure 2.3). Most of that increase has been due to a significant rise in international prices of coffee (ICO, 2014). While quantities exported from Ethiopia increased over the last decade, from 161,061 tons in 2004/05 to 189,669 tons in 2013/14, they were only 18 percent higher in 2013/14 compared to ten years earlier. However, Figure 2.3 shows a large increase in national coffee production, as shown in national statistics. This has been a result mostly of increasing expansion of the coffee area, rather than through yield increases, as illustrated by the similar gradients in the production and area expansion curves over the last decade. By comparing the production and export figures further, these indicate the high level of consumption of coffee within Ethiopia, usually about half of the production.

Figure 2.3: Coffee export and production performance of Ethiopian smallholder coffee producers in the last decade



Source: Authors' calculations from NBE, 2014 and CSA, 2013

[2] It is to be noted that most Ugandan coffee is of the Robusta type, which often has higher yields than Arabica type coffee.

[3] http://faostat3.fao.org/home/E

In the last decade, there have been major policy changes in Ethiopia that have affected how coffee markets function upstream. First, from December 2008 onwards it became mandatory for private traders and rural processors to sell their coffee through the Ethiopian Commodity Exchange (ECX), a new modern commodity exchange.[4] ECX trades standard coffee contracts, based on a warehouse receipt system, with standard parameters for coffee grades, transaction size, payment, and delivery. The first level quality control is decentralized and undertaken in nine liquoring and inspection units in major coffee production areas.[5] The establishment of ECX has led to important changes in the structure of the coffee value chain (Gabre-Madhin, 2012). Before the establishment of ECX, there was no third-party quality control (except when exported) and all trade was centralized and sold through an auction system in Addis Ababa.

Second, primary market centers for coffee have been established in rural areas, primarily to make local markets more transparent and competitive. As stated in the proclamation passed in 2008[6], all coffee should be traded through these primary marketing centers, markets should be fenced with specific sheds for different buyers, and only licensed agents of traders and processors or cooperatives are allowed to buy coffee at these primary marketing centers. Moreover, in an effort to stimulate the sales of red cherries and so promote the exports of washed coffee, sales of dried cherries are forbidden during cherry harvesting periods in a number of regions, and particularly in those areas where washed coffee processors are located.

3. DATA AND METHODOLOGY

A survey of 1,600 coffee producers was fielded in the high coffee producing zones in the country during February 2014. To select the producers for the survey, the 12 biggest coffee producing zones in terms of area and production were stratified based on the coffee variety produced, using the classification for export markets (Sidama, Jimma, Nekemte, Harar, Yirgachefe). Within each of these five strata, woredas were ranked by total area of coffee production. Two woredas were randomly selected from the more productive half and two from the less productive half of woredas. A list of all the kebeles from these selected woredas was obtained, and data on their total area of coffee production was collected. Two kebeles were randomly selected from the more productive half of kebeles and two from the less productive half of kebeles in these woredas. Finally, a list of all coffee-producing households in the selected kebeles was compiled. These households were ranked from small to large coffee producers, based on area cultivated in the year before the survey. We divided the producers into two groups, the less productive and the more productive. 20 coffee producers in each kebele were then selected: 10 from the less productive group of producers and 10 from the more productive ones. In total, 16 kebeles were chosen in each of the survey strata, from which 20 coffee producers were selected for the survey sample. Thus, 320 producers were interviewed in each stratum, for a total sample size of 1,600 producers across the five strata.

For each coffee type strata, 60 coffee processors were interviewed. Processors were interviewed in the four woredas selected for the survey sample in each stratum, 15 processors were to be interviewed in each woreda. A list of all the wet mills, hullers, and cooperatives that process coffee in the woreda was obtained from the Cooperative and Marketing Office (CMO) or the Bureau of Agriculture (BoA). The processors were then divided in three categories: 1) wet mills; 2) dry mills; and 3) cooperatives. In each category, five were selected randomly. If five processors were not available in one particular category, they were replaced by other processors from the most prevalent type processor category in that woreda.

Notably, recall questions were strongly relied upon in the analysis. The recall questions were carefully fielded and were focused on main changes in the business of these value chain agents, and, therefore, concerned issues that likely were easy to remember. Nonetheless, we acknowledge that such recall questions are prone to measurement error (e.g., de Nicola and Giné, 2014; De Weerdt et al., 2014). Therefore the recall results are mostly used in descriptive analysis. We do not conduct regression analysis using these recall data.

Table 3.1 provides some descriptive statistics on the producers that were interviewed in the survey. As planned, about one-fifth of the respondents were situated in each of the five selected strata. The majority (94 percent) of the coffee farming households are male-headed and with an average household size of 6 members. Education levels are low. About 34 percent of the heads of households are estimated to not have any education, while 52 percent received some form of

[4] Producers who are exporters can bypass ECX, as can farmer cooperatives.

[5] Before the establishment of ECX, quality inspection was carried out in Addis Ababa.

[6] Coffee Quality Control and Marketing Proclamation, August 2008 , Preamble, Proclamation No. 602, Federal Negarit Gazeta, 14th Year, No 61

primary education. Table 3.1 further shows that producers in our sample own on average 1.8 hectares of land.[7] Half of that land is used for coffee production. There is seemingly little rental activity and most of the owners cultivate the coffee plots themselves. The relative share of land dedicated to coffee is reflected in its importance for agricultural income. About half of the total agricultural income (including the value of auto-consumption) of these farmers comes from coffee. Average annual coffee income in 2013 amounted to 9,737 Birr (or 510 USD)[8]. This compares to an overall income of 25,577 Birr (or 1,353 USD). Off-farm income is also important for these households as it makes up on average the equivalent of half their coffee income. With respect to location, households live on average 51 minutes away from an all-weather road, two hours from the administrative center of the woreda, and one hour from input distributors.

Table 3.1: Descriptive statistics of coffee producers interviewed for study

	Unit	Sidama	Yirgachefe	Jimma	Nekemte	Harar	TOTAL
Number of observations	no.	320	320	318	320	320	1,598
Household characteristics							
Size of family	members	7.1	7.2	6.1	5.3	6.7	6.1
Head of households are male	share	0.97	0.95	0.94	0.93	0.95	0.94
Education level of head of household							
- None	share	0.23	0.26	0.42	0.29	0.49	0.34
- Other	share	0.06	0.05	0.03	0.03	0.11	0.05
- Primary	share	0.64	0.56	0.47	0.56	0.39	0.52
- Secondary	share	0.06	0.10	0.07	0.09	0.02	0.07
- Tertiary	share	0.01	0.04	0.02	0.03	0.00	0.02
Household economy							
Off-farm income	birr	4,147	7,366	6,560	2,998	4,125	5,037
Total income	birr	26,118	32,221	25,796	16,445	24,004	25,577
Total agricultural income	birr	21,971	24,855	19,237	13,447	19,879	20,540
Total coffee income	birr	12,893	12,137	9,517	6,538	7,099	9,637
Land							
Total land owned in hectares	ha	1.70	1.99	2.25	1.68	0.95	1.79
Coffee area owned in hectares	ha	0.98	1.09	1.08	0.86	0.33	0.92
Cultivated coffee area in hectares	ha	1.01	1.10	1.08	0.88	0.33	0.93
Location							
Travel time to							
… the nearest dry season road	minute	11.6	11.0	19.9	18.6	26.9	17.4
… the nearest all weather road	minute	89.5	38.7	40.1	45.8	57.1	51.4
… the woreda administrative center	minute	131.7	102.0	123.0	121.5	98.1	119.1
… the nearest agricultural coffee cooperative	minute	57.4	56.9	82.4	55.8	61.2	62.8
… the nearest agricultural cooperative that distributes agri-inputs	minute	101.0	65.2	55.4	49.4	51.3	60.6

Source: Authors' calculations based on ESSP's coffee producer survey 2014

4. DYNAMICS IN PRODUCTION PRACTICES

4.1. Reported changes

Table 4.1 illustrates that there have been significant improvements in coffee management practices over the last ten years. Compost was used on 2 percent of the land ten years before the survey, but that increased to 9 percent at the time of the survey. The practice of mulching and pruning also became much more prevalent in the last decade. 22 percent and 16 percent did mulching and pruning, respectively, ten years before the survey, but that percentage had increased to 44 percent and 37 percent, respectively, of farmers at the time of the survey. Stumping[9] of trees was not widely practiced, tilling increased slightly, and the number of times that a plot was weeded did not change over time.

[7] Given that we sampled according to productive area, larger farmers are oversampled and averages are therefore higher than what would be found from a survey where coffee farmers would be selected randomly.

[8] Using the exchange rate of June 2013 of 18.9 Birr per USD.

[9] Trees that are less productive after a number of years are cut at the bottom of the stem and the stem is allowed to regrow (this usually results in non-productivity for a couple of years, but higher productivity after this time)

Table 4.1: Changes in production

	Unit	At the time of the survey						Ten years earlier					
		Sidama	Yirga-chefe	Jimma	Nekemte	Harar	TOTAL	Sidama	Yirga-chefe	Jimma	Nekemte	Harar	TOTAL
Improved management practices													
Stumped trees	% trees	2.2	1.7	3.0	2.3	4.7	2.6	0.6	0.5	1.4	1.7	2.3	1.3
Mulching	% yes	71.6	45.6	62.3	20.9	60.3	45.4	18.4	17.8	33.0	12.2	48.1	21.8
Pruning	% yes	57.2	45.6	43.7	13.4	72.2	36.7	20.3	11.6	20.1	3.8	58.4	15.7
Compost use	% area	28.6	11.4	0.9	1.7	27.9	9.2	4.8	2.0	0.0	0.4	7.7	1.8
Tillings	% yes	90.9	72.2	53.5	82.2	100.0	76.7	81.6	65.3	40.9	81.9	99.4	71.1
Number of weedings	number	2.8	2.4	1.9	1.6	3.5	2.1	2.4	2.1	1.5	1.5	3.6	1.9
Modern input use													
Improved seedlings	% area	22.3	15.2	46.1	29.0	48.4	31.8	11.6	10.0	36.5	23.8	45.0	24.7
Chemical fertilizer used	% farmers	0.9	0.3	1.3	0.0	25.6	2.5	0.6	0.9	0.9	0.3	10.3	1.4
Herbicide use	% yes	0.3	0.0	3.1	0.9	4.4	1.5	0.9	0.0	1.6	0.3	5.3	1.1
Pesticide/fungicide use	% yes	0.6	0.3	0.3	0.0	2.8	0.4	1.9	0.6	2.5	0.3	5.9	1.6
Shocks, diseases and climate													
For every good year,													
- One bad year	% farmers	76.6	41.3	49.1	20.6	30.9	40.0	68.4	47.5	45.3	29.7	41.9	43.0
- Two bad years	% farmers	20.9	50.0	43.4	35.9	49.4	38.2	15.3	44.4	41.8	42.5	43.8	38.3
- Other	% farmers	0.6	5.0	6.6	32.5	17.8	16.3	0.3	1.9	6.3	12.2	11.9	7.5
- No difference between years	% farmers	1.9	3.8	0.9	10.9	1.9	5.4	15.9	6.3	6.6	15.6	2.5	11.2
Diseases are a problem:													
- Big problem	% farmers	30.0	39.7	43.1	26.3	66.3	35.8	22.5	19.7	23.9	28.4	22.2	24.7
- Small problem	% farmers	35.0	36.6	48.7	53.8	22.5	44.8	34.7	32.5	58.8	55.9	51.9	49.8
- No problem	% farmers	35.0	23.8	8.2	20.0	11.3	19.4	42.8	47.8	17.3	15.6	25.9	25.5
Yields (in whole dried cherries)													
Average	kg/ha	847	715	1,047	566	677	756	719	658	1,008	1,094	1,161	961
Median	kg/ha	800	500	1,000	400	523	600	700	600	1,000	1,000	1,000	800

Source: Authors' calculations based on ESSP's coffee producer survey 2014

When we look at the use of modern inputs, we see an increase in the number of farmers that were using improved seedlings from 25 percent to 32 percent. However, the use of chemical inputs in coffee production is very low.[10] One and 2 percent of farmers reported using herbicides and fungicides, respectively, and that seems to have changed very little over time. Also, fertilizer use changed very little over the decade. The low use of modern inputs might have been driven in part by a deliberate government policy that discourages chemicals in the coffee sector, especially by smallholders. The government's desire is to keep coffee production organic for national reputation purposes, although few farmers have actually become certified for organic production (Minten et al., 2015).[11]

Table 4.1 further shows that (perceived) yields are low (7.5 quintals per hectare expressed in whole dried cherries, equivalent to 3.75 quintals of clean green beans[12]). Compared to ten years earlier, yields increased slightly in Sidama, Yirgachefe, and Jimma, but they decreased dramatically in Harar and Nekemte.[13] This seems likely linked to the increasing prevalence of diseases in these areas and to changes in climatic conditions. While 25 percent of farmers stated that diseases were not a problem ten years earlier, this percentage declined to 19 percent at the time of the survey. On the other hand, 26 percent of farmers described diseases as a big problem ten years before the survey, but that share increased to 35 percent during the survey. The problem of disease has become especially prevalent in the Harar area. As explained later in this paper, the low productivity in the year of the survey in Nekemte is seemingly explained by late rainfall there.

Moreover, coffee trees in Ethiopia are often stated to have a bi-annual production cycle (AGRER, 2014), with 39 percent of the farmers believing this to be the case. However, the frequency of bad years seems to be increasing over time with 38 percent expressing that there are two bad years for every good year, and 17 percent expressing that good years are even more infrequent. During the year of the survey, 73 percent of the plots were considered to be in a year of low-productivity (not shown in table). AGRER (2014) argues that these changes in production cycles might be linked to climatic changes.

4.2. Associates of improved technology adoption

Given the presumed importance of adopting new technologies in order to improve productivity, in this section we aim to develop greater understanding of their uptake. Farmers were asked to indicate if they adopted any of the improved agricultural technologies that have been promoted by the government, and if so, in which year their adoption started. We see a significant change in the adoption of these technologies over the last decade (Figure 4.1). Changes in adoption rates over the last decade hovered between 20 and 30 percent for almost all of the promoted improved technologies. The lowest rate of adoption is noted for compost use, while the highest is for weeding.[14]

[10] Fertilizer use is relatively high in Harar where 26 percent of farmers reported use of chemical fertilizer on coffee plots. This might be driven by relative high incentives for fertilizer use because of relatively high coffee prices in Harar, and because of the destination markets for this coffee (Middle East) where there is seemingly less concern and less rewards for the use of organic practices.

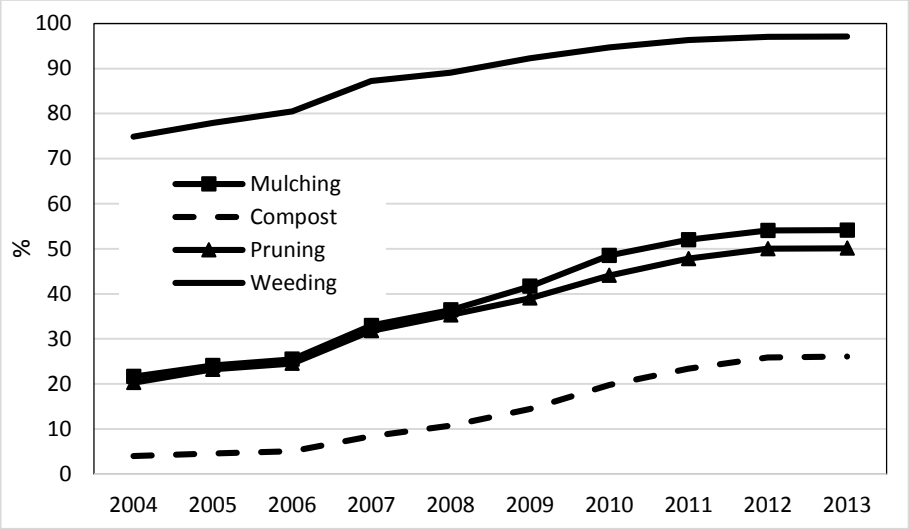
[11] 29 percent of farmers in our survey state that it is forbidden to use chemical fertilizer on coffee in their *kebele*.

[12] ICO recommends as a conversion factor 50 kg of clean green beans from 100 kg of whole dried cherries. See http://www.thecoffeeguide.org/coffee-guide/world-coffee-trade/conversions-and-statistics/?menuID=1585

[13] This decline in production is confirmed with ECX data. Compared to 2010, the volume of Harar coffee traded in ECX decreased by about 56 percent, while Wollega/Nekempt coffee decreased by about 44 percent.

[14] Note that there are differences between Table 3.1 and Figure 4.1. In the case of compost use and weeding, this is explained by the difference in outcome measures – area versus share of farmers for compost use; and number of times versus share of farmers for weeding.

Figure 4.1: Adoption of improved production technologies



Source: Authors' calculations based on ESSP's coffee survey 2014

In Table 4.2, we present the results of a regression of a number of associates on the adoption of improved technologies in coffee production. We use, as the dependent variable for probit regressions a dummy variable that equals one in the case of take-up at the time of the survey and zero otherwise, while for tobit regressions we use the share of area allocated to improved practices. We put a number of possible explanatory variables (household and plot characteristics, remoteness, and wealth measures) that may be associated with the adoption of these improved practices. A number of patterns emerge from the results of these regressions.

Visits by extension agents are unanimously associated with the adoption of improved practices. In three cases, coefficients are significant (two at the 5% level and one at the 10% level). While it has been argued that extension agents have been overly focused on cereals and have given little attention to the coffee sector (AGRER, 2014), the results indicate that the presence of extension agents often influenced change in the coffee sector. As shown in a number of other settings, the distance between the plot and the household's residence, is strongly and negatively associated with the adoption of improved practices (Pender and Gebremedhin, 2008). Its coefficient is negative in the models for all six improved practices considered and significant for five of them. Except for the use of pruning, forest and semi-forest cultivation is also linked with lower adoption of these improved practices, as could be expected. Richer households are significantly more likely to adopt improved practices, possibly as they have easier access to labor and liquidity, which are needed to adopt some of these improved practices. Improved land titling is often expected to lead to more investments and to the adoption of improved practices, but it is only positively related to adoption in three out of six improved technologies, and only significant in two of them. Therefore, it seems an unlikely major factor for the adoption of improved practices in coffee production, possibly linked to the lower prevalence of perceptions of land insecurity in these areas (Ghebru et al., 2015). Larger plots are generally also associated with higher adoption rates of improved practices.

Table 4.2: Producer characteristics associated with the adoption of new coffee production technologies

		Compost use		Improved varieties		Pruning		Mulching		Weeding		Tilling	
	Unit	**Coef.**	**t-value**	**Coef.**	**t-value**	**Coef.**	**z-value**	**Coef.**	**z-value**	**Coef.**	**z-value**	**Coef.**	**z-value**
Household characteristics													
Gender of head of household	1=male	-21.04	-1.20	3.22	0.26	0.06	0.47	-0.22	-1.92	-0.52	**-2.41**	-0.14	-1.01
Age of head of household (hh)	years	-3.75	**-2.49**	-0.59	-0.60	-0.01	-1.08	0.00	0.01	-0.02	-1.06	-0.01	-0.85
Age of head of hh squared	years	0.03	**2.08**	0.00	0.04	0.00	0.61	0.00	-0.10	0.00	0.97	0.00	0.00
Maximum schooling in hh	years	-3.50	**-2.20**	0.99	1.13	0.01	1.25	-0.02	-1.77	-0.01	-0.68	0.01	0.76
Size of household	number	7.19	**3.07**	-2.75	**-2.07**	0.02	1.45	-0.02	-1.29	-0.07	**-3.49**	0.00	-0.19
Dependency ratio	number	8.74	0.33	1.50	0.10	-0.22	-1.40	0.33	**2.13**	0.29	1.35	0.07	0.42
Visited by extension agent	1=yes	41.48	**4.46**	10.96	**2.00**	0.06	1.16	0.08	1.46	0.15	1.94	0.10	1.60
Plot characteristics													
Distance from plot to residence	log(minutes)	-21.81	**-5.23**	-11.21	**-4.90**	-0.06	**-2.61**	-0.07	**-2.85**	-0.03	-0.79	-0.05	**-1.99**
Forest or semi-forest cultivation	1=yes	-55.11	**-2.38**	-35.58	**-3.56**	0.39	**3.77**	-0.19	-1.90	-0.30	**-2.30**	-0.38	**-3.40**
Fertile soil	1=yes	30.19	**3.17**	20.54	**3.61**	0.05	0.85	-0.10	-1.75	-0.20	**-2.35**	0.06	0.93
Sloped plot	1=yes	-8.09	-0.87	8.43	1.61	0.13	**2.32**	0.09	1.71	0.07	0.90	0.13	**2.17**
Black soil	1=yes	4.61	0.49	-0.81	-0.15	0.02	0.39	0.10	1.77	0.33	**3.72**	0.05	0.77
Certified plot	1=yes	-16.93	-1.54	-12.14	-1.72	0.17	**2.52**	-0.01	-0.12	0.22	**2.11**	0.13	1.62
Area of plot	log(hectares)	37.44	1.78	13.74	1.17	0.47	**3.85**	0.01	0.07	0.82	**3.25**	0.56	**4.16**
Remoteness and wealth characteristics													
Distance to all season road	log(minutes)	-4.03	-1.13	-6.91	**-3.30**	0.09	**4.03**	0.09	**3.90**	0.07	**2.37**	0.04	1.81
Distance to woreda center	log(minutes)	6.22	0.93	-12.40	**-3.39**	-0.01	-0.21	0.06	1.44	-0.15	**-2.69**	-0.05	-1.05
Value of assets	log(birr)	6.23	1.67	5.57	**2.61**	0.01	0.45	0.11	**4.83**	0.10	**3.03**	0.11	**4.49**
Value of livestock	log(birr)	2.80	1.61	0.54	0.50	0.00	-0.15	-0.01	-1.23	-0.01	-0.36	0.00	0.23
Land owned	log(hectares)	-0.64	-0.08	12.40	**2.82**	0.02	0.38	-0.01	-0.16	0.06	0.92	-0.11	**-2.24**
Woreda dummies		included		included		included		included		included		included	
Intercept		-184.42	**-2.68**	35.46	0.87	-0.95	**-2.20**	-1.49	**-3.42**	1.64	**2.46**	1.18	**2.34**
Type of regression		Tobit		Tobit		Probit		Probit		Probit		Probit	
Number of observations		3,129		3,043		3,133		3,133		2,985		3,034	
Pseudo-R^2		0.17		0.07		0.20		0.23		0.26		0.33	

Note: Robust standard errors. T-values and z-values that are statistically significant at the 5% level are bold formatted.

Source: Authors' calculations based on ESSP's coffee producer survey 2014

4.3. Improved technologies and coffee productivity

In an effort to further understand how the increasing adoption of improved technologies contribute to higher coffee productivity, we present in Table 4.3 a fixed effect and a random effects Cobb-Douglas production function for coffee, using the logarithm of the yields measured in whole dried cherries per hectare as the dependent variable.[15] The results show that the characteristics of trees and density of trees per hectare are important determinants of coffee productivity. The more trees per hectare, the higher the productivity, but there is some curvature in that relationship, as shown by the negative coefficient on the squared number of trees variable. The latter result reflects that assuring an appropriate distance between trees is often presumed to be an issue in Ethiopia's coffee production, with extension agents incorporating this message into their mantra. Improved varieties are also shown to have a large impact on productivity. Increasing the share of improved trees from 0 to 100 percent is estimated to result in a doubling of coffee yields. Unproductive trees – because they are too old or too young, or because they have recently been stumped – have an important negative effect on productivity, as might have been expected. These effects are consistent in both the fixed and the random effects models.

We further look at the effect of improved management practices (application of compost and manure, weeding, pruning, mulching, and tilling) and modern input use (chemical fertilizer use). All these practices are positively associated with improved productivity, but the coefficients are not always significant at conventional statistical levels. However, compost use and weeding are significant in both specifications. While mulching and tilling are positively related to increased productivity, their coefficients are not significant in either model specification.

We also include a number of variables that measured shocks in the year of coffee production. We asked farmers to indicate if rains were late or scarce, if there were hailstorms and frosts, if there were more or less diseases than normal, and if there were losses because of animals (e.g., monkeys). The results show that disease shocks especially lead to important significant negative impacts on coffee productivity. While other shocks are mostly associated with negative effects on productivity, they are not significant at conventional statistical levels.

Finally, if community and household characteristics are included in the random effects model, higher altitudes are found to be characterized by lower productivity. We also note the differential impact of the timing of rainfall on productivity, i.e., good in March-April, versus bad in May-June, versus good in August-October. This is seemingly linked to providing a conducive environment for coffee flowering and maturing (Adugna et al., 2008).

Overall, we find that there have been improvements in the last decade in the adoption of improved coffee production practices, such as mulching, pruning, compost use, and weeding. Improved practices have been adopted especially on less remote plots and by farmers who have been exposed to the knowledge of extension agents. We also find that the adoption of these improved practices is associated with higher coffee productivity. In the next section, we look at the adoption of improved practices post-production and at their impact on price formation.

[15] Fixed-effect production functions have advantages over other specifications in that they control for unobserved heterogeneity at the household level. This might possibly be linked with the dependent variable. They therefore produce consistent parameter estimates (Wooldridge 2010). However, as a fixed effect model removes the household effect which might provide additional information, we also run a random effects model.

Table 4.3: Determinants of coffee productivity

		Fixed effect		Random effect	
Dependent variable: **log(yield)**	**Unit**	**Coef.**	**t-value**	**Coef.**	**t-value**
Production inputs					
Area of plot	log(hectares)	-0.069	-0.320	-0.221	-1.600
Trees per hectare	number	0.180	**6.550**	0.123	**6.160**
Trees per hectare squared	number	-0.004	**-5.260**	-0.003	**-4.380**
Share improved varieties	share	0.005	**2.850**	0.005	**4.530**
Share unproductive trees	share	-2.617	**-11.450**	-2.118	**-11.260**
Use of chemical fertilizer	1=yes	0.456	0.560	0.726	**2.660**
Share of trees composted	share	0.007	**2.280**	0.003	**2.200**
Manure	1=yes	0.360	1.660	0.281	**2.430**
Weeding	1=yes	0.694	**2.760**	0.361	**2.050**
Pruning	1=yes	0.453	1.620	0.374	**3.900**
Mulching	1=yes	0.271	0.880	0.143	1.420
Tilling	1=yes	0.268	1.590	0.121	1.200
Shocks					
Rains were … compared to normal (less=default)					
… more	1=yes	2.602	**3.020**	0.083	0.570
… normal	1=yes	0.698	1.210	0.279	1.820
The rains were … than normal (earlier=default)					
… later	1=yes	-0.155	-0.200	-0.051	-0.360
… normal	1=yes	-0.434	-0.650	0.057	0.450
Beans were affected by hailstorms or frosts … than normal (less=default)					
… more	1=yes	-0.930	-1.420	-0.062	-0.360
… normal	1=yes	-1.595	**-3.120**	-0.038	-0.250
Beans were affected by pests or diseases … than normal (less=default)					
… more	1=yes	-0.872	**-2.010**	-0.401	**-2.540**
… normal	1=yes	-1.917	**-4.500**	-0.950	**-5.830**
More or less loss because of animals than normal (less=default)					
… more	1=yes	-0.062	-0.160	0.298	1.660
… normal	1=yes	-0.646	-1.720	0.119	0.740
Fertile soil	1=yes	0.263	**2.280**	0.163	1.920
Sloped plot	1=yes	-0.012	-0.130	0.070	0.920
Black soil	1=yes	-0.033	-0.300	-0.057	-0.710
Household and community characteristics					
Altitude	log(meters)			-0.942	**-2.070**
Precipitation March-April 2005	log(mm)			3.415	**13.650**
Precipitation May-June 2005	log(mm)			-4.769	**-6.560**
Precipitation August-October 2005	log(mm)			3.711	**5.730**
Gender of head of household	1=male			0.330	1.480
Age of head of hh	years			0.023	1.520
Age of head of hh squared	years			0.000	-1.740
Maximum schooling in hh	years			0.034	**2.250**
Size of household	number			-0.061	**-3.070**
Distance from plot to residence	log(minutes)			-0.048	-1.450
Distance to all season road	log(minutes)			0.020	0.570
Distance to woreda center	log(minutes)			-0.176	**-2.740**
Intercept		4.871	**4.650**	6.969	**2.020**
Number of observations		3,208		3,207	
Number of groups		1,557		1,557	
R-sq within		0.26		0.23	
R-sq between		0.02		0.27	
R-sq overall		0.05		0.30	

Note: Robust standard errors. T-values that are statistically significant at the 5% level are bold formatted.

Source: Authors' calculations based on ESSP's coffee producer survey 2014

5. DYNAMICS IN HARVEST, POST-HARVEST AND OFF-FARM PRACTICES

5.1. Harvest and post-harvest

Relying on assessments by farmers and coffee processors, we find that there have been important improvements in the adoption of harvest and post-harvest practices in the last decade. These changes have led to better quality coffee. While the share of green cherries in the coffee harvest was as high as 11 percent ten years before the survey, this was estimated to have declined to only 4 percent at the time of the survey (Table 5.1). The lower share of green cherries likely is linked to improved harvesting methods, as ten years earlier, 35 percent of the farmers reported using stripping methods for harvesting. This practice, however, had declined to 5 percent at the time of the survey. On the other hand, selective harvesting was practiced by 26 percent of the coffee farmers ten years before the survey, but the use of this practice increased to 82 percent of farmers at the time of the survey. Post-harvesting practices improved significantly as well. While almost 60 percent of farmers would dry their cherries on the bare ground ten years before the survey, currently 77 percent and 17 percent of the farmers dry cherries on traditional beds or on a mat/plastic on the ground, respectively. Processors' assessments on changes in this area are in line with those of the farmers.[16] The improved drying methods are also associated with an increase in quality of exported natural coffee (Minten et al., 2014).[17]

Farmers were further asked to recollect the date on which they started using these improved harvest and post-harvest practices. The results are presented in Figure 5.1. Little changes were noted in the period from 2004 until 2006, but large changes in improved harvesting and drying methods have gradually occurred since this time.

Table 5.1: Changes in coffee harvest and post-harvest practices

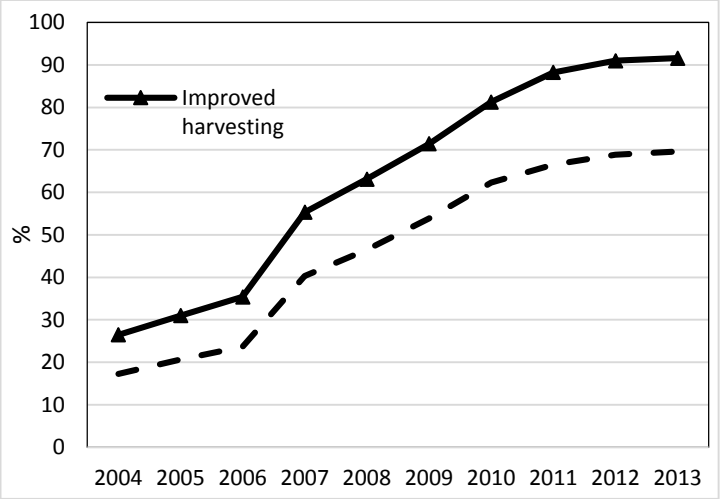
		At the time of the survey						Ten years earlier					
	Unit	Sidama	Yirga.	Jimma	Nekem.	Harar	TOTAL	Sidama	Yirga.	Jimma	Nekem.	Harar	TOTAL
Harvest practices													
Share of green cherries in coffee harvest	%	3.0	5.5	1.6	5.3	2.9	3.9	12.7	15.2	9.7	11.0	6.9	11.2
Stripping of cherries:													
- All	% farmers	2.5	5.0	0.9	4.1	11.6	3.8	26.9	34.1	30.5	33.8	40.6	32.4
- Partly	% farmers	10.6	20.6	1.6	13.1	24.1	11.8	46.3	50.0	27.4	40.6	43.1	39.8
- Selective harvest only	% farmers	86.9	74.4	97.5	82.8	64.4	84.5	26.9	15.9	42.1	25.6	16.3	27.8
Harvest earlier because of fear of theft	% farmers	6.3	6.6	0.3	10.6	1.9	6.2	5.6	5.6	9.7	9.4	2.8	7.9
Harvest earlier because of fear of monkeys	% farmers	1.9	5.0	11.9	6.3	2.2	6.4	2.2	4.4	12.9	7.8	5.3	7.5
Post-harvest practices													
Type of drying:													
- Traditional drying beds	%	53.4	59.7	91.5	99.1	6.6	77.4	11.9	20.6	37.4	36.3	0.6	27.8
- On a mat or plastic on the ground	%	35.0	31.9	0.9	0.9	77.2	16.5	13.8	28.8	2.8	1.3	13.1	8.2
- On bare ground	%	5.6	5.3	1.3	-	11.3	2.8	65.6	47.5	56.3	60.3	80.6	60.1
- Other	%	2.5	3.1	6.0	-	4.7	2.6	7.2	3.1	1.9	2.2	5.6	3.3

Source: Authors' calculations based on ESSP's coffee producer survey 2014

[16] 70 percent of processors agreed with the statement "The drying practices of farmers have improved over time; quality of whole dried cherries is better now than ten years ago"; 56 percent disagreed with the statement "The quality of cherries supplied by the farmers is declining over time", and 68 percent disagreed with the statement "There is more stripping now than before".

[17] Minten et al. (2014) show that for the unwashed bean market segment, the share of the worst quality coffee (grade 5) has been decreasing slightly over time, while the share of the better grade 4 has been increasing slightly. In 2006/07, 24 percent of unwashed coffee was grade 4, but this increased to 31 percent in 2012/13.

Figure 5.1: Increase in adoption of improved coffee harvest and post-harvest technologies, 2004 - 2013



Source: Authors' calculations based on ESSP's coffee survey 2014

5.2. Marketing

Given the start-up of ECX in 2008 and the new marketing proclamation, we also note large changes with respect to the marketing practices of coffee farmers. As a result of ECX, farmers now have better access to price information than before. 53 percent of the farmers stated that they had no access to price information from the radio ten years before the survey. That declined to 33 percent at the time of the survey (Table 5.2). Similar trends showing improvement are observed with farmers that have access to price information from wholesale markets (through auctions until 2008 and then through ECX from 2009 onwards). However, despite the significant efforts in dissemination, a large number of farmers (77 percent) still do not have access to price information from ECX.

Upstream marketing performance, as measured along a number of dimensions, seems to have improved. There was significantly more trust of traders with respect to weighing at the time of the survey than ten years earlier (53 versus 42 percent of farmers). More farmers reported that they received a premium for better quality coffee at the time of the survey than before, although the share of farmers stating that no premium is available at all for coffee is still surprisingly high at 90 percent.[18] Furthermore, farmers have more choice in traders to sell to and walk a shorter distance to conduct their sales. 27 percent of farmers stated that they had a lot of choice between traders ten years before the survey. The share of farmers stating this increased to 66 percent at the time of survey. 23 percent of farmers stated that they had no choice ten years ago, and this share declined to 6 percent at the time of the survey. We thus note significantly more competition in these coffee markets. Moreover, farmers have a shorter distance to walk to their place of sales. In the case of selling cherries, they have to walk on average 27 minutes to sell their cherries. Ten years earlier, this travel time was 43 minutes on average. In the case of red cherries, these travel times are 84 and 61 minutes, respectively. These changes might have been partly driven by the establishment of primary marketing centers.

As expected, we also see a significant changes in the place of sales with more sales being conducted at rural primary marketing centers. However, we see strong heterogeneity in the implementation of the proclamation by form of the coffee product and by region. In the case of red cherries, we find that primary marketing centers have become rather important, accounting for 56 percent of all sales at the time of the survey. 20 percent of the farmers used the village trader, while 14 percent went directly to the mill. Table 5.2 shows that the primary marketing centers are especially important in the Yirgachefe and Sidama areas. In the case of dried cherries, it is worth noting that the primary marketing center as the place for coffee transactions is much less important – only 22 percent of dried cherries are sold there. The regular markets (44 percent) and the village trader (26 percent) are much more important market channels for dried cherries.

[18] Rather than giving premiums to better quality cherries, buyers often require farmers to sort out green and defect cherries. Once this is done, prices are often not differentiated.

Table 5.2: Changes in coffee marketing practices

		At the time of the survey						Ten years earlier					
	Unit	Sidama	Yirga.	Jimma	Nekem.	Harar	TOTAL	Sidama	Yirga.	Jimma	Nekem.	Harar	TOTAL
Access to information													
Farmer has access to price information on radio													
- A lot	% farmers	27.2	18.4	25.5	31.9	25.9	27.3	9.4	7.2	14.2	13.1	12.5	11.9
- A little	% farmers	40.3	34.4	38.1	36.6	48.4	38.2	34.1	32.8	35.9	33.1	44.1	34.8
- No access	% farmers	32.5	47.2	36.5	31.6	25.6	34.5	56.6	60.0	50.0	53.8	43.4	53.3
Farmer has access to price information from auction/ECX													
- A lot	% farmers	9.1	2.8	6.3	7.5	11.3	7.1	2.2	0.6	1.6	2.5	5.0	2.2
- A little	% farmers	20.3	5.6	10.4	7.8	20.6	11.2	11.6	3.8	6.3	7.2	11.3	7.5
- No access	% farmers	70.6	91.6	83.3	84.7	68.1	81.7	86.3	95.6	92.1	90.3	83.8	90.3
The farmer trust the weighing of trader	% farmers	48.8	57.8	37.3	62.5	59.4	53.4	40.0	47.8	28.8	45.3	57.8	41.8
Better quality gets a premium													
- A lot	% farmers	10.6	8.8	1.0	0.6	0.9	3.4	5.0	1.3	1.3	0.3	1.3	1.5
- A little	% farmers	14.1	8.4	9.2	2.5	5.3	7.0	9.4	10.0	7.9	1.3	3.4	5.5
- No premium	% farmers	75.3	82.8	89.9	96.9	93.8	89.6	85.6	88.8	90.9	98.4	95.3	93.0
Market transactions													
Place of sales of red cherries:													
- Primary marketing center	% farmers	80.0	77.7	14.2	0.0	0.0	56.2	1.2	4.9	3.4	0.0	0.0	2.7
- Regular market	% farmers	2.9	3.1	10.6	51.9	49.6	8.2	13.7	34.2	22.6	100.0	66.5	25.8
- Village trader	% farmers	6.8	6.5	48.8	35.6	38.7	20.1	14.4	35.0	50.6	0.0	26.7	31.3
- Site of mill	% farmers	10.3	10.8	23.5	12.5	2.1	13.8	70.7	24.2	21.3	0.0	0.7	38.8
- Other	% farmers	0.0	1.9	2.9	0.0	9.6	1.6	0.0	1.8	2.1	0.0	6.1	1.4
Walking time to sell red cherries	minutes	35.4	21.8	20.0	21.3	22.7	26.9	55.7	35.5	26.9	120.0	43.4	41.9
Place of sales of dried cherries:													
- Primary marketing center	% farmers	21.8	38.5	33.8	13.0	0.0	21.4	1.0	2.1	4.8	1.4	0.0	2.1
- Regular market	% farmers	38.8	21.0	39.3	53.3	57.9	44.0	73.6	58.9	72.3	70.8	72.8	70.2
- Village trader	% farmers	38.9	32.9	19.9	19.9	36.4	25.8	17.5	34.5	16.6	15.5	24.0	19.2
- Site of mill	% farmers	0.5	5.4	3.8	6.2	2.2	4.3	7.9	3.5	3.5	2.7	0.8	3.6
- Other	% farmers	0.0	2.2	3.2	7.7	3.5	4.4	0.0	1.1	2.7	9.6	2.4	4.8
Walking time to sell dried cherries	minutes	57.6	31.3	63.1	71.3	51.0	60.4	100.5	60.5	72.7	92.3	80.0	84.1
Farmer has the choice between traders:													
- A lot	% farmers	80.3	77.5	62.7	67.0	62.9	69.1	31.4	35.5	23.0	24.3	26.4	26.7
- A little	% farmers	17.5	16.3	26.1	29.3	34.4	25.5	51.8	44.2	58.4	45.0	62.5	50.3
- No choice	% farmers	2.2	6.2	11.3	3.7	2.8	5.4	16.8	20.3	18.7	30.7	11.1	22.9
Access to cooperatives													
For red cherries selling farmers:													
Farmer has the option to sell to cooperatives	% farmers	71.2	71.4	40.7	100	0.0	61.3	68.8	71.9	42.0	0.0	0.0	56.7
For dried cherries selling farmers:													
Farmer has the option to sell to cooperatives	% farmers	9.9	26.3	9.3	16.1	27.7	15.9	4.5	6.7	9.3	7.7	4.9	7.2
Share of cooperatives in total sales													
- Of red cherries	%	49.4	35.4	20.0	16.3	1.6	34.0	54.3	28.2	21.7	0.0	1.9	33.1
- Of dried cherries	%	1.4	5.0	2.7	1.5	5.7	2.6	0.6	0.7	3.7	0.5	0.8	1.3
- Of all coffee	%	31.9	19.4	6.8	1.7	6.0	10.6	22.9	9.5	7.4	0.5	0.9	6.7

Source: Authors' calculations based on ESSP's coffee producer survey 2014

With respect to marketing, more output sale channels are coming up as shown by increasing access to cooperatives. These cooperatives have been promoted by government and other stakeholders. 60 and 16 percent of the farmers that sold red and dried cherries, respectively, had the option to sell them to cooperatives. This compares to 56 and 6 percent, respectively, ten years earlier (Table 5.2). While cooperatives are increasing their market presence, their share in the market is still relatively small. It is estimated that of all the coffee sold in Ethiopia in the year of the survey, 11 percent

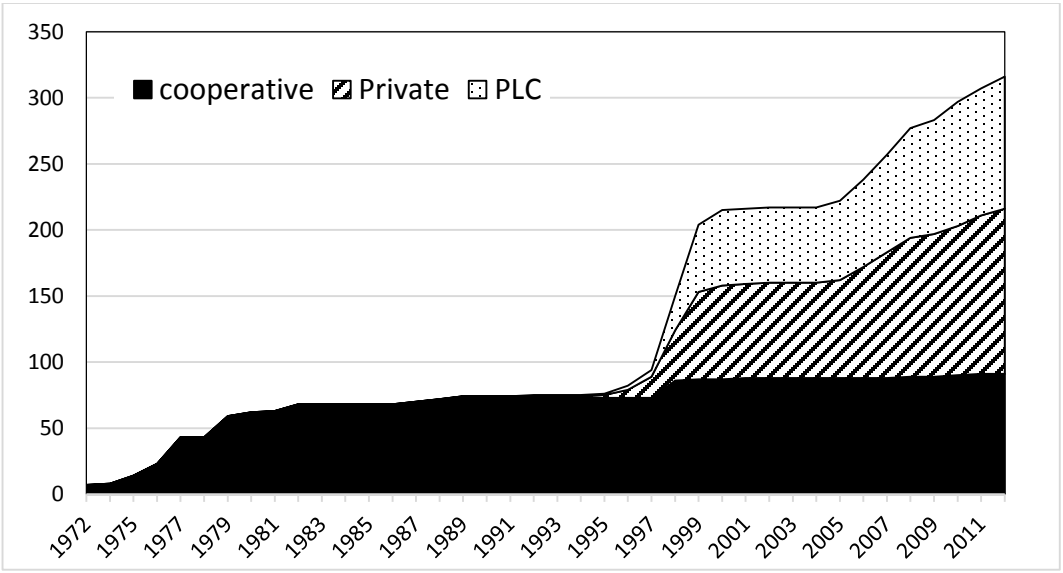
was sold to cooperatives. Their market share in red cherries, however, is high – it is estimated that cooperatives purchase about one-third of the red cherries in the country. While cooperatives, as well as a number of the commercial farmers, are the only suppliers that can accommodate voluntary sustainability standards (VSS), and therefore can benefit from the premiums that are associated with such standards, they seemingly suffer from other issues. Most importantly, they often lack liquidity and, therefore, are in the coffee market only for limited periods of the year (Minten et al., 2015).

5.3. Processing

The quality of coffee can be increased by washing, i.e., processing red cherries immediately after harvest in wet mills, instead of sun-drying the cherries (Nure, 2009).[19] Coffee that is processed in this way is sold at significantly higher prices in international markets (Minten et al., 2014). Over time, there has been an increasing shift from unwashed to washed coffee in Ethiopia. For example, Petit (2005) showed that washed coffee made up only 9 percent of total coffee exports in 1980, but by 2005 this share had increased to 33 percent.

To understand when and to what extent investments in wet mills have happened, data were obtained from the Sidama area on the presence of wet mills in that area. Note that the Sidama area, including Yirgachefe, is the most important exporting area of washed coffee in the country. Figure 5.2 shows that the first wet mills in the Sidama area were established in 1972 through cooperative structures. They grew quickly in the beginning of the socialistic Derg period, but then there was a plateau in the number of wet mills until the mid-1990s, i.e. when the new government took charge. There was a boom of wet mills after the mid-1990s, with significant investments by single private investors and by shareholding companies (PLCs). Higher growth rates are noted for the establishment of new mills since 2004 for both private entities. By 2012, it was estimated that cooperatives, single private companies, and shareholding companies made up 28, 40, and 32 percent of all wet mills in Sidama, respectively.

Figure 5.2: Number of wet mills in the Sidama area



Source: Authors' calculations

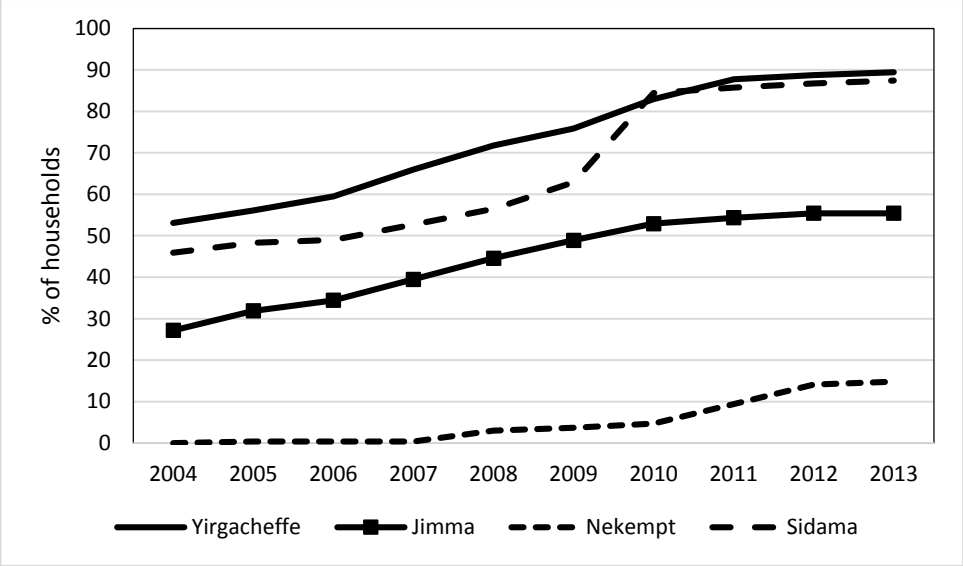
To understand to what extent the growth in the availability of wet mills in the country has led to changes at farm level, we asked farmers in our sample about their options to sell red cherries, which are the coffee cherries processed at the wet mills.[20] We see a significant increase over time in the option to sell red cherries. Ten years before the survey, 28 percent of farmers stated that they had the option to sell red cherries. At the time of the survey, this had increased to 43 percent (Table 5.3). The option to sell red cherries especially has grown in the Yirgachefe and Sidama areas (Figure 5.3). Over time,

[19] Washed coffee preserves the intrinsic quality of the bean better than unwashed beans, and the process leads to homogenous coffee with fewer defective beans. The washing process is carried out in washing stations where cherries are pulped immediately after harvesting, fermented in tanks, and washed in clean water to remove the mucilage. The wet parchment coffee is then dried in the sun. For unwashed coffee, cherries are dried on mats or concrete floors. After drying, the outer layer of the cherries is removed by hulling in coffee processing plants.

[20] While coffee is also sold in the form of red cherries in some parts of Harar, there are however no wet mills in that region. Some processors procure red cherries to prepare sundried specialty coffee themselves. This can lead to better quality coffee than procuring the already dried cherries from farmers as farmers might dry red and green cherries together, thus reducing the quality of the coffee.

we also see a significant increase in the share of coffee actually being sold as red cherries, notably increasing from 13 percent to 19 percent of all coffee sold (Table 5.3). It is estimated that around one-third of coffee is exported as washed coffee. The share of red cherries sold at farm level is lower as there are significant sales into the domestic market, which is mostly in the form of dried cherries (Assefa and Minten, 2014).

Figure 5.3: Households with option to sell red cherries to wet mills



Source: Authors' calculations based on ESSP's coffee survey 2014

Table 5.3: Changes in sales of red coffee cherries to wet mills

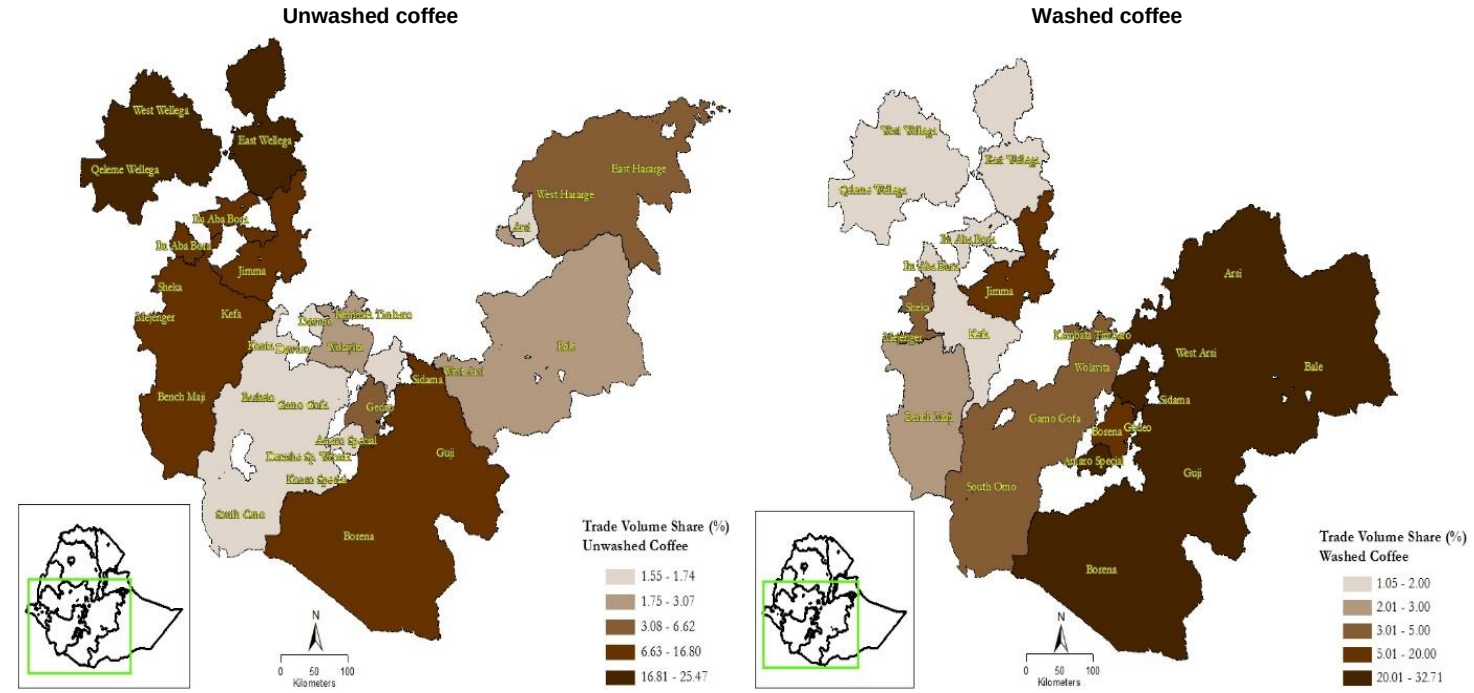
		At the time of the survey						Ten years earlier					
	Unit	Sidama	Yirga.	Jimma	Nekem.	Harar	TOTAL	Sidama	Yirga.	Jimma	Nekem.	Harar	TOTAL
Farmer has the option to sell red cherries	% farmers	82.0	88.2	56.5	14.0	1.4	42.7	51.8	60.2	45.4	5.7	1.0	28.5
Share of coffee sold as red cherries	% coffee	61.2	38.6	14.8	0.4	5.2	18.7	35.9	28.7	15.5	0.9	4.4	13.5
Walking time to the nearest wet mill	minutes	67.7	37.7	128.6	100.0	-	79.3	115.6	74.1	140.9	117.7	-	111.6
Walking time to the second nearest wet mill	minutes	91.9	67.5	132.9	112.3	-	96.7	131.9	100.9	140.1	137.6	-	125.6

Source: Authors' calculations based on ESSP's coffee producer survey 2014

The results also indicate that, despite households having the option to sell red cherries, they only sell part of their coffee that way. For example, while 90 percent of the farmers in Yirgachefe have the option to sell to a wet mill, only 39 percent of coffee is sold in the form of red cherries. The lack of use of wet mills even when they are available is illustrated by the stable share over time of washed coffee in total exports (Minten et al., 2014). Moreover, a number of these mills have shown important declines in turnover over the years, as noted by data from the processor survey.

Figure 5.4 shows the importance of different areas in the production of washed and unwashed coffee using ECX data. It shows that washed coffee is especially prevalent in the southeastern part of the country. However, these areas also produce important quantities of natural or unwashed coffee.

Figure 5.4: Trade share of washed and unwashed coffee in Ethiopia, by coffee producing area



Source: Authors' calculations from ECX data

5.4. Improved harvest, post-harvest, and marketing practices and coffee income

In this section we analyze to what extent the improved harvest and post-harvest practices and changes in marketing and processing affect price formation. First, however, we analyze the associated factors with respect to adopting improved practices in coffee harvest, post-harvest, and processing activities. As measures of these improved practices, we use the adoption of selective harvesting (yes or no); improved drying (i.e. any drying of cherries not on the bare ground) (yes or no); the share of red cherries (compared to dried cherries) in total sales of coffee; and, therefore, an indication of the adoption of washing (share). Depending on the unit of measure of the dependent variable, we run the appropriate probit or tobit model and regress the dependent variable on household characteristics, wealth measures, and remoteness indicators. The regression results are presented in Table 5.4.

The results indicate that visits by extension agents are significantly associated with the adoption of selective harvesting of beans and with improved drying methods. However, in the latter case, the coefficient is only significant at the 10% statistical level. Improved drying methods are also associated with households that are less remote, ceteris paribus. In the case of washing, it is shown that distances to wet mills and dry mills matter significantly (as shown by coefficients for the variables on walking time to the mills, both which are significant at the 10% level). The longer people within households have to walk to a wet mill, the less likely they are to sell to them. The opposite holds, as might be expected, for the distance to a dry mill. We also note that sales of red cherries are associated with lower wealth, indicating that smaller farmers who lack liquidity disproportionally participate in this form of sales.

Table 5.4: Associates of the adoption of improved post-harvest practices

		Selective harvesting		Improved drying		Washing	
	Unit	Coef.	t-value	Coef.	t-value	Coef.	z-value
Household characteristics							
Gender of head of household	1=male	-0.31	-1.53	-0.43	-1.40	3.69	0.73
Age of head of hh	years	-0.01	-0.44	-0.03	-0.82	0.86	**2.06**
Age of head of hh squared	years	0.00	0.42	0.00	1.03	-0.01	**-2.04**
Maximum schooling in hh	years	-0.01	-0.81	0.02	0.84	0.05	0.12
Size of household	number	-0.01	-0.40	0.03	0.92	-0.01	-0.01
Dependency ratio	number	0.13	0.49	-0.18	-0.52	1.89	0.28
Visited by extension agent	1=yes	0.30	**3.49**	0.21	1.84	-1.34	-0.56
Remoteness and wealth characteristics							
Walking time to all season road	log(minutes)	0.01	0.39	-0.10	**-2.06**	1.11	1.09
Walking time to woreda center	log(minutes)	0.07	0.97	0.00	0.03	-0.31	-0.16
Value of assets	log(birr)	-0.03	-0.73	0.04	1.02	-3.02	**-3.31**
Value of livestock	log(birr)	0.03	**2.08**	-0.02	-0.87	-0.87	**-1.97**
Land owned	log(hectares)	0.01	0.21	0.08	1.11	-2.63	-1.66
Walking time to nearest wet mill	log(minutes)	0.08	1.64	-0.02	-0.42	-2.39	-1.78
Walking time to nearest dry mill	log(minutes)	-0.01	-0.14	0.10	1.47	3.02	1.93
Woreda dummies		included		excluded*		included	
Intercept		0.89	1.34	2.04	**2.17**	71.79	4.09
Type of regression		Probit		Probit		Tobit	
Number of observations		1,592		1,584		1,583	
Pseudo-R^2		0.18		0.05		0.19	

* Because of lack of variation in dependent variable and perfect identification issues

Note: Robust standard errors. T-values and z-values that are statistically significant at the 5% level are bold formatted.

Source: Authors' calculations based on ESSP's coffee producer survey 2014

Second, we test to what extent harvest, post-harvest, and marketing practices have an influence on prices that farmers obtain in the market place. In the questionnaire, information was collected on major trade transactions in which coffee farmers engaged. We use the reported value of the transaction as the dependent variable and regress it on quantity, quality measures, and marketing arrangements. We also include woreda and monthly dummies to control for location and time effects, and then estimate robust standard errors. We run separate regressions for coffee sold as red cherries and as whole dried cherries. The results are presented in Table 5.5.

We find little effect of the quantity sold on the price obtained in a transaction, as in both the cases of dried and red cherries, the value-quantity elasticity is shown to be equal to 1.0. Overall, quality measures of cherries show the expected sign, but they are not all significant at conventional statistical levels. In the case of sales of cherries, green cherries obtain lower prices than red cherries or mixtures of red and dried cherries. These price differences amount to about 10 percent. In the case of dried cherries, we find that there are financial rewards to better drying methods. For example, those cherries that were dried on the bare ground obtain prices that are 7 percent lower compared to cherries that were dried using improved methods. Cherries that were harvested using selective harvesting methods also show higher prices.

Market governance variables are also associated with different prices. Farmers that have more choice between traders have higher prices than those that do not. The variable is especially significant for farmers that have no choice in selling their red cherries, as they obtain a price that is 11 percent lower, ceteris paribus. The place of sales is also often an important determinant of the coffee price. Red cherries sold on the roadside obtain a price that is 7 percent lower, while prices for red cherries sold at the site of the cooperative are 5 percent higher. In the case of dried cherries, cooperatives offer prices that are 14 percent higher. Cherries sold at the place of traders also have higher prices, i.e., 10 percent higher on average. It is noteworthy that prices on primary marketing centers do not differ significantly from those offered at the farm gate.

Table 5.5: Associates of coffee prices

		Red cherries		Dried cherries	
Dependent var. = **log(net value)**	**Unit**	**Coef.**	**t-value**	**Coef.**	**t-value**
Quantity	log()	1.00	**178.23**	1.00	**186.66**
Quality measures					
Sold with hull	1=yes	-	-	-0.12	**-2.71**
Dried on bare ground	1=yes	-	-	-0.07	**-2.00**
Type of red cherries (default=mostly green):					
- Mixture of red and green	1=yes	0.09	1.39	-	-
- Mostly red	1=yes	0.10	1.69	-	-
- Only red	1=yes	0.10	1.75	-	-
Stripping of harvest (default=all):					
- Partly	1=yes	0.01	0.26	0.03	1.18
- Selective harvest only	1=yes	0.01	0.22	0.05	1.92
Marketing arrangements					
Choice between traders (default=a lot):					
- A little	1=yes	-0.02	-1.33	-0.02	-1.68
- No choice	1=yes	-0.05	-1.38	-0.11	**-3.88**
Place of sales (default=farmgate):					
- At primary coffee market center	1=yes	0.00	-0.07	0.01	0.38
- At other market	1=yes	-0.01	-0.14	-0.03	**-2.09**
- At trader shop (fixed)	1=yes	-0.07	-1.46	0.03	1.89
- Roadside	1=yes	-0.07	**-2.07**	0.00	0.12
- At the site of cooperative	1=yes	0.05	1.91	0.14	**2.41**
- At the site of private mill	1=yes	-0.01	-0.42	0.03	1.15
- At the residence of trader	1=yes	-0.06	-1.51	0.10	**2.94**
- Other	1=yes	-	-	0.06	0.97
Monthly dummies		Included		Included	
Woreda dummies		Included		Included	
Intercept		1.54	**15.39**	2.89	**29.91**
Number of observations		1,448		1,904	
R-squared		0.97		0.97	

Note: robust standard errors

Source: Authors' calculations based on ESSP's coffee producer survey 2014

6. CONSTRAINTS AND DRIVERS FOR CHANGE

The increasing adjustments in the performance of local coffee value chains over the last decade in Ethiopia can be attributed to a number of identified drivers and constraints. Drivers for these changes include, most importantly, access to extension, local policy reform, and incentives.

First, as shown in the regression analysis, extension is positively and often significantly correlated with the adoption of improved technologies in production, harvest, and post-harvest practices. The change in extension services provision by the government over the last decade might therefore have contributed to the changes. Table 6.1 shows how extension has changed over the last decade. While 12 percent of farmers stated that extension agents were easily accessible ten years before the survey, 46 percent reported this to be the case at the time of survey, and while 29 percent of farmers reported that extension agents were not available ten years before the survey, this had now declined to 13 percent. Reports on how the quality of extension advice has improved also show a significant upward trend. 16 percent of farmers believed that the quality of extension advice was very good ten years earlier, but this figure increased to 48 percent at the time of the survey. Table 6.1 further illustrates some of the extreme methods that some extension agents have followed to assure that improved practices are adopted. For example, 43 percent of the farmers believe that extension agents will seize or burn their coffee if they were to find farmers drying coffee on bare ground. Moreover, about half of farmers agree that coffee quality is controlled by someone from the Bureau of Agriculture or by *kebele* managers when they sell at the primary marketing centers, illustrating the focus by government to improve coffee quality in the country.

Table 6.1: Changes in access to extension

		At the time of the survey						Ten years earlier					
	Unit	Sidama	Yirgach.	Jimma	Nekemte	Harar	TOTAL	Sidama	Yirgach.	Jimma	Nekemte	Harar	TOTAL
"Availability of coffee extension agents:"													
- Very available	%	47.5	33.4	39.6	57.8	24.1	45.9	8.4	11.3	12.0	15.0	6.6	12.1
- A bit available	%	41.6	51.6	29.6	28.8	55.9	36.2	44.7	48.1	42.1	48.1	45.9	46.0
- Not available	%	7.8	12.8	23.0	8.1	16.9	13.0	32.2	30.9	31.8	22.5	41.9	28.9
- Do not know	%	3.1	2.2	7.9	5.3	3.1	5.0	14.7	9.7	14.2	14.4	5.6	13.1
"Quality of extension advice on coffee related issues:"													
- Very good	%	46.3	40.0	47.8	56.6	20.6	47.8	9.7	17.8	17.6	17.5	7.2	15.5
- Moderately useful	%	35.9	40.9	23.3	29.1	38.4	31.1	34.1	40.0	34.0	29.1	30.4	32.6
- Not useful	%	5.9	9.4	9.4	5.9	31.9	9.3	18.1	19.4	17.3	21.3	45.5	21.4
- Do not know	%	11.9	9.7	19.5	8.4	9.1	11.9	38.1	22.8	31.1	32.2	16.9	30.5
"If the extension agent (DA) found that I dried my coffee on bare ground, he would seize or burn my coffee"													
- Yes, I agree	%	60.6	30.0	72.0	41.6	12.8	48.2						
- No, I disagree	%	35.3	57.8	23.0	53.8	81.9	46.1						
- It depends	%	1.6	8.4	2.2	0.6	3.4	2.4						
- I do not know	%	2.5	3.8	2.8	4.1	1.9	3.3						
"My coffee quality is controlled by somebody from the Bureau of Agriculture when I sell at the primary marketing center"													
- Yes, I agree	%	69.6	47.2	41.5	10.2	0.0	47.2						
- No, I disagree	%	26.3	46.8	44.8	83.7	100.0	44.9						
- It depends	%	1.1	4.9	5.5	0.0	0.0	3.3						
- I do not know	%	3.0	1.1	8.2	6.1	0.0	4.6						

Source: Authors' calculations based on ESSP's coffee producer survey 2014

Second, there has been significant local market policy reform. While the set-up of primary marketing centers is perceived to have helped to improve competition, price transparency, improved quality, and reduced transaction costs for farmers (Table 6.2), there, however, have been side-effects that might have affected system-wide transaction costs, as well as the quality of coffee. Processors were asked to evaluate the quality issues after the introduction of primary marketing centers. The results reported at the bottom of Table 6.2 indicate that a number of problems might have emerged in some areas because of this new policy. One-third of processors believe that the quality of the procured cherries has declined since the start-up of the primary marketing centers. They relate this to the deterioration of the quality of cherries during storage at the market and during transportation to and from the market. A number of processors believe that the time of procurement and processing has become too long, and that because of the increased competition, some processors stated that they had to buy lower quality coffee.

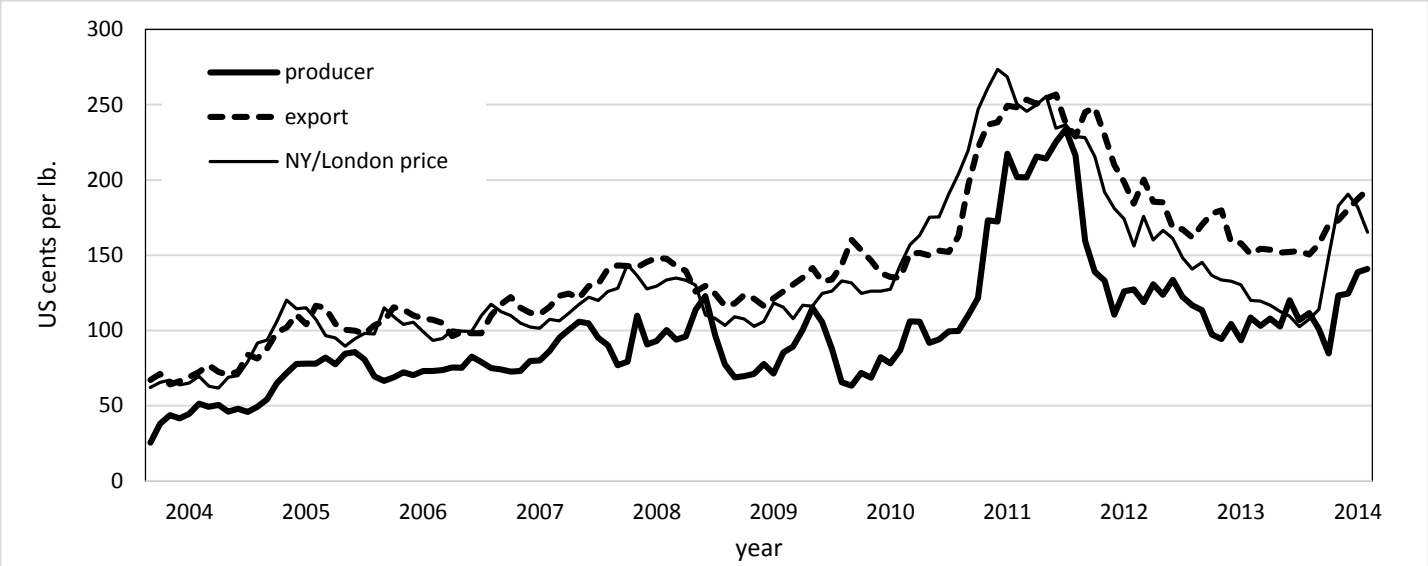
Table 6.2: Perceived impact of primary marketing centers

		At the time of the survey					
	Unit	Sidama	Yirgach.	Jimma	Nekemte	Harar	TOTAL
Assessment by producers							
"Since the start-up of primary marketing centers (PMC), there is more competition among traders"							
- I agree	%	88.0	81.8	79.8	73.5	0.0	81.9
- I disagree	%	8.3	16.4	11.5	16.3	100.0	12.4
- It depends	%	0.8	0.4	3.8	2.0	0.0	1.8
- I do not know	%	3.0	1.5	4.9	8.2	0.0	3.9
"Since the start-up of PMCs, there is more price transparency"							
- I agree	%	81.2	70.7	56.8	49.0	100.0	66.6
- I disagree	%	15.8	26.2	32.2	40.8	0.0	26.9
- It depends	%	0.0	1.1	6.0	0.0	0.0	2.2
- I do not know	%	3.0	1.9	4.9	10.2	0.0	4.3
"Since the start-up of PMCs, I have to walk less far"							
- I agree	%	86.5	73.8	54.1	55.1	100.0	68.9
- I disagree	%	10.9	25.5	39.9	40.8	0.0	27.7
- It depends	%	0.4	0.8	1.6	0.0	0.0	0.8
- I do not know	%	2.3	0.0	4.4	4.1	0.0	2.6
"Since the start-up of PMCs, I strip less as I have to walk less far to sell my cherries"							
- I agree	%	77.1	57.4	53.6	38.8	100.0	59.7
- I disagree	%	20.3	38.0	40.4	57.1	0.0	36.0
- It depends	%	0.4	4.6	1.6	0.0	0.0	1.8
- I do not know	%	2.3	0.0	4.4	4.1	0.0	2.6
Assessment by processors							
"Since the start of the PMCs, the quality of procured red cherries has declined"							
- Yes	%						34.1
- No	%						63.6
- Do not know	%						2.3
"If yes, this is due to…							
- … The agents I use are not very capable in assessing the quality of coffee", % yes							51.1
- … The quality of cherries deteriorates during storage at the market", % yes							60.0
- … The quality of the cherries deteriorates during transport to/from market", % yes							68.9
- … The time between procurement and processing is too long", % yes							62.2
- … Because of increased competition between processors, I am obliged to buy lower quality", % yes							86.7

Source: Authors' calculations based on ESSP's coffee producer survey 2014

Third, international prices of coffee have been volatile in recent years. Figure 6.1 illustrates the changes over the last decade in international prices, export prices from Ethiopia, and local producer prices, measured in green bean equivalent and in US cents per lb. The results show that prices were low at the beginning of the decade and producer prices were significantly below 50 US cents per lb. However, international prices increased significantly since then with a high peak in 2011, when prices were almost five times as high as they were at the beginning of the decade. Producer prices in Ethiopia have followed international price trends. While prices have come down since, they are still significantly higher than the level noted from 2004 to 2007.

Figure 6.1: Prices in major coffee producing zones (in green bean equivalent), export prices (green beans), and international prices (green beans) (2004–2014)



Source: Authors' calculations based on CSA (for retail data in 11 major coffee producing areas), Central Bank (for export price data) and ICO (for international prices of Brazilian naturals)[21]

These high prices might have contributed to incentives for investments in coffee production and quality. Because of high prices, farmers also seem to consume less coffee themselves, leading to higher commercial surpluses in the country (Minten et al., 2014). Farmers were asked to consider their behavior with respect to coffee consumption in a situation of increasing coffee prices (Table 6.3). Almost half of farmers agreed that they would reduce consumption in that situation. Table 6.3 shows that the percentage of farmers agreeing with this statement is especially high in those areas where coffee prices are high. When coffee prices are high, a number of farmers rely on husks of coffee (40 percent of farmers) to prepare drinks that give some taste of coffee, or prepare drinks using the coffee leaves brewed into a tea (the latter practice, called *quti*, is especially widespread in the Harar area).

Table 6.3: Perceived impact of higher coffee prices on coffee consumption behaviors, percent of farmers

	At the time of the survey					
	Sidama	**Yirgach.**	**Jimma**	**Nekemte**	**Harar**	**TOTAL**
"When prices of coffee go up, I consume less coffee"						
- I agree	52.5	54.7	37.4	38.4	78.1	45.7
- I disagree	47.5	44.4	57.6	60.0	19.4	52.2
- It depends	0.0	0.9	4.4	0.0	2.5	1.4
- I do not know	0.0	0.0	0.6	1.6	0.0	0.8
"When prices of coffee go up, I use coffee husks more to prepare coffee drinks"						
- I agree	28.8	48.8	24.2	35.0	64.1	35.5
- I disagree	70.9	50.6	73.6	64.4	33.8	63.4
- It depends	0.3	0.6	1.9	0.3	2.2	0.9
- I do not know	0.0	0.0	0.3	0.3	0.0	0.2
"When prices of coffee go up, I use coffee leaves more"						
- I agree	12.5	12.5	14.2	3.8	79.1	14.7
- I disagree	87.2	87.5	84.3	95.9	17.8	84.5
- It depends	0.3	0.0	1.3	0.3	3.1	0.7
- I do not know	0.0	0.0	0.3	0.0	0.0	0.1

Source: Authors' calculations based on ESSP's coffee producer survey 2014

However, there also have been a number of constraints that have limited the impact of the adjustments in the performance of local coffee value chains on productivity and income increases. They include, most importantly, a lack of

[21] Downloaded from http://www.ico.org/new_historical.asp.

Table 6.4: Access to improved seedlings

		At the time of the survey					
	Obs.	Sidama	Yirgach.	Jimma	Nekemte	Harar	TOTAL
Perceptions, % of farmers							
"It is hard to find reliable improved coffee seedlings"							
- I agree	1,598	45.0	48.4	36.2	53.1	56.9	47.4
- I disagree	1,598	52.8	47.2	61.6	45.3	42.5	50.5
- It depends	1,598	0.0	3.4	0.9	0.3	0.6	0.9
- I do not know	1,598	2.2	0.9	1.3	1.3	0.0	1.3
"Improved coffee varieties have higher yields than traditional varieties"							
- I agree	1,598	87.2	79.1	80.8	92.8	79.4	86.1
- I disagree	1,598	11.2	14.4	15.1	5.9	14.7	10.8
- It depends	1,598	0.0	3.7	2.5	0.6	3.7	1.6
- I do not know	1,598	1.6	2.8	1.6	0.6	2.2	1.4
"I do not trust the improved coffee seedlings sold by the Bureau of Agriculture (BoA)"							
- I agree	1,598	24.4	21.9	32.7	13.8	48.4	23.8
- I disagree	1,598	71.9	75.0	64.5	82.8	49.7	73.0
- It depends	1,598	0.6	0.0	1.3	2.2	0.9	1.3
- I do not know	1,598	3.1	3.1	1.6	1.3	0.9	1.9
Farmers buying seedlings in the last 12 months							
Farmer bought improved seedlings, % of farmers	1,598	23.7	17.5	33.3	11.3	7.8	19.2
Outlet that farmers bought improved seedlings from, % of famers buying seedlings:							
- BoA (Woreda)	299	44.7	41.1	29.2	61.1	32.0	41.1
- Cooperative	299	14.5	0.0	0.0	0.0	4.0	3.0
- Coffee plantation Enterprise	299	3.9	12.5	24.5	13.9	0.0	15.8
- Model farmer/Development Agent (FTC)	299	35.5	21.4	43.4	22.2	52.0	34.6
- Research Center	299	0.0	1.8	0.9	0.0	12.0	1.0
- NGO	299	0.0	3.6	0.0	0.0	0.0	0.4
- Commercial Farm	299	0.0	14.3	0.0	0.0	0.0	1.7
- Other	299	1.3	5.4	1.9	2.8	0.0	2.3
Farmers that tried to buy improved seedlings in the last 12 months but were unsuccessful							
The farmer tried to buy improved seedlings but were unsuccessful, % of farmers	1,299	24.6	19.3	17.9	12.7	17.3	16.8
The main reasons for not being able to buy improved seedlings, % of famers unable to buy seedlings							
- I was unable to find them	236	30.0	76.5	42.1	25.0	41.2	39.2
- The quality of improved seedlings is not good	236	8.3	2.0	7.9	0.0	17.6	5.4
- Gave up because hassle too much	236	10.0	2.0	5.3	8.3	9.8	7.2
- Improved seedling are too expensive	236	6.7	5.9	13.2	36.1	7.8	17.4
- I lacked the money at the time of need	236	45.0	13.7	31.6	30.6	17.6	30.2
- Other	236	0.0	0.0	0.0	0.0	5.9	0.5
Farmers that did not buy improved seedlings in the last 12 months							
Main reasons for not trying to buy improved seedlings, % of farmers that did not buy improved seedlings							
- The quality of improved seedlings is not good	1,063	7.1	4.7	0.6	0.4	5.3	2.4
- There is too much hassle/transaction cost	1,063	3.3	5.2	2.9	1.6	0.8	2.5
- Improved seedlings are too expensive	1,063	2.2	3.3	5.7	9.7	0.8	6.2
- I lacked the money at the time of need	1,063	26.1	10.3	11.5	20.6	6.6	17.0
- I am happy with the traditional seedlings	1,063	21.7	23.5	9.8	16.5	7.0	16.0
- I did not plan to plant new trees this year	1,063	29.3	46.5	68.4	37.9	60.7	45.9
- Other	1,063	10.3	6.5	1.1	13.3	18.8	10.0

Source: Authors' calculations based on ESSP's coffee producer survey 2014

access to improved seedlings, the perceived profitability of the improved practices, a lack of savings instruments, shocks, and disease prevalence.

First, despite the efforts of the government to distribute improved seedlings[22], access to improved varieties is often still an issue (Table 6.4). 47 percent of farmers felt that it was hard to find reliable improved coffee seedlings, even though

[22] AGRER (2014) reports that around 20 million seedlings have been distributed to farmers over the last decade alone.

almost all farmers (86 percent) were convinced that improved coffee varieties have higher yields than traditional ones and most trust the improved coffee seedlings sold by the Bureau of Agriculture. 19 percent of farmers had bought improved seeds in the last 12 months. The share was especially high in the Jimma area. Improved seedlings were mostly obtained from the Bureau of Agriculture (41 percent) or from model farmers or development agents (35 percent). On the other hand, 17 percent of farmers tried to buy improved seedlings in the last 12 months, but were unable to get them (39 percent) or farmers thought that the seedlings were too expensive and they did not have available funds when needed (47 percent). For those farmers that did not try to buy new seedlings in the last 12 months, most had no intention of planting new trees.

Second, there are constraints to the uptake of some improved techniques, such as washing. The uptake of washing might have been less than predicted, because washing is not always perceived as profitable. 67 percent of farmers believe that selling dried cherries is more profitable than selling red cherries immediately after harvest (Table 6.5). Moreover, 76 percent of farmers use dried coffee beans as a way to save and to spread income streams over the year. If farmers were to sell all their coffee immediately after harvest, this presumably would lead to liquidity problems in the off-season for some of these farmers. They therefore are hesitant to sell all their coffee in the form of red cherries soon after harvest.

Table 6.5: Constraints to change in coffee harvest, post-harvest, and marketing operations

		At the time of the survey					
	Unit	**Sidama**	**Yirgach.**	**Jimma**	**Nekemte**	**Harar**	**Total**
1. Preferences red versus dried cherries							
"I make more money when I sell coffee as dried cherries"							
- I agree	% farmers	54.1	57.0	77.1	95.7	94.7	68.6
- I disagree	% farmers	45.3	41.8	22.0	4.4	2.7	30.4
- It depends	% farmers	0.3	1.0	0.9	0.0	2.7	0.8
- I do not know	% farmers	0.3	0.3	0.0	0.0	0.0	0.2
"I prefer selling coffee in dried form (instead of red) as I can spread out my income that way (a way of saving)"							
- I agree	% farmers	68.6	68.7	80.8	89.1	94.0	76.1
- I disagree	% farmers	30.5	20.9	13.6	10.9	2.7	19.3
- It depends	% farmers	0.9	10.4	3.7	0.0	3.3	4.1
- I do not know	% farmers	0.0	0.0	1.9	0.0	0.0	0.6
2. Shocks and diseases							
The rains for this season were […] compared to normal							
- Less than	% of plots	6.4	5.9	27.6	58.9	14.5	37.4
- More than	% of plots	55.4	44.3	38.6	32.2	63.5	39.3
- Normal	% of plots	38.3	49.9	33.8	8.9	22.0	23.3
This season the rains were […] compared to normal							
- Early	% of plots	36.4	42.3	24.9	3.3	38.4	18.2
- Late	% of plots	19.7	9.5	48.6	91.3	22.5	60.5
- Normal	% of plots	43.9	48.3	26.5	5.4	39.1	21.3
The beans for this season were affected by frosts or hailstorms […] compared to normal							
- Less than	% of plots	14.2	6.9	19.0	15.2	18.1	14.9
- More than	% of plots	27.9	6.9	22.4	7.6	53.4	15.0
- Normal	% of plots	58.0	86.3	58.7	77.2	28.5	70.1
The beans for this season were affected by pest or diseases […] compared to normal							
- Less than	% of plots	16.1	8.2	21.2	9.6	10.6	12.8
- More than	% of plots	31.9	42.7	34.9	16.3	65.0	28.0
- Normal	% of plots	51.9	49.1	44.0	74.1	24.4	59.2
Type of disease that the plot suffered from							
- Coffee Berry Disease	% of plots	37.9	40.5	56.3	20.2	40.5	33.2
- Coffee Wilt Disease	% of plots	12.2	12.3	6.0	12.2	27.2	11.6
- Other	% of plots	0.7	9.2	1.0	0.1	4.0	1.6
- None	% of plots	49.2	38.0	36.8	67.5	28.4	53.6
The season, there was […] damage because of animals (monkeys/apes) than normal							
- Less than	% of plots	9.6	3.0	14.2	15.4	8.7	12.6
- More than	% of plots	8.2	12.8	32.5	20.9	6.8	20.1
- Normal	% of plots	82.2	84.2	53.3	63.7	84.5	67.3

Authors' calculations based on ESSP's coffee producer survey 2014

Third, the prevalence of diseases is an important issue in coffee production. With climate change, this issue is expected to increase (Davis et al., 2012). As shown in Table 4.3, disease shocks in particular, are a major determinant of low production levels of coffee in Ethiopia. The most prevalent diseases in Ethiopia are Coffee Berry Disease (CBD or locally referred to as "coffee cholera") and Coffee Wilt Disease (referred to as "coffee AIDS"). Despite the large investments to develop resistant varieties, it was estimated by farmers during the year of the survey that 33 percent of the plots suffered from CBD (Table 6.5). This compares to 12 and 2 percent of plots that suffered from Coffee Wilt Disease and other diseases, respectively. Only 51 percent of surveyed plots were reported to have not suffered from any diseases. The Harar area especially seems to suffer from CBD.

Other shocks are important too. The rains were late in the year of the survey (60 percent of the farmers stated that the rains were later than normal), which seemed particularly problematic in the Nekemte area, where 91 percent of the farmers stated this to be case. This explains the low production level during the year of the survey in that area.

7. CONCLUSIONS

We find that there have been significant increases in the adoption of improved coffee production practices by coffee producers in Ethiopia in recent years, with compost use, mulching, pruning, and weeding having shown an increase in adoption by more than 20 percentage points. The adoption of these practices are associated with higher productivity levels. Harvest and post-harvest practices have improved significantly as well, with stripping harvest methods reduced and improved drying methods now almost universally adopted. All this has led to an improvement in coffee quality. Moreover, we find that upstream marketing performance has progressed as measured by a number of indicators, including a greater choice of traders, access to cooperatives, access to price information, shorter walking time to mills and marketing centers, and increased trust in the weighing practices of traders. We have also seen increasing use of wet mills, leading to increasing exports of washed coffee. However, one important issue in coffee marketing is that quality premiums for better coffee are low, therefore providing little incentive for the farmers to produce quality coffee. Despite the growing adoption of improved practices, increases in productivity and incomes has been restricted because of institutional designs and shocks, especially diseases and weather.

While there have been a number of positive developments upstream in Ethiopia's coffee sector in the last decade, there, however, are still significant margins for improvement. First, coffee yields are low overall and the adoption of improved coffee varieties is not widespread. It seems that stimulating further adoption of improved tree varieties is important for two reasons. It would contribute towards helping to raise yields, and further improvements would help to mitigate widespread diseases issues, which are likely to increase with global climate change (Davis et al., 2012).

Second, markets in Ethiopia have seemingly been governed by too many controls and requirements. As shown in this paper, even well-intended market reforms might have unintended consequences on market performance and coffee quality. A conducive liberalized environment where producers can choose market outlets, depending on their performance and services offered, might lead to lower costs in the marketing system that might benefit both individual producers and the country as a whole.

Third, the lack of well-functioning economic institutions in Ethiopia might lead to farmers forgoing profitable options. For example, the lack of reliable savings institutions seem to steer farmers to use coffee as an savings instrument to ensure that their income can be spread out over the year. More widespread establishment and better access to savings institutions might lead to higher adoption rates of washed coffee practices, and subsequently lead to higher export earnings for the country.

Fourth, coffee is the most important export crop of the country, and counts for a large share of income for a number of Ethiopian smallholders. However, despite its importance, no significant efforts have been made in the country to understand the issues at the producer level, using large-scale representative surveys. The lack of updated representative information is a constraint for evaluations of projects, programs, and policies. This hampers the design of appropriate policies and investments that would lead towards a better performing coffee sector. The regular fielding of large-scale surveys, such as that completed for this study, would be worthwhile.

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