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ECONOMIC ANALYSIS OF COFFEE CERTIFICATION SCHEME IN ETHIOPIA: A CASE STUDY FROM OROMIA COFFEE FARMERS COOPERATIVE UNION

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LISTS OF ACRONYMS

2SLS	Two-stage least squares
CIC	Changes-in-Changes
DID	Difference –in- Difference
GIO	Geographic Indicators of Origin
GIS	Geographic Information System
GMM	General Method of Moments
GPS	Global Positioning System
IFOAM	International Federation of Organic Agriculture Movements
IV	Instrumental Variable
KMCFC	Kilenso Mokkonisa Coffee Farmers Cooperative
NTFP	Non-Timber Forest Products
OCFCU	Oromia Coffee Farmers Cooperative Union
OLS	Ordinary Least Squares
UNEP	United Nations Environment Program
UTM	Universal Transverse Mercator
VIF	Variance Inflation Factor

Abstract

This paper looks into the economic analysis of coffee certification scheme in Ethiopia. The study examines and compares per hectare productivity difference between farmers growing organic/ fair trade certified coffee and conventional coffee. Household survey data, conducted in four Kebeles at Bullie Horra district targeting Killenso Mokkonisa coffee farmers' cooperative, are reported and analyzed using instrumental variables (two-stage least squares) regression and standard linear difference-in-difference econometric model. In the analysis we find that, controlling for a range of factors, there likely are positive productivity effects per hectare for the treatment group but not for the control group owing to the scheme of coffee certification. This study will have policy implications on how best to design programs to link coffee farmers with the international markets.

Key Words: *Certification, Difference-In-Difference Estimation, Instrumental Variable, Killenso Mokkonisa-Ethiopia, Productivity.*

1. Introduction

1.1 Background

The precise hometown from where *coffea arabica* gene pool started spreading out and the way people begun to make use of and disseminate coffee have not yet been scientifically verified. However, there are legends that it is in Ethiopia. The most complete and pleasing Ethiopian Coffee legend are "Kaldi and the dancing goats". It locates the place of coffee origin in historical Kaffa region, an area in South-Western Ethiopia (Stellmacher, 2008). Although the notions on coffee aboriginality might be wooly, many researchers indicated that *Coffea arabica* is native to the Afromontane forests of Ethiopia.

Given this, it is an utter legitimacy that coffee production and consumption is closely entangled with Ethiopian people and its economy for extended historical periods. This cash crop is contributing significantly to the daily life of individuals and on the macro level for the state of Ethiopia as a whole; i.e. it accounts for 55% Of the export revenue and contributes over 25% of GNP (Ashenafi 2006). Thus, safeguarding this crop is critical to the success of improving its contribution to alleviating the lives of rural farmers living with destitution whose livelihoods depend heavily on coffee. Among others coffee certification scheme may be put forward as one way to this end. It may help in managing the ecosystem by protecting the environment from depletion and degradation, and helping maintain farmers' livelihoods or economic fortification at large. In other words, working towards certification at the farm level may add to environmental protection, increase economic benefits to farmers, and lead to more

successful conservation in coffee growing regions. Coffee certification would likely improve information for consumers in export markets about coffee quality and cause them to pay higher prices for superior quality coffee.

As more consumers in highly populated countries such as Japan, India, China and the rest of the world develop a taste for coffee, other things remaining unchanged, prices of coffee are likely to keep rising. Meanwhile demand for high quality coffee is rising in western countries. Sensitive consumers are demanding authenticity: they want to get information about where the coffee comes from. Thus the best coffee will spectacularly be differentiated, like fine wines and spirits, and sold at previously unthinkable prices[1].

Consumers in the international market are willing to pay premium price both for coffee that has certificate assuring its desirable explicit characteristics, such as good taste and aroma, and for coffee that has the desirable implicit characteristic of having been produced in a comportment that minimizes environmental degradation and social injustice, like, inappropriate and/or weak land ownership policy, discrimination and child labor abuse. To cater to this demand, third-party organizations certify coffee that possesses such explicit and implicit characteristics. This leads to an outcome where at least a portion of the price premiums consumers pay for organic/fair trade certified coffee is usually passed on to growers. Hence, certification represents a market-driven mechanism for boosting growers' productivity, that is, one that does not involve direct public sector funds to growers (Beatriz et al., 2006).

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[1] *http//www.economist.com*

Hence, this research is intended to deal with the economic analysis of coffee certification focusing on organic and fair trade certifications. The research is conducted on Oromia Coffee Farmers' Cooperative Union (OCFCU), which is a union of 129 cooperatives comprising 128, 361 farmers (OCFCU, 2009).

1.2 Statement of the Problem

Coffee certification scheme is a new phenomenon in Ethiopia but it is expected to have a far reaching significance to the country`s farmers and the Ethiopian economy at large. According to Stellmacher (2008), many concepts for certification have been developed and implemented in Ethiopia. The country is increasingly attracting attention of international standard holders who have opened their own branch offices in Addis Ababa. Stellmacher (2008) has summarized the existing certification schemes in Ethiopia. He pointed out that there has to be a change in the certification criteria, because transferring the certification standards to Ethiopian forest coffee given the existing situation including the land policy in the country is not a simple task. Some of the standards are describing an entirely different ecological, institutional and socio-economic situation with different contextual needs. Is the existing certification scheme in line with the prevailing socio-economic conditions in Ethiopia? Is there any impact of certification scheme on coffee productivity per hectare? Rigorous studies on these issues in the Ethiopian context are scant. Although several certification schemes provide some fundamental requirements for sustainable use of forest coffee, there is currently no certification scheme in place, which acknowledges the uniqueness and nativity of the Ethiopian forest coffee (wild growing coffee), nor creates incentives for forest conservation (Volkmann, 2008).

It is believed that from the prevailing coffee export market situation in Ethiopia, many small coffee farmers in the country are receiving prices for their coffee that are less than the same coffee quality supplied in the international market. If coffee growers are not getting reasonable price for the quality coffee they are producing, they may not have the interest to continue growing coffee as it may lead to destitution and hopelessness with little income. In light of this, farmers may be forced to exit coffee production and switch to the cultivation of other tradable crops like *chat* harvesting as it is happening in *Harar*[2]. The literature indicates that declining coffee farmers' livelihood is exacerbated by the fact that the world market price is extremely volatile, frequently experiencing steep price drop, and also due to a very low farm gate price that can be seen from the supply chain (Taylor, 2005). On the whole there is unfair trade; however, if the developed countries are benevolent for fair trade, they may encourage family farmers in developing countries to get organized and ask for competitive price in the international market. An agreement signed a couple of years ago between Starbucks and the Ethiopian government has been hyped as a big step forward to this effect. Establishing one or more trademarks and licensing for Ethiopian coffee may attach importance to the Ethiopian forest coffee certification line of reasoning. The hope is that trade marking will set up the Ethiopian coffee as brand names which enable farmers to increase their productivity. It also allows farmers to ask for fair trade and higher prices for their specialty coffee. Therefore, the livelihood of our farmer is alleviated by helping farmers to get incentives via trade marking, licensing, and particularly by coffee certification schemes fitting to the context of Ethiopian ecological, institutional and socio-economic situation.

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[2] *Highest quality coffee growing area in Eastern Ethiopia*

The empirical evidence suggests that certification of natural resources is an incentive mechanism for farmers to adopt sustainable practices. It aims at creating incentives for improved management of natural resources and for encouraging environmental and social responsibility in trade focusing on products that are marketed, particularly on exports like coffee. Certification also adds a quality attribute to the certified product. The more consumers trust the quality, the higher the price they are willing to pay. This high price helps farmers remain on their land keeping on harvesting more coffee per hectare, improving their family's health, keeping their kids in school, and reinvesting to improve the quality of their coffee. Thus helping the poor coffee farmers to boost their productivity may not be a question of choice but a must for concerned governmental and non-governmental organizations.

According to Volkmann (2008), certification as a control and incentive tool falls in line with standards that improve access to market leading to assuring and improving livelihoods through accord to supply certified coffee and eventually through price premiums. The price premiums may come from the idea that consumers are willing to pay more for products that meet certain explicit characteristics like environmental issues, traceability, customary rights, child labour, worker rights, health condition, quality issues, etc.

The enquiry of this study is to answer whether per hectare productivity of certified coffee growers is more than the conventional coffee growers and to see whether the existing certification scheme in Ethiopia is trustworthy. Are farmers growing organic/fair trade certified coffee more productive than those who are growing conventional coffee?

1.3 Objective of the study

The main objective of this study is to conduct an economic analysis of coffee certification scheme in Ethiopia. Specifically, the study tries to:

Examine if there is difference in per hectare productivity between certified and conventional coffee growers;

Examine whether the existing certification scheme in Ethiopia is trustworthy by showing if the certified coffee growers are meeting criteria for getting certification; and

Analyze whether certification scheme of coffee can lead to more economic and environmental benefit to farmers.

1.4 Research Questions

The study addresses the following research questions:

A. Do farmers who produce organic/fair trade certified coffee have higher yield than farmers producing conventional coffee?

B. Do the existing certification schemes lead to more economic benefit and environmental protection?

C. Are the existing certification schemes in Ethiopia reliable?

1.5 Data Source and Methodology

The study uses both primary and secondary data sources in order to acquire the necessary information. The source of the primary data is a cross-sectional farm household survey from Bulie Hora District focusing on Kilenso Mokennisa Coffee Farmers Cooperative (KMCFC)[3] which is a member of OCFCU. Secondary data are collected from OCFCU, KMCFC, certification agencies in Addis Ababa, coffee exporters, National Bank of Ethiopia, and other sources such as, research and statistical reports.

Descriptive analysis, instrumental variables regression (2SLS) and linear difference-in-difference (DID) econometric models are employed to gain an insight on the economic analysis of coffee certification scheme.

1.6 Significance and Limitations of the Study

Currently one of the major problems faced by coffee producing farmers in Ethiopia is the lack of premium prices for their specialty products. Therefore, this study, focusing on the supply side (coffee producing farmers and cooperatives), is expected to provide valuable information for policy makers intending to design programs that help in boosting the productivity of small-scale coffee farmers and strongly link them with the international markets. Besides, it helps in giving information to others interested in undertaking further studies on Ethiopian coffee certification schemes and biodiversity conservation, which is a crucial issue in determining the sustainability of flora and fauna. Time and cost constraints limited a more detailed approach for data collection and a more comprehensive coverage of coffee farmers` cooperatives in other areas of the country.

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[3] *Kilenso Mokkonisa Coffee Farmers` Cooperative which comprises 1500 coffee farmers, is a member of Oromia Coffee Farmers` Cooperative Union*

1.7 Organization of the study

The rest of the study is organized as follows. Various theoretical and empirical concepts that are used in the analysis of coffee certification scheme are discussed in section two. Section three discusses the nature of the data, the econometric model specification, and descriptive and econometric analysis of the data. The last section presents conclusions and policy implications.

2. Theoretical and Empirical Review of the Literature

2.1 What is Certification?

Certification is defined as an independent quality assessment of a product or production process by a third party, which is serving consumers as a credible evidence and written assurance for the fulfillment of quality standards and as a civil society tool for stimulating quality (Wiersum, 2007). Certification in the broadest sense represents a commercialization adaptation intended to address the socio-political, ecological, and economic failings that have been empirically observed in the on-going commercialization efforts for non-timber forest products (NTFP) (David and Jeremy, 2007). The certification process has to include roles of vested interest groups in defining acceptable or appropriate behavior and establishing mechanisms to enforce product processes and standards. Dankers (2003) and Mendinger (2003), argue that certification is a process through which transitional networks comprised of diverse actors set and enforce standards for products and production processes. The programs of certification are market based; they seek to achieve their goals by restructuring producers` relationships to consumers through markets (Dankers, 2003). New and different benefits and costs (opportunities and challenges) emerge that relate to increased transparency and formality of the terms of production and/or trade. Price premiums, improved market access, environmental conservation and sustainability, social justice, increased efficiency, organization, transparency, accountability, safety and education are perhaps the most frequently cited benefits of certification (Overdeyest, Rickenbach in press and Shanley 2005, Shanley 2002, Walter 2002, Viana 1996, Simula 1996). But according to Shanley et al. (2005), though certification was

described nearly 15 years ago as key to integrate market access, conservation and development, it still is in its infant stage in many countries.

Although certification is not well developed in developing countries, keeping on improving the quality of agricultural products by means of certification is among the appropriate marketing tools that address a growing worldwide demand for healthier and more socially-and environmentally-friendly products. Certification is increasingly accepted as a tool for defining standards for social and environmental performance in forest management. Certification started in response to consumer demand for sustainably produced timber, but since the early twenty-first century it is gradually being extended to include non-timber forest products (NTFPs). However, NTFP certification is more problematic than timber for several reasons (Shanley et al., 2000). According to the research findings of Tadesse et al. (2008), the certification of NTFPs is based on a wider set of criteria than those considered in timber certification. As a result, different certification schemes have been developed. Some of them focus on the role of NTFP production in relation to sustainable forest management as in timber certification, but others approach certification from the perspective of organic production (i.e., avoiding chemical inputs) or from the perspective of socially responsible manufacturing and trade. The subsequent section presents the major types of NTFP certification schemes.

2.2. Certification based on sustainable forest management criteria

Sustainable forest management is an extension of the sustainable development and sustained yield principles. According to the Brundtland Report in 1987, sustainable development defined as development that meets the needs of the present society without compromising the ability of future generations to meet their needs. Thus

sustainable forest management includes sustainable ecosystems, communities, and economies, as well as commodity and non-commodity, market and non-market goods and services. It infers that society seeks to provide enhanced forest management and protection for diverse values. It can be implemented through measurement and monitoring of the status of forest and social conditions, improved forestry research and innovation, and application of new technology in adaptive forest management practices. These approaches will help sustain, enhance, and restore forests and their innumerable economic, environmental, and social values (Frederick, 2006).

Forest management certification standards address the sustainable management of forests for timber harvesting and, to a lesser extent, other forest resources like coffee. Forest management standards prioritize management and ecological sustainability, but may include cursory standards or guidelines for social justice (David and Jeremy, 2007). According to a Report prepared by Tiina (2005), Sustainable forest management comprises the following seven common thematic areas:

(1) Extent of forest resources,

(2) Biological diversity,

(3) Forest health and vitality,

(4) Productive functions of forest resources,

(5) Protective functions of forest resources,

(6) Socio-economic functions, and

(7) Legal, policy and institutional framework.

These thematic conservation principles for coffee production apply to farmers and processing facilities in all coffee-growing regions of the world and could be the foundation of conservation-based certification programs. In many cases, these

principles require collaboration between producers, communities and local and national governments. Here one has to recognize that the specific application of these conservation principles will vary by region in accordance with their geographical conditions, i.e., climate, ecological variables, traditions and cultures. Therefore, programs that aim to improve coffee production systems must at least address and monitor progress in accordance with the above sustainable conservation principles.

2.3. Certification based on organic crop production criteria

Organic certification refers to holistic management systems that endorse and improve the healthiness of agro-ecosystems (Walter, 2002). Although organic emerged as a certification for agricultural crops, it is also applicable to managed and wild-harvested forest products as well, and hence coffee is among these. According to Tadesse et al. (2007), organic certifications guarantee that agricultural products claiming to be organic should be actually produced according to organic farming principles. These principles and criteria for organic certification are laid down by International Federation of Organic Agriculture Movements (IFOAM). The major theme of these organic certification principles is to promote, support, encourage and strengthen natural production processes without the use of any chemical inputs like fertilizer, pesticides, and insecticides, so as to provide guarantees to the consumer by maintaining quality of organic products.

The organic standards and certification schemes were developed in the private sector by non-governmental associations of farmers and consumers, and first arose in the US and Europe. This movement towards standards was initiated in the early 1970s (Diane, 2000). Today hundreds of organic certification bodies function worldwide, and many of these hold their own property standards, which may be specialized according to their

specific region and culture. The first organic certification in Ethiopia dates from 1999 (Diane, 2000). Though an estimated 90% of the coffee produced in Ethiopia is organic, a very small fraction of the coffee (0.1%) is certified as such (Mekuria et al., 2004). OCFCU is one of those who received organic certification. This organic certification is not directly given to each farmer, rather it is given to the cooperatives that belong to the OCFCU, through which they get acknowledged and receive their premium price.

The following are among the major standard areas of interest for IFOAM which are required for receiving organic certification (UNEP, 2008)[4]:

Health: Organic agriculture should sustain and enhance the soil, plant, animal, human and planet as one and indivisible.

Ecology: Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.

Fairness: Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities.

Care: Organic agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

By and large, organic farming shall be based on appropriate design and management of biological processes based on ecological systems using natural resources which are

[4] *http://unctad.org/trade_env/test1/publications/UNCTAD_DITC_TED_2007_15.pdf*

internal to the system. It should also be based on strict limitation of the use of chemically synthesized inputs to exceptional cases.

2.4. Certification based on Fair Trade criteria

Why do nations trade what they do? Is trade good? The theory of international trade provides convincing and elegant answers, and hence the vast majority of economists argue about the desirability of trade. International trade may make the division of gains from trade much harder: some nations ordinarily lose from the absence of fair trade (Jones, 1987).

In equilibrium the gains from international trade must ordinarily outweigh the losses among trade partners by prioritizing national gains from trade argument i.e. there needs to be non-zero-sum game in trade. Even so, most economists tend to favor efficiency-enhancing policies such as liberal trade on the pragmatic grounds that efficiency–reducing policies like protection causes gainers and losers, so it is better to go with the larger net gains and supplement them with feasible programs like certification, trademark, licensing, patent right etc to compensate the most obvious losers. What if losers are not compensated? A person taking this seriously must decide on fair trade by weighing a countries gains and losses. Ethical considerations give more weight (to losses and gains) to the poor than to the rich. The case of liberal trade is challenged by ethical considerations, because liberal trade polices of rich countries hurt the poor disproportionately, as documented by Gresser (2002). Therefore, fair trade serves as an equitable and fair partnership between global markets and producers in developing countries and the rest of the world. In other words a fair trade partnership works to provide low-income artisans and farmers with a living wage for

their work. In my opinion it helps family farmers in developing countries gain direct access to international markets, as well as develop the business capacity necessary to compete in the global marketplace.

In general, the principal criteria of fair trade certification according to different authors' views are (Shanliy, 2002, Tinna, 2005):

- Paying a fair wage in the local context, i.e. decent working and living condition for workers, free association of workers and co-operations, with structures for democratic decision making
- Ensuring that there is no abuse of child labor
- Direct trade with farmers, bypassing middlemen
- Sustainable agricultural practices including restricted use of agrochemicals, i.e. engaging in environmentally sustainable practices
- Building long-term trade relationships
- Access to capital, i.e. providing financial and technical assistance to producers
- Being open to public accountability

The growing literature questions the gain that can be obtained from free trade for developing countries like Ethiopia. Economists argue that fair trade guarantees farmers a fair price for their harvest; however, many small farmers receive prices for their agricultural products that are less than the cost of production, forcing them into a cycle of poverty and debt.

According to the classical economic thought fair trade through appropriate economic performance of trade can share the benefits of growth, productivity and efficiency between trading partners (Mannur, 1997). Strong export performance is one of the

immediate themes that every country aspires to achieve for rapid economic development. For countries like Ethiopia, export expansion, by increasing competitiveness, is an immediate prerequisite to economic growth and development. However, the literature indicates that the overall performance of foreign trade in Ethiopia had been poor and is characterized by negative trade balance for a long period. Production and institutional constraints related to trade promotion as well as problems on trade support services are the major ones among various reasons (Mekonnen, 1992). Moreover, the World Bank (1998) confirms that the interaction among the countries of the world through trade may not be equally beneficial to the involved parties.

2.5. Certification through area-based schemes

Area-based certification is a relatively new means of certification (Wiersum, 2006). According to Wiersum, the concept of area-based certification relates to a group of certification schemes that are not output-oriented, but geographic origin oriented. This could give due emphasis for the land quality rather than the product harvested on it, but it might develop market demand for agricultural products on the basis of land quality, which perhaps has direct links to the quality of the product. Since the land becomes unique in its characteristics, this type of certification could improve land quality, especially if it encourages land conservation by farmers once they are aware of this type of certification. This may alleviate the current land degradation problem in Ethiopia. Therefore, geographic oriented certification schemes limit the scope of certification to a limited area, there are no standard criteria, and each area can create its own unique certificate based on its unique nature and characteristics. Wiersum (2006) notes that there exist several types of area based certifications. In some cases

whole areas have been certified and every product that comes from this area may get the certificate. And to this effort of certification offerings by the vested interest group, different techniques are used to develop geographic indicators of origin (GIO) to confirm the origin of agricultural products.

> ".....GIO identifies a crop by its specific growing area that is often defined by satellite-aided location or Global Positioning System (GPS). The most effective method is using Geographic Information Systems (GIS) which supplements satellite imagery with on-the-ground verification. An important product for which this system is being tried is coffee; as coffees often carry the distinct characteristics of their particular microclimate several of the world's finest and most expensive coffees have been GIO certified."(Wiersum, 2006, p. 9)

A broad conclusion that emerges from this is that the area-based certification schemes could show a direct relation with the quality of products harvested from the area.

2.6. Coffee certification scheme in Ethiopia

Coffee certification scheme in Ethiopia is a recent phenomenon and rigorous empirical literatures in the Ethiopian context are scant. The first certification of forest coffee in Ethiopia started in 2002, and ever since, though it is on its formative years, concerned organizations are working for it (Stellmacher, 2008). According to this scholar, many concepts for certification have been developed and implemented. He stated that, forest coffee from Ethiopia can be certified according to certification scheme developed by different stakeholders under different agendas and backgrounds with different geographical foci in response to different ecological and socio-economic

concerns. In the interim, the country is increasingly attracting attention of international standard holders who have opened their own branch offices in Addis Ababa. These are Forest Stewardship Council, Rainforest Alliance, Utz Certified/Utz Kapeh, Fair Trade and Organic Standard (Stellmacher, 2008). These certification standards were evaluated by Volkmann (2008) vis-à-vis their relevance and applicability of principles and criteria in the specific context of the present ecological, political, institutional and socio-economic situation in South-West Ethiopia. However, transferring these standards to Ethiopian forest coffee given the existing situation including the land policy in the country is not a simple task since some of the standards are describing an entirely different ecological, institutional and socio-economic situation with different contextual needs. Volkmann concludes that at present there is no standard fitting the requirements of forest coffee certification in the Ethiopian context and the establishment of a new certification system should be considered. According to Stellmacher each of the above certification schemes is developed by different stakeholders under different agendas and backgrounds with different geographical foci in response to different ecological and socio-economic concerns. This means the certification schemes are not considering the prevailing socio-economic situation in Ethiopia and hence they may serve as barriers to the country's competition capacity in the international market. Of the existing certification schemes in Ethiopia, the OCFCU obtained both organic and fair trade certification and KMCFC too.

3. The Study Area, Data, Econometric Models and Results

3.1. Description of the Survey Site

The survey site is located in southern Oromia region called Bulle Hora (Hagere Mariam) district, which is 470 kms south of Addis Ababa. This district is confined within the altitude of 1564-2050 meters above the sea level. Its average annual temperature ranges from 18 ^{0}C to 21 ^{0} C and its average annual rain fall is 800mm. It has four climatic regions of which 11% is *Dega* (highland) where cereal crops are cultivated, 55% is *Weyna Dega* (temperate) where coffee is mainly grown and the rest 34% is *Kolla* (Semi-desert) where people are pastoralists. The area is also known for its *'Enset'* or false banana cultivation. It is densely populated with a population of 284,353 people who live on 38,400 hectares of land. 88% of the population lives in rural areas and the rest in urban areas. The district consists of 48 *Kebeles*, of which 3 are in Bulle Hora town and the rest are in the rural areas. Ninety percent of the total area is conducive for agriculture and 11,123 hectares are covered by coffee trees (around 30% of the total area). The major economic activity in this district is agriculture. Coffee is the main cash crop, while 'Kocho' made from false banana, is the main staple food for the people. Other agricultural crops like maize, sorghum, teff, barely and bee keeping are practiced[5] .

[5] *Bulle Hora District Agricultural and Rural Development office*

Four kebeles (Kilenso Mokonisa, Kalaltu Sawa, Sorilie Wachu, and Saraji)[6], which are known for their colossal coffee production, were chosen for the survey. The soil type of these kebeles is clay, sand and loom soil. The farmers of these four *Kebeles* have their own coffee farmers' cooperative called KMCFC. KMCFC is one of the biggest members of OCFCU which is working for the attainment of farmers` sustainable economic development. OCFCU was launched on June 1, 1999 with initial members of 22,503 coffee growers organized into 34 cooperatives, of which KMCFC is one. The initial capital of OCFCU was 825,000 *Birr*[7] and today it has 146 coffee farmers` cooperatives from different parts of Oromia region. The net income of OCFCU in the year 2008 was 23,423,228.08 Ethiopian bucks. Based on the amount of coffee the farmers sold, OCFCU paid 11,716,614 *Birr* dividends of premium in the same year. The total assets of OCFCU in the year 2008 were 114,419,957 Birr, of which 44,712,604 *Birr* is capital and the rest was its liability[8] .

KMCFC is among the founders and leading members of OCFCU and was established in the year 1976. Today it has 15,173 hectares of coffee farm and 1,612 members of which 81 are female and the rest are male.

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[6] *The geographical location, Universal Transverse Mercator (UTM), and elevation of the study areas are given in the table below.*

Kebeles	Location	UTM	Elevation
Kilenso Mokonisa	*37N 042817*	*0625633*	*1996meter*
Kalatu Sawa	*37N 0425947*	*0623121*	*1926meter*
Sorile Wachu	*37N 0428863*	*0623506*	*1916meter*
Saraji	*37N 0424390*	*0626248*	*2030meter*

Author`s GPS Reading on 29/01/2009

[7] *Birr is the Ethiopian bucks*

[8] *Interviews with OCFCU manager, 2009*

In the year 2009, KMCFC has 2,645,865.96 *Birr* of capital. KMCFC possesses a wet coffee processing machine at each *Kebele*. This cooperative does not have a dry coffee processing plant.

KMCFC purchases coffee from member and non-member farmers and sells it in the international market. The coffee purchased from member and non-members are sold separately to the importers and hence the cooperative do not get premium for the conventional coffee. It has obtained fair trade certification and organic certification from the international certifier agents, which gives them an opportunity to have a direct right of entry to new market channels via its union and get premium from importers. The additional price acquired from certification is distributed to farmers as dividend. The dividends are appreciated by farmers and have encouraged farmers to improve the quality of their life. Moreover, social infrastructure (like roads, electricity, schools, and health centers) is improved using proceeds from the premium price. This shows how coffee cooperatives have brought benefits to coffee farmers. Moreover the existence of cooperatives in the coffee market has improved the purchasing price offered by private traders because of competition with the cooperatives.

3.2 Data Sources and Sampling

We have used both primary and secondary data. Secondary data was collected from OCFCU, KMCFC, Bulle Horra district, coffee exporters, NBE, and other sources. The source of primary data was a cross-sectional household survey conducted by the author. Following systematic random sampling of farmers and training of enumerators, a pilot survey was conducted on 20 coffee farm households. After the revision of the questionnaire based on the pilot survey, 200 farm households were interviewed.

Individuals at coffee processing plants at each kebele, officials of KMCFC, and the manager and founder of OCFCU were also interviewed.

The enumerators, who were employed to conduct the survey, were agricultural development workers in the Bulle Hora district Agricultural Office. The questionnaires were translated from English to Afan Oromo so that the enumerators and farmers can communicate with each other at ease.

To generate the required information systematic[9] sampling technique was applied in the selection of coffee farmers from a list once the coffee farmers` cooperative is selected. The selection of coffee farmers` cooperative was done on the basis of its active participation on coffee certification activities. The second stage involves the systematic random sampling of farmers who are members of cooperative and getting benefits from certification and those who are non-member of cooperative and not getting the benefits from certification. The systematic random selection was done using the catalog of members. Based on the total number of members from each kebele, 52 farmers were selected from Kilenso Mokonisa, 43 farmers from Sorile Wachu, 33 from Kalatu Sawa, and 31 from Saraji. Among those who are not getting the benefits of certification 15 farmers from each kebele were selected and a total of 60 farmers were interviewed from this group. Not all of the farm households remembered the total coffee output they have produced in the year 2008. And hence the data for this year was collected from KMCFC catalog, whilst recall data reported by non-member farmers for the same year was used. May be the yield data from the survey and cooperative could result in different regression analysis.

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[9] *Total population is divided by the number of sample size to determine systematic interval selection from the list of members.*

3.3. Econometric Model specification

We have tried to use instrumental variables (IV) and difference-in-differences (DID) econometric modeling to estimate the effects of certification on farmer's productivity by controlling for a number of variables. DID or changes-in-changes (CIC) estimation is one of the most important program evaluation and identification strategies in applied economics (Meyer, 1995; Angrist and Krueger, 1999; Heckman, LaLonde and Smith, 1999; Bertrand, Duflo and Mullainathan, 2004; Athey and Imbens, 2006)[10]. This model is one of the most popular tools for applied research in economics to evaluate the effects of policy interventions and other treatments of interest on some relevant outcome variables[11].The DID model can be expressed by the following four key variables (Wooldridge, 2007):

- C_{it} =dummy variable for program participation which is 1 if observation i belongs in the state that will eventually be certified and 0 otherwise
- T_{it} =dummy variable for time period which is 1 in the time period after the treatment, i.e., certification, occurs and 0 otherwise
- $T_{it}C_{it}$ interaction term, treatment states after the intervention
- $X_1, X_{2...,} X_{n-1}$ are other control variables.
- Y_1 and Y_0 are outcomes with and without the treatment, respectively.

[10] *Cited on Patrick A. Puhani, 2008*

[11] *http://papers.ssrn.com/sol3/papers.cfm?abstract_id=640121, accessed on February 6,2009*

Putting together the pieces, we obtain the following estimating equation:

$$Y_{it}=\beta_0+\beta_1 T_{it}+ \beta_2 C_{it} + \beta_3 T_{it}C_{it} + \theta_i X_{it}+ \varepsilon_{it} \quad (1)$$

Where:-

Y (T=0, C=1) is average income of the control group before certification

Y (T=1, C=1) is average income of the control group after certification

Y (T=0, C=0) is average income of the control group before certification

Y (T=1, C=0) is average income of the control group after certification

The DID estimator is given by:

$$\Delta\Delta Y = [Y (T=1, C=1) - Y (T=0, C=1)] - [Y (T=1, C=0) - Y (T=0, C=0)] \quad (2)$$

$$DID = [\Delta Y(C=1)]-[\Delta Y(C=0)] \quad (3)$$

Y_{it}	Before Change(Y_{0t}) ....[1]	After Change (Y_{1t}) .....[2]	Difference [2]-[1]
Treatment group	$\beta_0 + \beta_2+ \theta_i X_{it}+ \varepsilon_{it}$	$\beta_0 + \beta_1 + \beta_2+ \beta_3+ \theta_i X_{it}+ \varepsilon_{it}$	$\Delta Y_t= \beta_1+ \beta_3$
Control group	$\beta_0+ \theta_i X_{it}+ \varepsilon_{it}$	$\beta_0 + \beta_1+ \theta_i X_{it}+ \varepsilon_{it}$	$\Delta Y_c= \beta_1$
Difference	B_2	$B_2 + \beta_3$	$\Delta\Delta Y= \beta_3$

From the above table and equations, we can see that the DID estimator is the coefficient on the interaction term, namely β_3 (T_i * C_i).[12] Where β_1 T_i captures the

[12] *Wooldridge (2007)*

trend over time, $\beta_2 C_i$ controls for initial differences between the treatment and control group, and $\theta_i X_{it}$ shows the effects of other control variables on income.

However, certification is not randomly assigned to farmers and due to absence of adequate data on the explanatory variables on each household for the year before certification, using the DID model results in a naive program evaluation and the result becomes less informative. Due to the nature of the data we would not be able to control for a number of independent variables to see the impacts of certification on coffee farmers` production per hectare. And hence instrumental variable or two-stage least squares (2SLS) method is employed to see the effects of certification on per hectare coffee production. The variables included in the analysis are the following: The dependent variable is coffee output per hectare in kilograms for the year 2008 (Y); the explanatory variables are: total area of coffee farm land (CFL) in hectare , dummy variable for color of the soil in the coffee farm (X5) which is 1 if the color of the soil is red and 0 otherwise, educational level of the coffee farm household head (educ), years of experience on coffee farming (experCF), dummy variable for use of fertilizer/pesticide (X9) which is 1 if the farmer is using fertilizer/pesticides and 0 otherwise, number of working age people in the household (X10), dummy variable for type of labor employed on the coffee farm (X11B) which is 1 if the farmer is employing both family and hired labor and 0 if either of the two type is used, dummy variable for employing forest , soil , water and environmental management (X12) which is 1 if the farmer is employing forest, soil ,water and environmental management and 0 otherwise, dummy variable for effect of certification (C) which is 1 if certified and 0 if conventional, dummy variable for farmers` awareness on certification (IV1) which is 1 if the farmer has awareness on certification and 0 otherwise , and farmers'

perception on selling organic/fair trade certified coffee (IV2) which is 1 if they tell selling organic/fair trade certified coffee is beneficiary and 0 otherwise.

Hence the following linear model is specified to see the effects of certification on farmers` coffee production per hectare.

$$Y_i = f(X_i, C, \mu_i) \quad (4)$$

Where:

X_i is explanatory variables affecting per hectare coffee productivity(Y),

C is as defined above,

μ_i is the error term

$$Y_i = \beta_0 + \beta_1 \chi_{i1} + \beta_2 \chi_{i2} + \beta_3 \chi_{i3} + \beta_4 \chi_{i4} + \ldots + \beta_k \chi_{ik} + \mu_i \quad (5)$$

$$E(\mu) = 0, \; Cov(xj, \mu) = 0, \; j = 1, 2, \ldots, K-1 \quad (6)$$

The independent variables are normally assumed to be exogenous, however X_k might be correlated with μ, and X_k has a possibility to be endogenous in equation (5), due to simultaneity, measurement error, omitted variables and selection bias. We have a number of econometric way-outs from this sunk (Wooldridge 2002, Green 2002).

In our particular case, the decision of a farm household to participate in certification scheme is based on the coffee growers self interest which is also constrained by membership fee (see the descriptive analysis), and amount of premium received due to certification. In light of this fact, there may be a possibility for the variable (C) to be endogenous and hence we can think of χ_k in equation 5 as C. Thus we can say

certification is endogenous assuming that there might be lack of information about the importance (benefits) of certification, lack of information on the price of organic/fair trade certified coffee, membership fee affecting certification, and amount of premium. These variables may not affect coffee productivity directly except through its effect on C and hence can be considered instruments.

Therefore, OLS estimation of equation (5) generally results in inconsistent estimators of all β_j if cov $(X_k, \mu) \neq 0$. Moreover without further information, if we only have information, for example, on y, X_1, and X_2, we cannot consistently estimate the parameters in equation (5), as there might be correlation between the error terms and C or χ_k as a result of certain unobserved explanatory variables like knowledge on getting certification and its benefit, lack of awareness among farmers on their duties and responsibilities from participation in coffee certification scheme, productivity skill, etc, that affects participation in the program. Thus, according to Wooldridge (2002), standard instrumental variables (IV) regression provides solution to the problem of an endogenous explanatory variable.

To use the IV approach with X_k endogenous, we need an observable variable Z_i, which is not in equation (5) that must, satisfy two conditions.

1. Z_i should be correlated with C_i (the correlation between Z_i and C_i should be significant)

More specifically, if we run the linear projection (reduced form projection)

$$C_i (x_k) = \delta_o + \delta_1 X_1, \ldots, \theta_i Z_i + \eta_i \qquad (7)$$

We had better expect θ_i in equation 7 to be non zero. In other words after the other variables (X_i) are taken into account the IV (Z_i) had better have some power in acting as a representative for X_K, otherwise it will be a lousy IV. By definition of a projection, $E(\eta_i) = 0$ and η_i is uncorrelated with X_i and Z_i, here one has to note that it does not matter if X_i and Z_i are discrete or continuous.

Where the following holds, $\mu_i \sim N(0, \sigma)$ (8)

$$\eta_i \sim N(0, \sigma)$$

$$\text{corr}(\mu_i, \eta_i) = \rho$$

where $\acute{Z}_i$ is a vector of exogenous variables, θ is a vector of unknown coefficients, η_i and μ_i are random disturbance terms .The latent variable C_i is not observable, it has dummy variable that is related to the explanation in equation (1).There are variables that affect C (IV1, IV2) but not the outcome variable (Y_i) except through C. When $\rho = 0$ standard OLS regression provides unbiased estimates, when $\rho \neq 0$ the OLS estimates are biased.

2. Z_i should be uncorrelated with μ_i

In other words, cov (Z_i, μ_i)=0, i.e. Z_i should be exogenous like X_i .The intuition here is that Z_i should not have its own independent influence on Y(i.e., it should not be an omitted variable in (5), if it were, it should have been in the model in the first place). The requirement is that any relationship that Z_i has to Y is only through its indirect influence via C (or X_k). The correlation between Z_i and C_i (X_k) is testable but cov (Z_i, μi) =0 can not be tested, it is based on economic reasoning or common sense.

To fix the endogeneity problem with IV we somehow want to internalize Z_i into equation (5), since X_k puts us in a sunk. By substituting (7) in for X_x in equation (5) we create a new linear projection:

$$Y_i=\beta_0+\beta_1\chi_{i1} + \beta_2\chi_{i2} + \beta_3\chi_{i3} + \beta_4\chi_{i4} + \ldots + \beta_k(\delta o + \delta 1Xi1+,\ldots,+\theta iZi + \eta i) +\mu_i \quad (10)$$

This looks like it could be just estimated with a regression of Y on X_i and Z_i. The new error term is uncorrelated with X_i and Z_i so that this can be consistently estimated with OLS, after rearranging equation (10). The coefficient on θiZi describes the influence of the instrument on the outcome(Y).

3.4. Descriptive and econometric discussions of the research out come

3.4.1. Descriptive analysis

In this part we analyze the differences between the conventional and certified coffee growers for the year 2008. The differences are scrutinized on the basis of the following characteristics that may indicate their socio-economic situations: gender of the household head, experience of the farm household head, family size, number of family members working in the production of coffee, educational level of the farm household head, total farm land owned by the household, total farm size covered with coffee trees, color of the soil in the coffee farm land and total number of the coffee trees on the coffee plot.

3.4.1.1 Some general description of the sample

The descriptive statistics of the sample area is indicated in the tables below. The P-values in the tables tell as whether the mean of the two groups are statistically significant or not. All the P-values with two asterisks have statistically significant difference in means across groups.

Table 1.General descriptions of the sample area

Kebele	Certified coffee Growers		Conventional coffee Growers		Total	
	#	%	#	%	#	%
Kalatu Sawa	13	28.6	33	71.74	46	100.00
Sorile Wachu	10	16.95	49	83.05	59	100.00
Kilenso Mokonisa	14	22.58	48	77.42	62	100.00
Saraji	11	22.58	34	77.36	45	100.00
Total	**48**	**22.64**	**164**	**77.36**	**212**	**100.00**

Source: *Survey sample data; the first number indicates frequency, and the second %*

Table 2.Socio-economic characteristics of the households

Variable	Certified coffee Producers 77.36%	Conventional Coffee Producers 22.64%	P-Values
Average number of years spent on coffee production	(17.95)	(15.64)	0.10
Head of family in %	(98.78)	(89.58)	0.00**
Gender of Head (Male)%	(94.51)	(97.92)	0.33
Martial Statues (married) %	(89)	(90)	0.25
Age (experience)	(50.87)	(37.64)	0.00**
Education	(2.7)	(3.7)	0.04**
Household size	(10.6)	(8.1)	0.00**
Between age of 18-65 years	(4.77)	(2.875)	0.00**
Above age of 65	(0.5)	(0.33)	0.38
Less than age of 18	(5.2)	(4.93)	0.65
Number of family labor used in coffee farming	(3.7)	(0.33)	0.38
Employing children on coffee farm %	27.08%	28.66%	0.83
Farmers employing family labor %	51.83 %	45.83 %	0.44
Farmers employing both family and hired labor %	48.56 %	54.17%	0.44
Total farm land (hectare)	(2.03)	(1.73)	0.44
Total Coffee farm land (hectare)	1.18	1.09	0.32
Color of coffee farm soil (red) %	74.39	79.17%	0.12
Number of coffee trees on coffee farm land	2319	1841	.31
Values in bracket are Means			

*Source: survey data, ** to mean statistically significant difference in means across groups*

The P-value shows the existence of significant difference between the ages (experience) of farmers among the two groups which may contribute to differences in productivity. However, there was no significant difference in the number of years spent on coffee production. From the total farm household sample 30.19% were illiterate. Of those who are literate 79.92% of the conventional coffee producers and 68.9% of the certified coffee producers were educated from grade 1 up to 11. The average education level of farmers who produce certified coffee is statistically significantly smaller than that of conventional coffee producers.

The average family size of the total sample was 10.07 people, with minimum family size of 1 and maximum of 34 people. For the conventional coffee growers the average family size was 8 with minimum family size of 1 and maximum of 18, while for the certified coffee farmers it was 10.63 with 2 person of minimum and 34 person of maximum family size (Table 2 above).

3.4.1.3. Coffee farmers' resource endowments

1. Farm Labor

   An average of 3.7 and 2.56 people from the households took part in coffee production in certified and conventional coffee growing households, respectively and the difference is statistically significant. If we take a look at the age structure of the farm households, on average we have 4.77 people in the standard working age group (18-65 years of age) from certified coffee growers, and 2.88 people in the conventional coffee producers and the difference is statistically significant. The age structure is dominated by those whose ages were below 18 and the average numbers of children whose age is below 18 was 5.2 and 5 for the certified and conventional coffee producers respectively (the difference is not statistically significant).

   For both groups of coffee growers only a small number of family members are older than 65 years of age. About 27% of conventional coffee producers in the sample are using child labor in their coffee farming while about 29% of the certified coffee producers are using child labor and the difference is not statistically significant (Table 2 above). This implies that the farmers are not well aware about their duties and responsibilities to getting certification. One of the criteria to getting fair trade certification is that the farmers should not use child labor in their

coffee farm and in any farming activity in general. The data show, however, that more than a quarter of the farmers in the sample use child labor and certified coffee producers are not statistically different from conventional coffee producers in this respect. A little over half (51.83%) of the certified coffee growers use family labor and 45.83% of conventional coffee growers are using family labor. The rest are using both hired as well as family labor, but the differences between the two groups of farmers are not statistically significant (Table 2).

2. Coffee farmers` land

Table 3.Total land holding of the coffee farmers

Total land size in hectare	% of respondents	Certified coffee growers	Conventional coffee growers
0.5-1.5	33.96	32.32	39.59
2-3.5	61.32	56.25	62.8
4-10	4.71	4.16	4.27

Source: *Survey data*

About 34% of the respondents held 0.5 to 1.5 hectares of land and 61.32% held 2 to 3.5 hectares while only 4.71% held 4 to 10 hectares of land. The difference in average total land holdings in hectares of certified (2.03) and conventional (1.73) coffee producers was not statistically significant. Similarly, the average coffee farm land was more or less the same for both groups of coffee producers (Table 3). Farms not used for coffee production are used for inter-cropping like *chat*, false banana, maize, etc.

Table 4.Coffee farm size and % of farmers using fertilizer and pesticides on coffee farm

Coffee farm size in hectare	% of total respondents	% Certified coffee growers	% Conventional Coffee growers
0.5	12.50	6.10	7.55
1—1.5	78.66	78.30	78.30
2—5	10.42	15.25	15.25
Farmers using chemical fertilizers & pesticide	23.11	23.78	20.83 P-value= 0.6917

Source: Survey data

Table 4 portrays the differences in the distribution of coffee farm land holding. About 13% of the respondents cultivated 0.5 hectares of coffee plot, and about 79% held from 1 to 1.5 hectares of coffee farm while the rest (about 10%) held 2 to 5 hectares of coffee farm. In general one can see from table 4 that the differences in coffee farm holding between certified and conventional coffee growers were nearly indistinguishable.

Similar to the results for use of child labor presented above, there are farmers among the certified coffee growers who are not implementing some of the certifier agents` standard sets of criteria in terms of use of inorganic inputs. About 24% of the respondents from certified coffee producers are using inorganic fertilizer and pesticide while they are getting benefits from organic and fair trade certification. Among the conventional coffee producers 20.83 % are using inorganic fertilizer and pesticides while the remaining 79.17 % are not using inorganic fertilizers and are adhering to the requirements of organic certification in this respect even if they are not certified. The difference in the percentage of farmers using inorganic inputs between certified and conventional coffee producers is not statistically significant (Table 4). If we take a look

at the market share, 50.61% of the certified coffee growers are selling their coffee only to the cooperative, 3.05% are selling to private traders, and the rest 46% are selling for both private traders and KMCFC. While 25% of the conventional coffee growers are selling to private traders and 12. 50 % of them sell to KMCFC and the rest 62.50% are selling to both (Table 5).

Table 5.Social, economic and environmental benefits from certification

Benefits from Certification		Certified coffee producer	Conventional coffee producers	P-Values
Average production of coffee/hectare of coffee plot in the year 2008 in Kg		2052.416	827.4931	0.00**
Obtained second payment		96.95 %	0.00%	0.00**
Obtained training on certification, forest and soil conservation , and other technical assistance on agriculture		85.37%	0.00%	0.00**
Obtained training on marketing skills, consumer demand for specialty coffee or certified coffee		85.37%	0.00%	0.00**
Voiced their problem together through the cooperatives		82.93%	0.00%	0.00**
Got access to credit facility		70.12%	0.00%	0.00**
Obtained access to coffee processors		84.76%	0.00%	0.00**
Learned how to preserve the ecology		84.76%	0.00%	0.00**
Encouraged to diversify crops		88.42%	0.00%	0.00**
Received better income		100%	2.8%	0.00**
Increased sells		100%	2.8%	0.00**
Obtained greater skill in production		97.56%	2.8%	0.00**
Attained food security		97.56%	0.00%	0.00**
Selling their coffee often to :--	Private traders	3.05%	25%	
	cooperatives	50.61%	12.50%	
	To both	**46.34%**	**62.50%**	

Source: Survey data

3.4.1.4. Benefits to farmers producing organic and fair trade certified coffee

Table 5 shows social, economic and environmental benefits to farmers that produce organic and fair trade certified coffee. One can easily see from Table 5 the productivity difference among the certified coffee growers and conventional coffee producers at KMCFC. The average coffee production per hectare of coffee farm for the certified coffee producers was 2052.416kg of red cherry, while for the conventional coffee producers it was 827.4931kg per hectare. We also see that the difference is statistically significant. The conventional coffee growers are producing only 40.32% of the total output per hectare of the certified coffee producers. If we take a look at the combined productivity 71.3 % coffee output per hectare comes from the certified coffee growers in KMCFC and the rest 28.7% from the conventional coffee producers. These are just unconditional means and the result may be very different when one controls for other variables that affect productivity. The conditional mean productivity is estimated in the econometric analysis section by using IV. From the survey data we note that among the certified coffee growers 96.95% obtained second payment[13], 85.37% obtained training (on certification, forest and soil management, marketing skill, consumer demand on specialty coffee, and other technical assistant on agricultural activity), 82.93% voiced their problem through KMCFC, 70.12% obtained access to credit facility, 84.76% obtained access to coffee processors and learned how to preserve the ecology, 88.42 were encouraged how to diversify crops, 100% increased sells and received better income, 97.56% obtained greater skill in production and attained food security (Table 5). On the contrary, almost 100% of the conventional coffee growers are missing all these benefits.

[13] *Second payment is the dividend paid to farmers by the cooperatives receiving the faire trade/organic certification benefits from importers*

The farmers do not receive certification directly or autonomously; it is given to cooperatives than to individual coffee growers that may unwrap an opportunity for free riding. To fetch the benefits from certification they need to be a member of the cooperative. However 97.92 % from the conventional coffee growers reported that they could not afford the high entrance fee for membership (Table 6).

Table 6.Understanding of coffee growers about organic and fair trade coffee certification

Responses of farmers to certification related issues	Certified coffee growers	Conventional coffee growers	P-values
Want to produce organic coffee and use organic fertilizer like dung	81.71%	47.92%	-
Loose second payment if they are not certified?	96.34%	37.50%	0.00**
Not certified due to high entrance fee	-	97.92%	-
Awareness on cooperatives acknowledgment for certification	81.10 %	-	-
Informed on price difference on certified and conventional coffee	86.59 %	39.58 % not informed	0.00**
Aware of organic and fair trade certification	92.07%	52.08%	0.00**
Certification gives special privileges for our coffee product	91.46%	52.08 %	-
Employ forest management	96.95%	87.50%	0.00**
Employ shade grown coffee	98.78%	87.50 %	0.00**
Employ soil conservation	98.17%	89.58%	0.00**
Employ protection of water	88.41%	79.17%	0.10
Employ management of by products	84.76%	77.08	0.21

Source: Survey data

The rest 2.08% reported that they do not want to be associated with the cooperative. Hence the cooperative has to mull over this problem so as to scale up the opportunity of conventional coffee growers to be organic/fair trade certified coffee growers.

3.4.1.5. Understanding of coffee growers about organic and fair trade coffee certification

Out of the total certified coffee farmers 81.71 % produced organic coffee and they are using organic fertilizer, while the corresponding figure is 47.92% for the conventional coffee growers. 96.34% of the certified and 35.50% of the conventional coffee growers reported that they will lose only second payment from not being a member to KMCFC. About 19% of the certified coffee farmers in the sample do not have any idea whether their cooperative is certified. The problem with information flow regarding certification and its implication may keep them away from asking for their privileges. Besides about 13% of growers of certified coffee do not know the existing price differential between certified and conventional coffee and the same is true for 60.42% of the conventional coffee farmers. Regarding awareness of organic and fair trade coffee certification 92.07 % of the certified coffee growers are aware while only about 52.08% know about it. Table 6 shows that 91.46% of the certified coffee growers believe certification favors farmers producing specialty coffee, helps in getting better income and gives special privileges for their product; 52.08% of conventional coffee producers share these same ideas. From the above results one can see that the cooperative has to put its effort in educating the coffee farmers about the existence of alternative markets. Almost all sampled farmers from KMCFC are producing eco-friendly coffee. Eco-friendly means that they employ forest management, shades over coffee trees, soil conservation, water protection and management of by-products. The percentages employing these practices are: 96.95% and 87.50%, 98.78% and 87.50%, 98.17% for certified farmers, and 89.58%, 88.41% and 79.17%, 84.76% and 77.08% for conventional farmers. This shows that these farmers have their own indigenous eco-

friendly farming techniques in addition to the technical assistance they receive from their cooperative. We also note that the differences between the two groups of farmers with respect to these variables are statistically significant up to the 10% level of significance except for management of by-products.

3.4.2. Econometric analysis

Though instrumental variables/two-stage least squares (2SLS) and DID models were specified to address the research questions, we focus on the former in this analysis for reasons mentioned above. The first–stage estimation considered certification as the dependent variable and all exogenous variables of the second stage as explanatory variables. In addition the two excluded instruments (IV1 and IV2) were also used in the first stage. In the second stage estimation where coffee production per hectare (Y) is the dependent variable, we include as right-hand-side variables certification status of the farmer (C) and other exogenous variables expected to affect coffee farmers` per hectare productivity. While conducting instrumental variable regression (using the "ivreg2" command in Stata) multicollinearity, heteroskedasticity, exogeneity of the instruments and endogeneity of the variable that is instrumented for (i.e. certification status) were tested. For example the mean of Variance-inflation- factor (VIF) is 1.45 and for each variable it is less than 2 and this result stipulates absence of collinearity as the VIF for all independent variables is less than 10. Generally there is no indication of the presence of the above econometric problems (see results of these tests in the annex).The reported results are also robust to arbitrary heteroskedasticity.

From the result of the first-stage regression we can observe that certification is significantly correlated with the two excluded instruments: farmers` awareness on

organic/fair trade certification and their perception of producing organic/fair trade certified coffee. The partial R^2 of the two excluded instruments is 0 .5823, which means 58% of the variation on C comes due to the two excluded instruments that affect productivity per hectare via C where the two Chi-sq (2) tests; Kleibergen-Paap rk LM and Kleibergen-Paap rk Wald statistic give you an idea on the inquiry of its significance (see table 7 below).

Moreover, we note that educational level and experience of the farm household are negatively correlated with certification, when these two attributes increase; farmers become less likely to get certification (see the first stage regression results in the annex).

Table 7: Summary results for first-stage regressions (with ivreg2)

Variable	Shea Partial R2	Partial R2	F (2, 201)	P-value
C	0.5823	0.5823	165.71	0.0000

Under identification tests

Ho: matrix of reduced form coefficients has rank=K1-1 (under identified)

Ha: matrix has rank=K1 (identified)

Kleibergen-Paap rk LM statistic Chi-sq (2) =51.45 P-val=0.0000

Kleibergen-Paap rk Wald statistic Chi-sq (2) =349.56 P-val=0.0000

Table 8.Econometric results of two- stage least square (2SLS) for the basic model

Variable	Coefficient	Standard error	P-values
Intercept	-846.1074	561.122	0.132
C	1459.058	297.328	0.000*
CFL	-1096.257	280.5339	0.000*
X5	69.73049	262.7574	0.791
educ	94.24534	41.36635	0.023**
experCF	63.23594	13.62605	0.000*
X9	804.7504	381.2329	0.035**
X10	52.2278	50.03433	0.297
X11B	369.8878	291.857	0.205
X12	783.1065	385.1978	0.042**

*P-Values are showing level of significance at 1 %, 5%, 10% ***, **, * respectively, Number of obs = 212, F (9, 202) = 6.17, Prob > F = 0.0000, Centered R2 = 0.2472, Uncentered R2 = 0.5685*

As can be seen from Table 8, the results show that there is a significant difference in per hectare productivity between the organic/fair trade certified coffee and conventional coffee growers. The conditional mean of per hectare productivity for the certified farmers is 1459.1 kg/hectare. Thus on the basis of *ceteris paribus* assumption, the positive sign of the coefficient on C portrays that fair trade/organic certified coffee farmers of KMCFC produce red cherry of 1459.1 kg more per hectare than the conventional coffee growers which is statistically significant at the 1% level. Part of this difference in productivity may be explained by the training given to the certified coffee growers on certification, forest and soil management, marketing skill, consumer demand on specialty coffee, and other technical assistant given on agricultural activity

while the conventional coffee growers are not getting it. The coefficient on C perhaps is capturing the effects of all other factors that are related to certification not included in this regression which may be elucidated by the disturbance terms.

More over a few of key informant groups among conventional coffee producers reported that they are selling their coffee to the cooperatives via their relatives, neighbor etc who are members of the cooperatives and are receiving the benefits from certification via these people with out having been certified. To the extent that the data on output collected from the cooperatives includes such output sold to cooperatives by certified farmers, this would have its own impact on the empirical results. For example it may have blown up coefficients on C. Due to this use of data from the survey and cooperative may lead to different econometric results.

Consequently, certification has a positive impact on farmers' productivity and it should be encouraged. However there are some farmers that can be called "free riders," because they are getting the benefits of certification without meeting the requirements of the certifier agents' specifications. The coefficient on X9 (using fertilizer and pesticides) which is significant at 5% level depicts those farmers who are using fertilizer/pesticides produce 804.7504 kg more per hectare than those who are not using it. Note that the organic/fair trade certified coffee growers are not supposed to use chemical fertilizers/pesticides as they are expected to produce organic coffee and get organic certification. Hence, to encourage those farmers who are producing in line with the certification criteria, the vested interest groups in certification scheme have to monitor farmers and enforce the criteria to decrease the number of farmers who are producing inorganic coffee even when they are "organic" certified.

The econometric results in Table 8 show that, out of the nine socio-economic variables five of them are statistically significant at 10% level or less. Coffee farm land and per hectare productivity of the farmer are inversely correlated. Productivity per hectare decreases by 1096 kgs with a one hectare increase in size of land holdings which is significant at the 1% level. This means that smaller farmers are found to have higher productivity per hectare than the large ones. A large proportion of the economic development literature is devoted to this topic, with arguments both for and against the notion that smaller farms are more productive (Christopher, 1993).

In general smaller farms in KMCFC are more productive. Possible reasons may be differential factor prices, differential land use intensities (cropping and inputs), qualitative factor differences, class-based differences among farms of different sizes, or some combination of these factors and also unobserved heterogeneity matters.

In the descriptive analysis we have seen that 75% of the respondents have coffee farm land with red color, and we found that the impact of coffee farm color on per hectare productivity is not significant. Productivity per hectare is significantly and positively correlated with the educational level of the household head. One grade additional level of education results in an increase of coffee productivity per hectare by 94.25 kg, and this is significant at 5% level. We also found that as experience of the coffee farmer increases by one year, coffee farmer`s productivity per hectare increases by 63.24 kg. This may happen due to the farmer's perception of better ways of production that could be acquired from training on better farming techniques given to them by the concerned stakeholders and also from their own traditional ways of cultivation (learning by doing). Number of working age people is positively correlated

with productivity but it is not significant and the same is true for the type of labor employed on the coffee farm.

Use of forest, soil, water and other environmental protection techniques is significantly and positively correlated with productivity at the 5% level. These farmers employing environmentally-friendly techniques are producing 783 kg more than those not using these techniques. Hence there is a need to coordinate efforts in formulating programs that improve farmers` awareness on conserving forest, soil, and water.

Finally we have tried to show the DID estimation controlling only for change in total farm land, change in total coffee farm land and change in land allocated for other crops. As it is explained in the previous section, we are not able to control for other socio-economic variables. Hence the following DID estimate depicts that certification has positive effect on productivity per hectare but not statistically significant. However the change in coffee farm size has significant effect on per hectare productivity suggesting that there is inverse relationship between coffee farm size and productivity. The result shows the same thing explained above in the 2SLS that small farms are more productive than the larger ones.

Table 9.Results of difference-in-difference estimation (d-i-d)

ΔΔY	Coef.	Std. Err.	t	P>|t|	95% Conf. Interval	
TD	-1.01e-11	79.21937	-0.00	1.000	-155.7191	155.7191
C	1360.265	165.3471	8.23	0.000	1035.247	1685.282
TC	1.30e-11	233.5803	0.00	1.000	-459.1416	459.1416
XX1	264.2333	122.455	2.16	0.032	23.52731	504.9392
XX2	-1370.271	218.4453	-6.27	0.000	-1799.662	940.8802
XX3	704.4603	135.9703	5.18	0.000	437.1878	971.7329
_Cons	400.8333	56.01655	7.16	0.000	290.7233	510.9433

*Where XX1=TFL_{2008}-TFL_{1999} XX2=CFL_{2008}-CFL_{1999} XX3=OFL_{2008}-OFL_{1999}, Figures in brackets are P-Values showing level of significance at 1 %, 5%, 10% ***, **, * respectively, Number of obs = 424, F (6, 417) = 58.14, Prob > F = 0.000, R-squared = 0.1125*

This DID model is designed to be used to test for the presence or absence effects of particular policies, laws, regulations, etc. It is based on a "natural experiment" approach to testing for the effect of certification scheme. It is a very simple yet powerful tool that has two notable features or requirements. First is value free or theory free. There is no economic model being proposed or tested. It is purely an empirical tool. Second, it does have strong empirical requirements. Hence the discussion focused on the 2SLS result as the household survey data fails to meet the empirical requirements to make rigorous DID analysis.

4. Conclusion and Policy Implications

4.1. Conclusions

The main theme of this study was to scrutinize the economic motivation of coffee certification scheme in Ethiopia. As indicated earlier the objectives of the research were three and it focused on KMCFC which has been able to sell its coffee to organic and fair trade export market, via OCFCU, and be paid the incentives offered for organic and fair trade certification. Instrumental-variable and difference-in-difference technique were employed on 212 randomly selected rural farm households from four kebeles in Bule Hora district.

Conditional relations between certification scheme and per hectare productivity of coffee farmers had been estimated in this study and the results suggest a statistically significant relation. Given this potential of the model in revealing the effects of an event/policy changes on certain sector, it is possible to identify a scenario at which organic/fair trade certification encourages per hectare productivity. The results point out that certified coffee growers on average are likely producing 1459 kg more per hectare than the conventional coffee growers, *ceteris paribus*. More over the training given to the certified coffee growers on certification, forest and soil management, marketing skill, consumer demand on specialty coffee, and other technical assistant given on agricultural activity stipulates how certification scheme of coffee can lead to more economic and environmental benefit to farmers.

Hence, getting certification is advantageous as it results in superior productivity. However there are some farmers that may be called "free riders" which impose a cost on the honest farmers and cooperative. For example, the conventional coffee growers

are receiving the financial benefits of certification by selling the conventional coffee to KMCFC via their relatives and friends which is hurting the honest farmers. There is also a positive externality to the conventional coffee growers from the community facilities like water, sanitation, schools, clinics, etc provided by OCFCU with the premium price being collected from the coffee importers.

Nonetheless, if this free riding problem keeps on persisting, the cooperative could not be able to fetch sustainably the benefits from certification and same holds to the farmers. The study also indicated that 23.78% of the organic/fair trade certified coffee producers are using inorganic fertilizer and pesticides, and 28.66% of them are using child labor whose age is below 18 years. Therefore, among the organic/fair trade certified coffee growers, some of them are not meeting the requirements of the certifying agents. In the meantime some of the criteria of certifying agents do not consider the existing socio-economic conditions of Ethiopian farm households. Thus the existing certification scheme in Ethiopia is not trustworthy.

By and large, the entire attempt made in this study shows that in identifying some options that fit the prerequisite of the models, 2SLS and DID modeling can be applied to do the economic analysis of coffee certification scheme in the context of other coffee farmers' cooperative union in Ethiopia.

4.2. Policy Implications

1. Policy makers can consider certification scheme as having potentials in improving productivity and conserving the environment;

2. Policy makers need to build and encourage certification scheme fitting to the context of Ethiopian ecological, institutional and socio-economic situation;

3. Certifying agents have to keep on inspecting and providing training to the farm households at each level of coffee growing and production process;

4. There is a need to bring about efficient monitoring and enforcement of the certification criteria

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Appendix

Econometric Results

Table 10.Variance inflation factor (VIF) diagnostics for multicollinearity for the variables used in the analysis

Variable	VIF	SQRT VIF	Tolerance	R- Squared
CFL	1.09	1.04	0.9175	0.0825
X5	1.07	1.03	0.9343	0.0657
educ	1.12	1.06	0.8930	0.1070
experCF	1.21	1.10	0.8272	0.1728
X9	1.18	1.08	0.8510	0.1490
X10	1.36	1.17	0.7337	0.2663
X11B	1.14	1.07	0.8783	0.1217
C	2.63	1.62	0.3805	0.6195
IV1	1.85	1.36	0.5415	0.4585
IV2	1.83	1.35	0.5473	0.4527
Mean VIF 1.45				

Table 11.First-stage regression of C:

Number of obs = 212

F(10, 201) = 49.92

Centered R2 = 0.6207

Uncentered R2 = 0.9141

C	Coef.	Std. Err.	t	P>|t|	95% Conf. Interval	
CFL	.0438168	.037558	1.17	0.245	-.0302414	.117875
X5	.0316642	.0250572	1.26	0.208	-.0177444	.0810728
educ	-.0084061	. 0082438	-1.02	0.309	-.0246615	.0078493
experCF	-.0003898	.0022951	-0.17	0.865	-.0049154	.0041358
X9	.0329136	.0505987	0.65	0.516	-.0668587	.1326859
X10	.0088751	.0088642	1.00	0.318	-.0086036	.0263538
X11B	-.0502841	.0385086	-1.31	0.193	-.1262168	.0256485
X12	.0784975	.1494363	0.53	0.600	-.2161665	.3731616
IV1	.516558	.0815441	6.33	0.000	.3557674	.6773505
IV2	.4121831	.0753456	5.47	0.000	.2636139	.5607522
_cons	-.1080742	.1488096	-0.73	0.469	-.4015024	.1853541

Tests of joint significance of endogenous regressors B1 in main equation

Ho: B1=0 and over identifying restrictions are valid

Anderson-Rubin Wald test F (2,201) = 12.16 **P-val=0.0000**

Anderson-Rubin Wald test Chi-sq (2) =25.64 **P-val=0.0000**

Stock-Wright LM S statistic Chi-sq (2) =17.83 **P-val=0.0001**

Table 12.Two-Step GMM estimation

Number of obs = 212
F(9, 202) = 6.17
Prob > F = 0.0000
Centered R2 = 0.2472
Uncentered R2 = 0.5685

Y	Coef.	Std. Err.	Z	P>|Z|	95% Conf.	Interval
C	1459.058	297.328	4.91	0.000	876.3058	2041.81
CFL	-1096.257	280.5339	-3.91	0.000	-1646.093	-546.4203
X5	69.73049	262.7574	0.27	0.079	-445.2646	584.7256
educ	94.24534	41.36635	2.28	0.023	13.16879	175.3219
experCF	63.23594	13.62605	4.64	0.000	36.52938	89.9425
X9	804.7504	381.2329	2.11	0.035	57.54755	1551.953
X10	52.2278	50.03433	1.04	0.297	-45.83769	150.2933
X11B	369..8878	291.857	1.27	0.205	-202.1415	941.9171
X12	783.1065	385.1978	2.03	0.042	28.13263	1538.08
_cons	-846.1074	561.122	-1.51	0.132	-1945.886	253.6716

Under identification test (Kleibergen-Paap rk LM statistic): 51.445
Chi-sq(2) P-val = 0.0000
Endogeneity test of endogenous regressors (C): 3.337
Chi-sq(1) P-val = 0.067

QUESTIONNAIRE

Addis Ababa University

School of Graduate studies

Faculty of Business and Economics

Department of Economics

A questionnaire designed to conduct a household survey on the coffee farmers at Bulle Horra district among members and non-members of Kilenso Mokonnisa coffee farmers Cooperatives

Kebele _____

Date_____

Interviewer`s name _____

Interview started at _____

Interview ended at _____

Household identification number _____

Greetings! Thank you for sharing your precious time.

My name is _____. I am working in Bulle Horra agricultural and rural development office. This interview is part of the research Mr. Abebe Jotte is undertaking. You are selected randomly from the population living in this kebele. We are interested in

observing how farmers benefitted from the existing certification scheme in their cooperatives. Moreover we want to see how per hectare productivity of coffee farmers is affected through certification. The interview takes a few minutes and it will be confidential.

1. For how long did you produce coffee? _____

1.1. What is the total size of your farming plot (in hectare)? _____

1.2. How much of the total is used for coffee production? _____

1.3. What is the color of your coffee farm plot?

1) Red_____

2) Black_____

3) Grey_____

4) Others_____

2. Are you the head of your family? 1) Yes____ 2) No_____

2.1. Gender 1) Male___2) Female____

2.2. Age_____

3. Number of people living in the house? _____

1. between 18 and 65 years of age _____

2. below 18_____

3. above 65 _____

4. Educational Level, Grade_____, illiterate _____

5. Marital Status

1) Married_____ 2) single_____

3) Divorced_____ 4) Widowed____

6. Are you a member of the cooperative? Yes_____ No_____

6.1. If yes to question 6, has your cooperative been acknowledged for organic/fair trade certification? Yes ___, No __

6.2. If yes to question 6, what are the benefits you received from your cooperative? _____

	Yes	No	How much
1. Obtained Premium price	____	____	_____
2. Received Dividend	____	____	_____
3. Obtained training on certification	____	____	
4. Obtained training on forest, soil conservation and other technical assistance on agriculture	_____	_____	
5. Obtained training on marketing skills, consumer demand for specialty coffee/ certified coffee	_____	_____	

6. Voices our problem together through

the cooperatives _____ _____

7. Access credit facilities _____ _____

8. Obtained access to coffee processors _____ _____

9. Learned to preserve the ecology _____ _____

10. Encouraged to diversify crops _____ _____

6.3. For how many years have you been a member of this cooperative?

6.4. Do you know the difference between fair trade/organic certified coffee and conventional coffee? 1. Yes_____ 2.No_____

6.5. Do you know the benefits of selling organic/fair trade certified coffee?

1. Yes__ 2.No___

6.6. If you are not a member of a cooperative, what do you think that you lose?

_____

6. 7. Why you are not a member to a cooperative?

_____

_____

6.9. How much kg of coffee you have produced in?

	1999/2000	2007/08
	_____	_____

6.10. How has your living condition changed due to certification/ after you become member to the cooperative?

1. Received better income _____
2. Obtained greater skill in production _____
3. Increased production and sells _____
4. Attained food security _____
5. Others_____

7. Do you use fertilizers/ pesticides on your coffee farm?

1. Yes __ 2. No ___

7.1. If your answer is No to the above question, what is/are your reasons? 1. I cannot afford it _____

2. I want to produce organic coffee _____
3. I use organic fertilizer like dung _____
4. Due to all the above reasons _____

8. Indicate land ownership

	1999/2000	2007/08
8.1. Total ownership in hectares	_____	_____

8.2. Area under coffee _____ _____

8.3. Area under other crops _____ _____

9. How many household members are engaged in the production of coffee? _____

9.1. Are you employing on your coffee farm children whose age is below 18?

1. Yes _____, 2. No _____

9.2 Which type of labor do you use?

1. I use only family labor _____

2. Use only hired labor _____

3. I use family labor and hired labor _____

10. For whom you are often selling your coffee?

1. Private traders' _____

2. Cooperatives _____

3. Both to private traders and cooperatives _____

11. Do you know what coffee certification is? 1. Yes ___ 2. No ____

11.1. If your answer to the above question is yes, how do you get this information?

1. through radio_____

2. through cooperatives_____

3. through private traders_____

4. Others, please specify_____

11.2. If your answer is No to question 11, what is the reason?

1. No radio_____

2. Cooperative do not inform us_____

12. Do you want to expand your coffee farm?

1).Yes_____

2).No, I want to leave coffee farm_____

3).No, I want to manage the existing one_____

12.1. If your answer to 12 is yes what is your reason?

1).Because of the premium price after certification_____

2).Because of the change in the income from coffee farm_____

12.2. If your answer to 12 is No, what is your reason?

1).Not getting benefit from certification_____

2).Due to low income from conventional coffee_____

3).Not getting certification_____

4).Because of land shortage _____

13. Do you have a plan to shift from coffee growing to other type of income generating activity? 1. Yes _____, 2. No_____

13.1. If yes specify why you would choose to shift

to_____

13.2. If your answer to question 13 is No explain the reason for choosing not to shift to other income generating activities

_____

14. Is it true that certified coffee fetches premium price?

1. Yes____ 2.No _____

15. Do you know what organic coffee certification and fair trade certification are? 1. Yes_____ 2.No_____

15.1 If yes which of the following statements do you agree the most with regard to coffee certification?

1) Certification is a means of getting better income_____

2) Favors farmers producing specialty coffee_____

3) It gives special privilege (or a mechanism to give) for our coffee product_____

16. Do you want to sell more coffee to the cooperative than you currently do? 1. Yes_____ 2.No_____

16.1. If Yes why?_____

16.2. If No why?_____

17. When are you paid for your product?

1) in advance_____2) Up on delivery_____3) after delivery_____

18. How many coffee trees do you have? _____

19. Are you employing the following healthy techniques that have impact on the environment?

1) Forest Management_____

2) Shade grown coffee_____

3) Soil conservation_____

4) Protection of water resources_____

5) Management of by product_____

End. Thank you very much! I appreciate your cooperation

Interviewer`s name_____

Signature _____Address _____

Interviewer`s Observations

To interviewer, did the respondent consider the survey and answer the questionnaire carefully?

Comments about the respondent:

Comments about specific questions (attribute, attribute level):

Any other comments:

Declaration

I, the undersigned, declare that this paper is my original work and has not been presented for a degree in any other university, and that all source of materials used for the study have been duly acknowledged.

Declared by:

Name Abebe Jotte

Signature: [signature]

Date: June 24, 2009

Confirmed by Advisor:

Name: Alemu Mekonnen (PhD)

Signature: [signature] 24/04/06

Date: _____

Place and date of submission: 24/04/06