Household Welfare Impacts of Black Pepper Certification in Kerala, India

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Abstract

Organic farming and fair trade certified commodities considered as catering to niche markets is growing rapidly. So far little is known on the welfare impacts of such innovations and it is of particular interest if the joint adoption of both systems adds additional benefits to smallholders in developing countries. Hence, this paper examines the household welfare impacts of an organic and fair trade certification by smallholder black pepper farmers in Kerala, India. We use panel data collected from 300 smallholder rural pepper growers in Idukki district and apply a multinomial endogenous switching regression model along with a counterfactual analysis to estimate certification impacts. Results show that both certification systems have a significant impact on income compared to conventional black pepper farming. However, membership in fair trade marketing systems does not increase income of organic farmers, but has positive asset effects.

Keywords: Organic farming, fair trade, impact evaluation, multinomial switching regression

JEL codes: D1, D6, O1, Q1

1. Introduction

The global market of organic produce increased three folds in the last ten years and reached 59 billion US$ in 2010 (Willer and Kilcher (Eds), 2012). Fair trade is also growing rapidly with sales of around 6.6 billion US$ in 2012 (Fairtrade International, 2012-13). While the major share of organic and fair trade production to date is already generated in the developing countries of Asia and Latin America,[1] the major demand for these products is in Europe and North America. The key question related to the introduction of eco-friendly farming practices and ethical trade regimes in developing countries such as organic and fair trade certification is, whether in addition to their ecological and social benefits; these systems are also effective in contributing to increased welfare. Moreover, whether organic agriculture combined with fair trade marketing systems can mutually strengthen and benefit smallholder farmers in emerging economies needs to be debated (Parvathi and Waibel, 2013).

Different principles govern these systems. Where organic deals with production standards, fair trade pertains to marketing and labour conditions at the workplace. Though fair trade recommends following certain minimum environmentally friendly production standards it does not insist on an organic certification. The motivation to buy organic produce is predominately related to health and environmental concerns while fair trade is perceived to reduce poverty among the smallholder producers in developing countries.

Also, both certification systems differ in terms of pricing. Organic market prices are generally higher than conventional market prices. Fair trade has two components to its price namely a price premium and a minimum price. The price premium is a pro-poor social premium that is paid by the consumer to fair trade cooperatives to improve the social conditions in the surroundings of small scale producers like infrastructure development. The minimum price protects smallholders by reducing their vulnerability to market shocks. In addition to this, a minimum organic price differential was recently introduced for certain products like coffee and cocoa to encourage organic certification in these products. Hence, the organic farmers under fair trade schemes will receive the organic market prices or the minimum organic price differential plus minimum fair trade price, whichever is higher. With regard to certification costs, organic depends on farm size wherein larger farms pay more. In case of fair trade the size of the cooperative is taken into

[1] A small share of organic and fair trade produce also comes from Africa.

account. If the cooperative has more members then the per head cost of certification is lower. In addition to this product specific fees also apply.

Research on organic farming and fair trade in developing countries is growing. Organic farming literature is predominant with adoption studies (e.g. Kallas et. al, 2010). Most of the organic agricultural impact research inclines towards food security, environmental aspects and soil fertility (e.g. Tilman et. al, 2002). Nevertheless, some studies like Pimentel et. al (2005) claim that organic farmers receive a higher net economic return per hectare when compared to conventional growers which is attributed to higher organic market prices. Moreover, Kleemann and Abdulai (2013) find that organic farmers have higher return on investment than conventional farmers. Fair trade literature has a few studies that analyze poverty reduction through participation in fair trade networks (e.g. Jena et. al, 2012). Becchetti and Costantino (2008) argue that fair trade networks helps in improving economic well-being. This is reinforced in the study conducted by Utting (2009) among coffee farmers in Nicaragua.

It also needs to be noted that most of the organic and fair trade impact studies largely pertains to coffee networks (e.g. Bacon, 2010). Moreover, in spite of the fact that having both certifications help in reducing livelihood vulnerability (Bacon, 2005); very few studies analyze the combination of organic and fair trade arrangements (e.g. Valkila, 2009). However, the additionality of fair trade over organic certification is yet to be discussed in literature. This paper aims to bridge this gap by examining the welfare impacts of both these certifications on smallholder farm households in a developing country setting.

In this context, this article analyses organic and fair trade certification of pepper in India. Although fair trade was introduced at least three decades ago and organic farming officially recognized by the Indian government in 2000, hardly any study is available that investigates the combined impact of both these systems in India. In the recent past, Indian pepper crop has been floating in troubled waters. Its production and productivity declined, prompting India to import pepper (Jeromi, 2007). Degrading soil fertility, increasing input costs and fluctuating supply in the international markets has made the price and profitability from pepper unstable making pepper farmers more vulnerable to poverty. Moreover, there was a drastic fall in international pepper prices in 2003-04 that also affected the domestic Indian prices (Hema et.al, 2007). This

also prompted the introduction of fair trade standards and certification for pepper in 2005 (Fairtrade International (FLO), 2014a).

The domestic pepper problems also encouraged many smallholder pepper farmers in India to explore alternative agricultural systems. To increase productivity by improving soil fertility and to escape the fluctuating market prices of pepper, many smallholder farmers shifted to organic production and fair trade management regimes. But has adopting these systems helped smallholder pepper farmers to perform well in contrast to conventional farmers needs to be examined.

Therefore, this study aims to analyze the welfare impact of organic and fair trade certification on smallholder pepper farmers in India. We have a twofold objective namely; (1) to examine the effect of organic and fair trade certification on total household welfare and (2) to investigate the added value of a fair trade certification for organic farmers.

As impact evaluation is perpetually tested with the problem of counterfactual, we use a multinomial selection bias corrected endogenous switching regression and implement a counterfactual analysis to study welfare impacts using panel data. Results show that certification helps in improving household welfare. Though an additional fair trade certification does not give any added advantage to the current income of organic farmers, it contributes to permanent income in the long run by increasing real wealth in terms of assets.

2. Theoretical framework and methodology

In this section, we develop a framework to measure the impact of organic and fair trade pepper certification on household welfare. There have been various methods to measure economic welfare. Economists have relied on measurable metrics like income and consumption expenditure as welfare indicators (Hagenaars, 1986; Ringen, 1988). While income estimation is favoured in the industrialized world, consumption expenditure is mostly used in developing countries. The difficulty in measuring seasonal and self-employment earnings encourages using consumption expenditure as a substitute to measure disposable income in the Third World. However, Friedman (1957) advocates using real wealth as a key determinant of consumption. He states that consumption is dependent on permanent rather than current income and long term average income is determined by assets of the household. Moreover, Carter and Barrett (2006) also point out that if one wants to assess long term welfare then assets and asset growth is a better indicator.

Hence to evaluate welfare of organic and fair trade pepper certification on smallholder households, we use all three welfare indicators namely; total household income, consumption expenditures and assets as dependent variables to measure current and long term impact.

2.1 Welfare impact estimations of organic and fair trade certification

Impact evaluation has both ex-post and ex-ante estimations. In this paper ex-post assessment is followed, wherein we measure the actual welfare impact accumulated by the smallholder pepper farmers due to certification. The challenge in such studies is to estimate the counterfactual outcomes of certified farmers in case they were not certified and vice-versa. To overcome this problem of missing data, we create a counterfactual group following a two stage modelling framework. In the first stage a multinomial logit selection equation is estimated to ascertain the determinants of organic and fair trade pepper adoption. Then an outcome equation is estimated with the multinomial selection bias correction terms calculated from the multinomial logit model entering the equation as generated regressors. In the second stage a counterfactual analysis is implemented and the average treatment effects on the treated (ATT) and the average treatment effects on the untreated (ATU) are calculated to ascertain the impact of certification on welfare. Following Di Falco and Veronesi (2013) and Teklewold et al (2013), we refer to this multinomial selection bias corrected regression as a multinomial endogenous switching regression model.

2.1.1 Multinomial logit selection equation

Farmers choose agricultural certifications to maximize their expected utility or profits (Dorfman, 1996 and Feder, 1980). In this study the farmer has the option of choosing between two certification strategies, organic and both organic and fair trade (C_1 and C_2) and no certification (C_0) respectively. The farm household *i* would choose certification strategy *s,* over alternative certification strategy *r,* if the expected welfare (W) the household earns from $W_{is} > W_{ir}$, $\forall\ s \neq r$. The expected welfare that a farmer will derive from implementing a particular certification strategy *s* is a latent variable W_{is}^{*} and it can be specified as:

$$W_{is}^{*} = \beta_s X_i + \varepsilon_{is} \quad (1)$$

X represents a vector of relevant explanatory variables and ε represents unobserved factors that are assumed to be independent and identically distributed random variables with zero mean. The

chosen certification strategy *s* is defined as: *s = con* if no certification is chosen, *s = org* if only organic certification is chosen and *s = oft* if both organic and fair trade certification is chosen. Hence, a farm household will choose strategy *oft* if *oft* helps in maximising the household´s expected welfare than choosing any other strategy *r* (Bourguignon et al, 2007). This can be stated by a multinomial logit model drawing from McFadden (1973) as:

$$\begin{pmatrix}\text{probability of farm household } i, \\ \text{choosing strategy } s\end{pmatrix} = \frac{\exp\left(\beta s \mathrm{X} i\right)}{\sum_{r=con,org}^{oft} \exp\left(\beta r \mathrm{X} i\right)} \quad (2)$$

We estimate the multinomial endogenous switching regression to evaluate the impact of choosing a particular certification on welfare based on Dubin and McFadden (1984) and Bourguignon et al. (2007). This model not only helps to corrects for self-selection bias but also takes into account the relations between the options of the various certification strategies (Mansur et al., 2008). We estimate a welfare outcome equation for each of the certification strategy as below:

$$W_{icon} = \mathrm{Q}_i\alpha_{con} + \mu_{icon} \;\; if\, W^*_{icon} > \max_{r \neq con} (W^*_{ir}) \quad (3a)$$

$$W_{iorg} = \mathrm{Q}_i\alpha_{\mathrm{org}} + \mu_{iorg} \;\; if\; W^*_{iorg} > \max_{r \neq org} (W^*_{ir}) \quad (3b)$$

$$W_{ioft} = \mathrm{Q}_i\alpha_{oft} + \mu_{ioft} \;\; if\; W^*_{ioft} > \max_{r \neq oft} (W^*_{ir}) \quad (3c)$$

Q_i refers to all the explanatory variables included in X_i and the variable pepper yield. As we measure welfare in terms of household income, consumption expenditures and assets; the dependent variables include log income per capita, log consumption per capita and log asset per capita. $W_{icon}, W_{iorg}\; and\; W_{ioft}$ represent all these outcome variables for each strategy respectively. μ_{icon}, μ_{iorg} and μ_{ioft} refer to the error terms distributed with zero mean and equal variance. W_{icon}, W_{iorg} and W_{ioft} are observed only when $W^*_{icon} > \max_{r \neq con} (W^*_{ir})$, $W^*_{iorg} > \max_{r \neq org} (W^*_{ir})$ and $W^*_{ioft} > \max_{r \neq oft} (W^*_{ir})$ respectively. Hence, if the errors ε´s and μ´s are not independent and are correlated, the OLS coefficient estimates of equations (3a), (3b) and (3c) will be inconsistent. For the consistent estimation of α_s, selection correction terms generated from the selection equation (2) needs to be included. For this, we apply the Normalized Dubin McFadden (DMF 2) model which allows for linearity of errors in the outcome equation and by

construction makes the errors ε´s and μ´s independent. Based on DMF 2 model the equations (3a), (3b) and (3c) are identified as:

$$W_{icon} = Q_i\alpha_{con} + \gamma_{con}\,\delta_{con} + \Omega_{icon} \qquad if\, W^*_{icon} > \max_{r \neq con}(W^*_{ir}) \tag{4a}$$

$$W_{iorg} = Q_i\alpha_{org} + \gamma_{org}\,\delta_{org} + \Omega_{iorg} \qquad if\ \ W^*_{iorg} > \max_{r \neq org}(W^*_{ir}) \tag{4b}$$

$$W_{ioft} = Q_i\alpha_{oft} + \gamma_{oft}\,\delta_{oft} + \Omega_{ioft} \qquad if\ \ W^*_{ioft} > \max_{r \neq oft}(W^*_{ir}) \tag{4c}$$

Where γ_r refers to the covariance between ε´s and μ´s, δ_r refers to the inverse mills ratio calculated from the probabilities estimated in equation (2) and Ω_r are error terms with mean value zero computed drawing from the DMF 2 model of Bourguignon et al. (2007). To account for the heteroskedasticity arising from the generated regressors (δ_r), the standard errors are bootstrapped in equation (4a), (4b) and (4c) respectively.

As including inverse mills ratio and using standard fixed effects does not lead to consistent estimates (Wooldridge 2002), we use Mundlak´s fixed effects (1978) to control for unobservable characteristics. This method relies on the assumption that unobservable characteristics like farm management skill are a linear function of the average of the farm variant explanatory variables. Therefore farm variant variables can be used to control for farm specific effects (Udry, 1996). As pepper yield is a farm variant variable, we take the average of pepper yield ($\overline{P\boldsymbol{i}}$) and use it as one of the explanatory variables in equations (4a), (4b) and (4c). It is assumed that the unobservable characteristics c_i is a linear function of $\overline{P\boldsymbol{i}}$ such that $c_i = \overline{P\boldsymbol{i}}\,\theta + \omega_i$, where θ refers to the corresponding coefficient vectors. ω_i is a normally distributed error term with zero mean, equal variance and not correlated with $\overline{P\boldsymbol{i}}$ (Di Falco and Veronesi, 2013).

For this model to be identified, selection instruments need to be included. We include these instruments based on a falsification test drawn from Di Falco et. al, (2011). They note that a variable can be used as a valid exclusion restriction, if it affects the selection of a particular certification strategy in the multinomial logit selection equation but does not affect the welfare outcome equation of those smallholder farm households that did not choose any certification strategy or for whom s = *con*. Based on this concept, we include perception towards organic and fair trade certification and distance from farm to market as exclusion restrictions. The variables perception towards organic and fair trade certification and the distance from farm to market are

jointly significant in the multinomial logit model but does not affect the welfare outcome equation of the conventional farmers[2].

Though the multinomial selection equation is limited by the independence of irrelevant alternatives (IIA), Bourguignon et al. (2007, p.199) state that "selection bias correction based on the multinomial logit model can provide a fairly good correction for the outcome equation, even when the IIA hypothesis is violated."

2.1.2 Estimation of treatment effects of certification

Using the above framework, we calculate the counterfactuals following Carter and Millon (2005), Di Falco and Veronesi (2013) and Teklewold et al (2013) and estimate the average treatment effects in the actual and the counterfactual scenarios as follows:

Certified farmers choosing actual certification strategy (actual):

$E(W_{iorg}|\ W_i = org) = Q_i\alpha_{org+} \gamma_{org}\, \delta_{org}$ (for *org* farmers choosing *org*) (5a)

$E(W_{ioft}|\ W_i = oft)_{\ i} = Q_i\alpha_{oft+} \gamma_{oft}\, \delta_{oft}$ (for *oft* farmers choosing *oft)* (5b)

Certified farmers choosing conventional farming (counterfactual):

$E(W_{icon}|\ W_i = org) = Q_i\alpha_{con+} \gamma_{con}\, \delta_{org}$ (for *org* farmers choosing *con*) (6a)

$E(W_{icon}|\ W_i = oft)_{\ i} = Q_i\alpha_{con+} \gamma_{con}\, \delta_{oft}$ (for *oft* farmers choosing *con)* (6b)

ATT effects are calculated as the difference between equations (6a) and (5a) and (6b) and (5b) respectively. The same approach is extended for *oft* farmers to choose *org.*

Conventional farmers choosing conventional strategy (actual):

$E(W_{icon}|\ W_i = con) = Q_i\alpha_{con+} \gamma_{con}\, \delta_{con}$ (for *con* farmers choosing *con*) (7a)

Conventional farmers choosing *org* and *oft* respectively (counterfactual):

$E(W_{iorg}|\ W_i = con) = Q_i\alpha_{org+} \gamma_{org}\, \delta_{con}$ (for *con* choosing *org* certification) (8a)

$E(W_{ioft}|\ W_i = con) = Q_i\alpha_{oft+} \gamma_{oft}\, \delta_{con}$ (for *con* choosing *oft* certification) (8b)

[2] The falsification test results to check the validity of selection instruments can be supplied upon request

ATU effects are calculated as the difference between equations (8a) and (7a) and (8b) and (7a) respectively. The same concept is extended for *org* farmers to choose *oft*.

3. Data

3.1 Study Area

The state of Kerala accounts for nearly 90% of the total black pepper production in India (Hema et. al, 2007). It is the major source of agricultural employment and around two million farm households are dependent on pepper cultivation. In Kerala, Idukki is the largest pepper producing district and has around 37.9% of the total pepper area of the state (SBI, 2008 and ESD, 2011). Hence, Idukki district is chosen as our survey area. In Idukki the taluks[3] of Udumbanchola and Peerumedu grow majority of pepper and data was collected from these areas. Both these regions share similar topography and climatic conditions.

We did a panel survey in 2011 and 2012 from 300 smallholder pepper farmers. In the survey, farmers were asked about the previous production years 2010 and 2011 respectively. Panel data was collected for two successive years in order to measure changes from production decisions that go beyond one year. In terms of management regimes, we had three groups of farmers namely, (a) 100 conventional farmer, (b) 100 only organic certified farmers and (c) 100 both organic and fair trade certified farmers. The only fair trade certified pepper farmers in the survey area are large tea plantation farmers having pepper as a mixed crop. Their minimum landholding is 10 hectares. As this survey was focused on rural smallholders with a maximum of five hectares of land, we do not have only fair trade certified farmers in our sample.

A list of conventional farmers in the survey region was obtained from the agricultural office of the district for the regions of Udumbanchola and Peerumedu. The list of certified farmers for the two regions, organic and both organic and fair trade were obtained from the non-government organization (NGO) named Peermade Development Society (PDS), operating in the district which was also promoting organic and fair trade certification in Idukki. From these lists 100 farmers were randomly chosen for each of the management regime. Thereby from 9 villages in

[3] Taluk is an administrative division of the district. It is like an entity of the local government and has certain fiscal and administrative powers over the villages and municipalities coming under its jurisdiction

Udumbanchola and 5 villages in Peerumedu, a total of 300 farmers were surveyed in 2011. In 2012, due to attrition of 3 conventional farmers data was collected from 297 farmers.

It was noted that there was no dis-adoption or late-adoption observed in the sample in 2012 and all farmers remained in the same category as in 2011 survey. Moreover, it was observed that organic adoption is a continuous process ranging from as early as 1997 till 2010 in the sampled households and thereby the sample covers early and late adopters. Fair trade certification was introduced in the survey area around 2005, when FLO introduced fair trade certification for pepper, to the already existing organic pepper growers by PDS. Some organic households decided to adopt the additional fair trade certification and the first year they started selling certified organic and fair trade pepper was in 2009. As the data pertains to 2010 and 2011, we observe early adopters of both regimes in addition to the organic pepper adopters which cover a longer adoption period.

A household survey questionnaire was used to generate information on household characteristics, agricultural activities, off-farm employment, asset endowments, credit access and consumption expenditures. A specific section was drafted on the basis of a likert scale (1 to 5) to understand their perception and attitudes towards organic and fair trade certified agriculture. The perception variable is measured using a five point likert scale. In the questionnaire attitudes relating to soil fertility, health, environment and government support was rated. The response variables 1 and 2 were treated as positive and given value one and 3, 4 and 5 were considered as negative and given value zero. Then total score was calculated and all households equal to or above the mean were given the value of one and zero otherwise. This is included as a dummy variable where one is treated as a positive response. Table 1 describes the variables. It needs to be noted that income refers to total household income including farm and non-farm. Consumption expenditures refer to total household expenses comprising food and non-food. Total asset includes both production and household assets.

<< Table 1 here >>

It was observed in the sample that smallholders produce pepper as a mixed crop along with other crops. As black pepper is a vine, it was planted with other crops like arecanut, coconut, silver oak (timber trees) or a majority was tied to teak poles. Conventional farmers predominately combined pepper, which covered 50% of farm area along with cardamom being the second crop followed

by other crops. The certified farmers produced black pepper in 50% of the farm area and coffee as the second major crop along with other crops. Most of the farmers in all the management regimes had a small percent of other crops like turmeric, cloves and ginger. Moreover, all the crops produced by the certified farmers are organic certified as there was no partial organic land adoption observed in the sample.

Moreover it is important to note that the NGO provides the needed training and technical support for adopting organic and both organic and fair trade certification. It also advances the certification costs to smallholders. The condition for the payment of certification costs is that all certified products should only be sold to the NGO. To recover the certification costs, NGO reduces the market price for organic and both organic and fair trade certified products. Hence, both the categories of certified farmers do not receive actual organic market prices or organic and fair trade pepper prices.

3.2 Descriptive statistics

The descriptive statistics are presented in table 2. The per capita income of conventional farmers increased in 2011 though they have the lowest per capita income in comparison to the other two groups. Organic farmers had the highest per capita income in 2010 but saw a decline in 2011. The per capita income of both organic and fair trade farmers increased in 2011. Consumption expenditure decreased for conventional and both organic and fair trade certified farmers from 2010 to 2011 whereas for organic farmers it increased in 2011. Asset per capita declined for all the categories of farmers from 2010 to 2011.

Total land area is the highest among the farmers having both the certifications. Government extension support seems to not be effective in the survey area. Also, the certified farmers received all needed support from the NGO. The irrigation access of conventional farmers strikingly declined from 62% in 2010 to only 10% in 2011. All the three groups have more than 80% access to credit. However, less than 50% have access to off-farm income in both years. Almost more than 45% of the households in all the groups own livestock. Yield of pepper is highest for organic farmers.

<< Table 2 here >>

To understand whether fair trade adds additional value to organic certification a gross margin analysis is presented in table 3. In 2011, organic farmers have 98 and both organic and fair trade farmers have 88 observations as 2 organic and 12 both organic and fair trade certified famers stored all their pepper produce for future sales. The parameters cost of production and variable costs include materials (fertilizers and manure) and labour costs. In 2010, there is no significant difference between the two groups except in selling price per kilogram of pepper. It is interesting to note that organic farmers were able to sell pepper at a higher rate compared to both organic and fair trade certified farmers in 2010. This may be due to the recovery of fair trade certification costs by the NGO. In 2011 all parameters show significant differences between the two groups. It shows that organic farmers perform statistically significantly better than organic and fair trade farmers in 2011 though total land area and pepper area are significantly higher for both organic and fair trade certified pepper growers. Pepper yield is significantly and strikingly higher for organic farmers. Organic producers are able to grow pepper much more efficiently than their fair trade counterparts which are also reflected in the cost of production of a kilogram of pepper. It is interesting to observe that both organic and fair trade certified farmers have significantly higher variable costs per hectare and thereby earn less net income from pepper compared to organic smallholders. An important observation is that both organic and fair trade certified farmers are at an average able to sell just 10% more than their cost of pepper production per kilogram. Hence, their profit margins from pepper are not very high. Overall, these results show that higher prices alone do not lead to higher net income from pepper, as yield, land size and cost of production also play substantial roles.

<< Table 3 here >>

As significant differences in the gross margin analysis was found in 2011 data, we further explore the relationship between the costs of production of pepper per kilogram against the set fair trade minimum price. The minimum fair trade price and premium differ for conventional and organic pepper. For conventional black pepper the minimum fair trade price does not exist and is equivalent to the commercial price. A premium is set at 15% of the commercial price. With regard to organic pepper, the minimum price is 1.13€ / kg and a premium of 8% over organic market prices are given (Fairtrade International, 2014b). The minimum price in the case of organic pepper is only significant when market prices fall below it. But, for conventional black pepper as it is equal to commercial prices it is more or less insignificant and does not protect the

farmers against price shocks. 1.13 € was approximately around INR 75/kg for black organic pepper during 2010 and 2011. Thus, we use the organic fair trade minimum price of INR 75/kg and compare it with the cost of production. The red line in figure 1 depicts the minimum fair trade price. It is observed from figure 1 (b) that the distance between costs of production per kilogram of pepper and the minimum fair trade price is minimum for conventional farmers, though a few are very inefficient. Most of the organic farmers (figure 1 (c)) are able to produce pepper much below the minimum fair trade price. However, majority of both fair trade and organic certified farmers (figure 1 (d)) produce almost close to the fair trade minimum price. There is less distance between minimum fair trade price and cost of a kilogram of pepper production. Overall, figure 1 (a) depicts that fair trade certification can be beneficial only for those smallholder pepper farmers who can maximize the distance between the set minimum fair trade price for a kilogram of pepper and their cost of production for a kilogram of pepper. It only adds value to those organic farmers who are able to produce pepper at least equal to the set fair trade minimum price per kg so that during a price fall they can recover at least their variable costs of production.

<< Figure 1 here >>

4. Results

4.1 Adoption determinates of organic and both organic and fair trade pepper

We use the selmlog command (Bourguignon et al., 2002) in stata 12 to estimate the multinomial endogenous switching regression. The results of the pooled multinomial logit selection equation are presented in table 4 with conventional farmers as the base category. Even less educated farmers are able to adopt both organic and fair trade certified pepper due to the awareness programs conducted by the NGO. The higher the farm experience the higher is the organic pepper adoption. Organic and both organic and fair trade adoption are perceived more advantageous by those farmers who have lesser irrigation access. This could be because those smallholders who have adequate irrigation may shift to other high value crops like cardamom. Extension support is negatively related to organic farming as most of the certified farmers received support from the NGO and also as depicted in table 1, extension support was hardly available to all the categories of farmers including conventional. Higher access to credit increases

organic and both organic and fair trade pepper adoption (e.g. Weil, 1970). Owning livestock is used as an indicator of wealth in this study. Contrary to many findings (e.g. Feder et al., 1985) it is negatively related to organic pepper adoption. This could be as, due to the support from the NGO, even farmers having lower assets were able to enter organic certification programs. Consistent with literature (e.g. Musara et al., 2012 and Chouichom and Yamao, 2010) both these systems favor pepper growers with large farm size. Moreover as found in other studies (Adesina and Zinnah, 1993; Rogers, 1995; Wossink et al., 1997; Amare et al., 2012) a positive perception towards organic and fair trade certification increases its adoption. A shorter distance to market and thereby reduced transportation costs increases the adoption of both these farming alternatives as also found by Dadi et, al. (2004).

<< Table 4 here >>

The results of the multinomial endogenous regression model are presented in table 5. Education helps to increase disposable income of conventional farmers. Higher farm experience reduces log asset per capita of both the categories of certified farmers. This could be because more experienced farmers may rather choose to invest their profits from farming back in agricultural expansion activities than in acquisition of assets. As expected a smaller household size increases log consumption per capita and log asset per capita for organic as well as income per capita for both organic and fair trade certified farmers. Consistent with literature all the welfare variables are positively and significantly related to farm size. Higher irrigation access helps to increase log consumption per capita of organic and fair trade certified farmers. An increased access to government extension support would prove a positive assistance to organic farmers and access to credit facilities would help conventional farmers in increasing their assets respectively. Access to off-farm income helps to increase log income per capita for all the categories of farmers as anticipated. Increased yield would increase the welfare of both organic and fair trade farmers.

Moreover, mean pepper yield is significant for log income per capita for conventional and both organic and fair trade certified farmers. It is also significant for log consumption per capita for both the categories of certified farmers. This indicates the presence of unobserved heterogeneity in these welfare outcomes. Therefore having applied Mundlak´s fixed effects based on mean pepper yield helps to control for unobserved factors.

All the selection bias correction terms except log asset per capita for organic farmers are not significant indicating that adopting organic and both organic and fair trade certified pepper will have the same impact on non-adopters, if they choose to adopt these certification systems, as adopters.

<< Table 5 here >>

4.2 ATT and ATU effects of certification

The results of the counterfactual analysis and certification impact are discussed and presented in table 6 and 7. Table 6 describes ATT effects of income, consumption expenditures and assets under actual and counterfactual scenarios. We compare for e.g. the actual income of organic farmers to the counterfactual income if they were conventional farmers. Table 7 shows the ATU effects, wherein we compare for e.g. the actual income of conventional farmers with their counterfactual incomes in case they were organic certified.

With respect to log income per capita, we find that organic and both organic and fair trade certified farmers earn statistically and significantly more income than conventional farmers due to their respective certifications. As the welfare indicators are in terms of logarithm, we interpret the results in percentages. Conventional farmers can increase income by 98% and 33% if they choose organic and both organic and fair trade certification respectively. It is also deduced from the ATT and ATU effects that if both the categories of certified farmers become conventional they will still perform better than the non-certified farmers. This indicates that there are unobserved characteristics like farm management skill that make certified farmers better. However, it is interesting to note that organic farmers perform better than both organic and fair trade certified farmers. The ATU results displays that organic farmers will have a 29% fall in income per capita if they market under fair trade systems. This shows that an additional fair trade certification over and above organic does not give added income benefits.

For log consumption expenditure per capita, ATT effects show that organic and both organic and fair trade certified farmers will have a fall in consumption per capita of 19% and 29% respectively if they shift to conventional farming practices. Moreover, ATU results show that organic farmers will have a 14% increase in log consumption expenditures per capita if they choose both organic and fair trade certification. This indicates that an additional fair trade

certification over an organic certification helps to increase disposable income. Overall, certification increases consumption expenditure in our study. As we find that certification also increases income, this confirms to the economic theory that increases in income leads to increases in consumption expenditure.

With regard to ATU results for log asset per capita, we find that conventional farmers will have a 17% decrease in assets per capita if they shift to organic and both organic and fair trade systems respectively. This could be because assets can be sold to meet household expenses during the organic conversion period when the yields are low (Feder et. al, 1985). Moreover, if the conventional farmers choose organic without the support of the NGO, they would have to pay the certification and inspection costs upfront which could add burden to their financial resources. However, contrary to income results, both organic and fair trade farmers will witness a 25% drop in assets if they shift to organic certification in the ATT analysis. The ATU results also reinforce this as organic farmers can increase their asset per capita by 23% if they add fair trade certification.

<< Table 6 here >>

<< Table 7 here >>

Hence, these results show that certification does help in improving income of conventional farmers; however it does not necessarily reflect the added income benefit of a fair trade certification for organic farmers. This could be because the ability of fair trade networks to provide premium prices largely depends on the global market prices of the respective product (Valkila and Nygren, 2010). The income effect is directly a reflection of a price differential in the short run. Hence, if organic and fair trade certified pepper farmers receive a higher selling price per kilogram of pepper than organic farmers, perhaps it will result in a higher income effect for the double certified farmer. However that is not the case in fair trade pricing. The fair trade price premium is for the cooperative or NGO to improve social benefits in the study region. This premium is not directly added to the net income of the farm household. The organic farmers get the minimum organic fair trade price or the organic market price whichever is higher under fair trade regimes. Hence, fair trade farmers also in effect sell at organic price premiums though they pay for an additional fair trade certification. As mentioned earlier, the NGO recovers certification costs when purchasing pepper and other certified produce from the rural smallholders. The

income effect from the minimum fair trade price can only be captured if the organic market prices fall below the set organic fair trade minimum price of pepper, which was not the case during the period of data collection. Hence, an income impact may not truly reflect the benefit of an added fair trade certification for organic pepper farmers in the short run.

However the asset analysis presents a different picture. The asset counterfactual analysis shows that in the long term organic farmers can increase their assets by over 20% by venturing into fair trade certification systems. This could be because fair trade helps to access global markets, establish shorter value chains and an easy credit facility of up to 60% of production costs in case of need from an assured buyer. Moreover the social benefits from fair trade premium prices like construction of infrastructure facilities and water treatment plants may possibly reduce transportation costs and water costs and thereby enhance the standard of living of the rural households in the region. Also the savings from these potentially reduced costs can lead to investments and asset creation. Moreover, the surety of a buyer for their produce and the minimum organic fair trade price protects the organic farmers from price risks. Thus, in the long term fair trade does enhance the welfare of organic farmers. Therefore, when assessing fair trade benefits, it is important to use assets as a welfare measure rather than income, as income only reflects the immediate price benefits which may not always occur with fair trade pepper.

5. Summary and conclusion

In this study, we examine the welfare impacts of organic and fair trade certification along with whether fair trade provides additional benefits for black pepper organic farmers in India. We use panel household data collected from 300 smallholder pepper farmers in India to ascertain impacts on income, consumption expenditures and assets using a multinomial endogenous switching regression along with a counterfactual analysis.

Findings show that both the categories of certified farmers earn more income per capita than conventional growers and have higher consumption expenditure. Also, organic and both organic and fair trade certified farmers have some unobservable characteristics that make them better producers and thereby earn more income even under the counterfactual setting in case if they would be conventional pepper growers.

A key finding is that fair trade certification does not add additional benefits to organic pepper in terms of income. Nevertheless, the results from the counterfactual analysis show that an added

fair trade certification will help organic pepper farmers to increase their assets. This could be because the price advantage of a fair trade certification comes into effect for organic farmers only if the organic market prices fall below the minimum organic fair trade price. Even in such a scenario, only those organic farmers with pepper production costs lower than the fair trade minimum price will reap profits. The added benefit of a fair trade certification for organic pepper farmers can be attributed to forging long term relationship with importers in developed countries, access to international markets, shorter value chains and insurance from price shocks. As fair trade for spices was only introduced by FLO in 2005 and rural farmers started selling as organic and fair trade in the study region in 2009, with increasing years of association with fair trade, organic farmers may gain as pointed out by Becchetti et. al (2011) in the case of Thai Jasmine rice. Also, perhaps as more organic farmers choose fair trade the per head fair trade certification cost may also decline.

Another critical result is that to measure fair trade impacts of organic farmers, assets rather than current income is a better indicator. Fair trade inhenretly seems to cater to long term benefits of rural farmers and hence income may not be a correct measure to capture its benefits. Raynolds (2002) also points that the income effects from fair trade certifications may be less pronounced than the indirect benefits that farmers receive in terms of empowerment and capacity building which are more long term in nature. Hence, assets, accumulated over time are more suitable to measure the benefits of a fair trade certification. Therefore we submit that it is important to use asset as a measure to study fair trade impacts in the context of developing countries and emerging economies like India.

Furthermore, the role of a third party in introducing and implementing these certifications play an important role (Chiputwa et, al, 2015). The effectiveness of any certification largely depends on the local setting and in the enforcement and monitoring of the certification schemes as pointed out by Giovannucci et. al (2008). Moreover, it is essential to integrate the different institutions and players involved in organic and fair trade systems. This helps in not only promoting eco-friendly and chemical free agriculture but can also contribute towards a sustainable socio-economic development of rural smallholder producers in developing countries.

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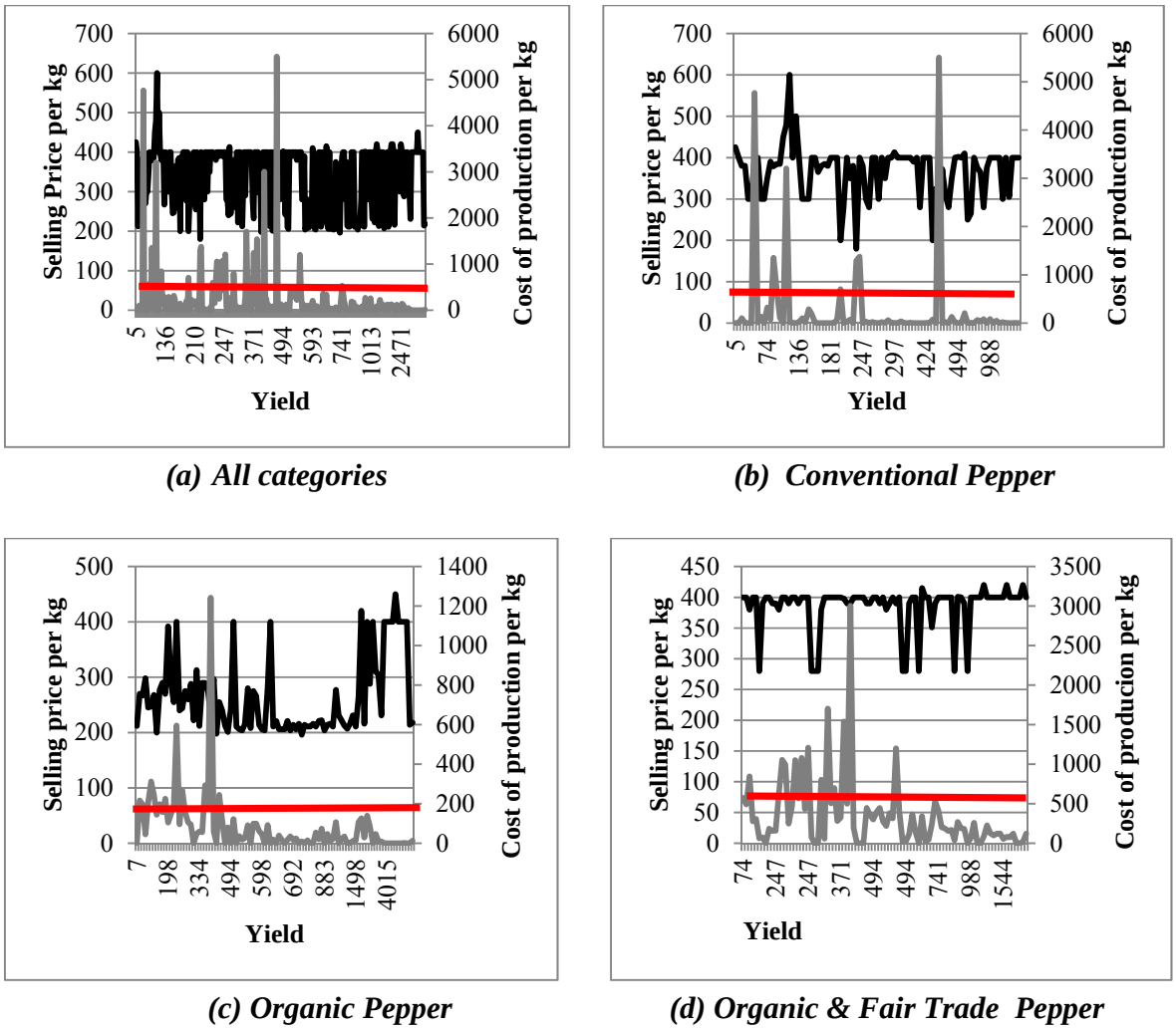

(a) All categories

(b) Conventional Pepper

(c) Organic Pepper

(d) Organic & Fair Trade Pepper

Figure 1: Comparison between cost of production (*grey line*) of pepper per kg against the fair trade minimum price (*red line*)

Note: Selling price (black line) and cost of production per kg are in Indian Rupees (INR)

Source: Own calculation based on household survey 2012

Table 1: Definition of variables used in regression

Variable Name	Description
Dependent variables	
Total income per capita (in INR)	Total per capita income of the household in INR (farm & non-farm) per year
Consumption expenditure per capita (in INR)	Total per capita consumption expenditures of the household in INR per year
Asset per capita (in INR)	Total per capita asset of the household in INR per year
Independent variables	
Age	Age of the household head in years
Years of schooling	Education of the household head in years
Farm experience (years)	The farming experience of the household head in years
Total Household size	Total number of members in the household
Dependency ratio	The total household members below 15 and above 65 divided by the rest of the household members
Total Landsize (in ha)	The total household members
Irrigation access (yes = 1)	If the household had access to irrigation (yes = 1 and no = 0)
Extension support (yes = 1)	If the household had access to irrigation (yes = 1 and no = 0)
Credit access (yes = 1)	If the household had access to credit (yes = 1 and no = 0)
Have off farm income (yes = 1)	If the household had access to off-farm income (yes = 1 and no = 0)
Have livestock (yes = 1)	If the household has livestock (yes = 1 and no = 0)
Pepper yield	Pepper quantity produced per hectare in kg
Perception towards organic fair trade (positive = 1)	If the household has livestock (yes = 1 and no = 0)
Farm to market distance in km	The distance from farm to market in kilometers

Source: Own calculation based on household survey 2012

Table 2: Descriptive statistics

Variables	Conventional Mean		Only Organic Mean		Organic and Fair Trade Mean		Total Sample Mean	
	2010	2011	2010	2011	2010	2011	2010	2011
Dependent variables								
Total income per capita (in INR)	17436.43	18054.95	49309.31	31775.14	22534.85	32387.25	29760.20	27500.23
Consumption expenditure per capita (in INR)	21012.11	17623.50	18416.03	21024.52	26656.17	22943.40	22028.10	20559.84
Asset per capita (in INR)	465188.80	423312.90	299772.80	286109.80	576779.90	418429.50	447247.20	375472.30
Independent variables								
Age	50.86	50.84	51.63	52.31	53.65	54.21	52.05	52.47
Years of schooling	9.32	9.42	9.76	9.81	7.90	7.97	8.99	9.06
Farm experience (years)	29.42	28.92	33.38	32.73	33.68	33.43	32.16	31.72
Total Household size	4.52	4.40	4.39	4.40	4.22	4.29	4.38	4.36
Dependency ratio	0.41	0.39	0.51	0.46	0.35	0.36	0.42	0.40
Total Land size (in ha)	0.79	0.72	1.03	0.91	1.05	1.11	0.96	0.92
Irrigation access (yes = 1)	0.62	0.10	0.07	0.01	0.03	0.35	0.24	0.15
Govt. Extension support (yes = 1)	0.22	0.11	0.06	0.06	0.07	0.13	0.12	0.10
NGO Support	0.00	0.00	1.00	1.00	1.00	1.00	0.67	0.67
Credit access (yes = 1)	0.81	0.82	0.97	0.85	0.99	0.97	0.92	0.88
Have off farm income (yes = 1)	0.46	0.36	0.40	0.32	0.42	0.44	0.43	0.37
Have livestock (yes = 1)	0.59	0.56	0.45	0.58	0.56	0.66	0.53	0.60
Pepper yield	512.92	596.54	872.38	1625.35	843.46	777.23	742.92	1003.78
Perception towards organic fair trade (positive = 1)	0.26	0.11	0.37	0.23	0.58	0.57	0.40	0.31
Farm to market distance in km	5.90	5.39	3.32	2.50	2.10	2.49	3.77	3.44
Number of Observations	100	97	100	100	100	100	300	297

Source: Own calculation based on household survey 2011 and 2012.

Table 3: Gross margins from organic and both organic and fair trade certified pepper

	2010			2011		
	Organic	Organic & Fair Trade	Mean Diff	Organic	Organic & Fair Trade	Mean Diff
Number of households	100	100		98	88	
Pepper Area (in ha)	0.51	0.45	0.06	0.41	0.57	-0.16**
Pepper Yield (kg / ha)	877.32	843.47	33.85	1644.80	673.94	970.86**
Gross Income (in '000 INR/ha)	150.94	135.24	15.70	423.40	269.55	153.85
Variable costs (in '000 INR/ha)	22.71	22.35	0.36	42.59	150.57	-107.97***
Net Income (in '000 INR/ha)	128.23	112.89	15.34	380.81	118.99	261.82**
Cost of Production per kg	32.20	38.97	-6.77	81.30	346.47	-265.17***
Selling price per kg	176.21	158.56	17.65**	264.46	381.98	-117.52***

Note: T test is done on mean differences. ***significant at 1%, **significant at 5% and * significant at 10% level

Source: Own calculation based on household survey 2011 and 2012.

Table 4. Multinomial logit - selection equation

Base Category - Conventional famers	Only Organic	Organic and Fair Trade
Age	0.177	0.088
	(0.138)	(0.146)
Age squared	-0.002	-0.001
	(0.001)	(0.001)
Years of schooling	0.040	-0.190**
	(0.063)	(0.067)
Farm experience (years)	0.072**	0.034
	(0.023)	(0.028)
Total Household size	-0.135	-0.294**
	(0.144)	(0.145)
Dependency ratio	0.648	0.413
	(0.413)	(0.503)
Total Landsize (log)	0.949***	1.253***
	(0.219)	(0.230)
Irrigation access (yes = 1)	-3.188***	-1.481***
	(0.403)	(0.313)
Extension support (yes = 1)	-0.804*	-0.551
	(0.453)	(0.413)
Credit access (yes = 1)	0.624*	2.436***
	(0.365)	(0.686)
Have off farm income (yes = 1)	0.111	0.132
	(0.293)	(0.279)
have livestock (yes = 1)	-0.540**	-0.087
	(0.271)	(0.294)
Selection instruments		
Perception towards organic fair trade (positive = 1)	0.820**	1.876***
	(0.262)	(0.248)
Market distance in km (log)	-0.699***	-0.905***
	(0.167)	(0.171)
Constant	-4.456	-0.924
	(3.776)	(4.050)
Number of Observations	597	
log pseudolikelihood	-485.14019	
Pseudo R2	0.2603	

Note: Standard errors clustered at panel level in parenthesis. ***, ** and * refers to significance at 1%, 5% and 10% respectively

Source: Own calculation based on household survey 2011 and 2012.

Table 5. Multinomial endogenous switching regression

	Conventional	Organic	Organic and Fair Trade	Conventional	Organic	Organic and Fair Trade	Conventional	Organic	Organic and Fair Trade
	Log income per capita			Log consumption expenditure per capita			Log asset per capita		
Age	-0.025	-0.018	0.042	-0.020	0.020	-0.011	-0.031	-0.009	0.009
	(0.063)	(0.055)	(0.053)	(0.030)	(0.035)	(0.034)	(0.038)	(0.047)	(0.040)
Age squared	0.000	0.000	-0.000	0.000	0.000	0.000	0.001	0.000	0.000
	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Years of schooling	0.028	0.047	0.027	0.047**	0.026	-0.019	0.014	0.047	-0.034
	(0.038)	(0.041)	(0.027)	(0.020)	(0.019)	(0.020)	(0.027)	(0.035)	(0.025)
Farm experience (years)	0.005	-0.000	0.007	0.007	-0.007	0.005	-0.006	-0.024*	-0.020**
	(0.012)	(0.019)	(0.008)	(0.008)	(0.008)	(0.006)	(0.008)	(0.014)	(0.010)
Total Household size	-0.093	0.006	-0.176***	-0.072	-0.135***	-0.185***	-0.212***	-0.095**	-0.243***
	(0.061)	(0.061)	(0.037)	(0.059)	(0.026)	(0.034)	(0.052)	(0.047)	(0.044)
Dependency ratio	-0.047	-0.250	0.125	-0.032	-0.029	-0.081	0.021	-0.118	-0.116
	(0.202)	(0.152)	(0.164)	(0.116)	(0.087)	(0.094)	(0.124)	(0.138)	(0.129)
Total Landsize (log)	0.479***	0.306**	0.184*	0.128**	0.139**	0.148**	0.431***	0.035	0.185**
	(0.117)	(0.123)	(0.109)	(0.064)	(0.068)	(0.067)	(0.085)	(0.104)	(0.082)
Irrigation access (yes = 1)	-0.180	-0.010	-0.313	-0.041	0.082	0.441**	0.251	0.447	0.293
	(0.312)	(0.604)	(0.264)	(0.191)	(0.285)	(0.199)	(0.218)	(0.514)	(0.240)
Extension support (yes = 1)	-0.162	0.298	0.133	-0.168	0.258	-0.113	-0.009	0.329*	-0.004
	(0.195)	(0.254)	(0.170)	(0.132)	(0.157)	(0.098)	(0.178)	(0.199)	(0.143)
Credit access (yes = 1)	0.217	-0.106	-0.536	0.084	0.087	-0.423	0.361**	0.052	-0.554
	(0.228)	(0.233)	(3.304)	(0.113)	(0.111)	(1.964)	(0.160)	(0.213)	(1.872)
Have off farm income (yes = 1)	1.500***	0.805***	0.457***	0.031	0.163**	0.017	0.065	-0.158	0.031
	(0.148)	(0.121)	(0.106)	(0.085)	(0.068)	(0.089)	(0.107)	(0.099)	(0.088)
have livestock (yes = 1)	0.190	-0.146	-0.111	0.100	-0.004	0.049	0.118	0.152	-0.034
	(0.171)	(0.152)	(0.099)	(0.100)	(0.077)	(0.083)	(0.123)	(0.134)	(0.108)
Pepper yield (log)	0.003	0.027	0.301***	0.013	0.050	0.142**	0.006	-0.002	0.106**
	(0.023)	(0.043)	(0.062)	(0.013)	(0.051)	(0.052)	(0.018)	(0.039)	(0.048)

Mundalk´s fixed effects									
Mean pepper yield	0.001**	-0.000	0.001*	0.000	0.001**	-0.001**	0.000	0.000	0.000
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Selection Bias Correction terms									
_m1 (δ_{con})	0.148	-0.083	-0.486	-0.275	0.085	-0.296	0.046	1.993*	-0.159
	(0.417)	(1.265)	(0.665)	(0.260)	(0.577)	(0.426)	(0.344)	(1.024)	(0.505)
_m2 (δ_{org})	0.657	0.111	0.745	0.382	0.007	-0.889	-0.251	0.220	-0.844
	(1.035)	(0.467)	(0.748)	(0.555)	(0.239)	(0.585)	(0.774)	(0.332)	(0.710)
_m3 (δ_{oft})	0.513	-0.577	-0.213	-0.674	-0.228	-0.122	0.861	0.914	-0.299
	(0.934)	(1.377)	(0.361)	(0.573)	(0.610)	(0.219)	(0.678)	(1.099)	(0.267)
Constant	8.683***	9.848***	7.457**	9.656***	8.639***	10.750***	13.512***	13.330***	13.655***
	(1.854)	(2.410)	(3.612)	(1.030)	(1.400)	(2.233)	(1.145)	(2.052)	(2.116)

Note: Number of Observations - 597. Bootstrapped standard errors (1000 replications) in parenthesis. Fixed effects at panel level are included. $\delta_{con,}$ δ_{org} and δ_{oft} refer to selection correction terms of equation (5a), (5b) and (5c) respectively. ***,**,and * significance at 1%, 5% and 10% respectively

Source: Own calculation based on household survey 2011 and 2012.

Table 6. ATT effects of organic and fair trade certification

	Average Treatment effects on the Treated (ATT)				
	Counterfactual			Actual	ATT
Log income per capita	If *org* adopt *con*	9.26	*org* remain *org*	10.18	- 0.92***
		(0.055)		(0.034)	(0.065)
	If *oft* adopt *con*	9.39	*oft* remain *oft*	9.95	- 0.56***
		(0.052)		(0.025)	(0.058)
	If *oft* adopt *org*	10.33	*oft* remain *oft*	9.95	0.38***
		(0.029)		(0.025)	(0.038)
Log consumption expenditure per capita	If *org* adopt *con*	9.61	*org* remain *org*	9.80	- 0.19***
		(0.014)		(0.018)	(0.023)
	If *oft* adopt *con*	9.67	*oft* remain *oft*	9.96	- 0.29***
		(0.017)		(0.024)	(0.029)
	If *oft* adopt *org*	9.88	*oft* remain *oft*	9.96	- 0.08**
		(0.018)		(0.024)	(0.030)
Log asset per capita	If *org* adopt *con*	12.78	*org* remain *org*	12.41	0.37***
		(0.029)		(0.024)	(0.036)
	If *oft* adopt *con*	12.78	*oft* remain *oft*	12.79	- 0.01
		(0.031)		(0.030)	(0.043)
	If *oft* adopt *org*	12.54	*oft* remain *oft*	12.79	- 0.25***
		(0.038)		(0.030)	(0.048)

Note: *con* – conventional, *org* – organic and *oft* – organic and fair trade. Standard errors in parenthesis.
***significant at 1%, **significant at 5% and * significant at 10% level

Source: Own calculation based on household survey 2011 and 2012.

Table 7. ATU effects of organic and fair trade certification

	Average Treatment effects on the Untreated (ATU)				
		Counterfactual		Actual	ATU
Log income per capita	If *con* adopt *org*	10.11	*con* remain *con*	9.13	0.98***
		(0.040)		(0.060)	(0.072)
	If *con* adopt *oft*	9.46	*con* remain *con*	9.13	0.33**
		(0.087)		(0.060)	(0.106)
	If *org* adopt *oft*	9.89	*org* remain *org*	10.18	-0.29***
		(0.037)		(0.034)	(0.051)
Log consumption expenditure per capita	If *con* adopt *org*	9.68	*con* remain *con*	9.65	0.03
		(0.026)		(0.017)	(0.031)
	If *con* adopt *oft*	9.66	*con* remain *con*	9.65	0.01
		(0.053)		(0.017)	(0.055)
	If *org* adopt *oft*	9.94	*org* remain *org*	9.80	0.14***
		(0.026)		(0.018)	(0.032)
Log asset per capita	If *con* adopt *org*	12.48	*con* remain *con*	12.65	-0.17*
		(0.054)		(0.038)	(0.066)
	If *con* adopt *oft*	12.36	*con* remain *con*	12.65	-0.29***
		(0.051)		(0.038)	(0.064)
	If *org* adopt *oft*	12.64	*org* remain *org*	12.41	0.23***
		(0.032)		(0.024)	(0.041)

Note: *con* – conventional, *org* – organic and *oft* – organic and fair trade. Standard errors in parenthesis.
***significant at 1%, **significant at 5% and * significant at 10% level

Source: Own calculation based on household survey 2011 and 2012.