

CEIS Tor Vergata

RESEARCH PAPER SERIES

Vol. 7, Issue 1, No. 141 – January 2009

*Is Fair Trade Honey Sweeter?
An Empirical Analysis
on the Effect of Affiliation on Productivity*

Leonardo Becchetti and Stefano Castriota

Is Fair Trade Honey Sweeter? An Empirical Analysis on the Effect of Affiliation on Productivity

Leonardo Becchetti
Stefano Castriota

Abstract

We evaluate the impact of affiliation to Fair Trade on a sample of Chilean honey producers. Evidence from standard regressions and propensity score matching shows that affiliated farmers have higher productivity (income from honey per worked hour) than the control sample. Additional results on the effects of affiliation on training, cooperation and advances on payments suggest that affiliation contributed both to, and independently from, the economies of scale effect. Therefore, we show that the productivity effect is partially explained by the superior capacity of affiliated workers to exploit economies of scale.

Keywords: fair trade, economies of scale, productivity.
JEL Numbers: D63, D64, O18, O19, O22.

1. Introduction

Fair Trade (from now on also FT) may be considered as a general purpose innovation which creates a new line of products. The main characteristic of such products is that of being a bundle of physical and socially responsible elements. The socially responsible content of FT goods consists of an original organization of the product chain and, within it, of the relationship between primary producers, importers, certifiers and retailers. Such distinctive element is formally resumed by FT (IFAT)¹ rules. The latter documents how Fair Trade schemes aim at using consumption and trade to promote inclusion and capacity building of poor farmers in global product markets through a package of producer friendly trade agreements which include long-term relationships, anti-cyclical mark-ups on prices (an insurance against price fluctuations), credit facilities and business angel consultancy to build producers' capacity.

¹ According to IFAT (the main federation gathering producers and Fair Trade organizations) such criteria are: i) Creating opportunities for economically disadvantaged producers; ii) Transparency and accountability; iii) Capacity building; iv) Promoting Fair Trade; v) Payment of a fair price; vi) Gender Equity; vii) Working conditions (healthy working environment for producers. The participation of children, if any, does not adversely affect their well-being, security, educational requirements and need for play and conforms to the UN Convention on the Rights of the Child as well as the law and norms in the local context); viii) The environment; ix) Trade Relations (Fair Trade Organizations trade with concern for the social, economic and environmental well-being of marginalized small producers and do not maximise profit at their expense. They maintain long-term relationships based on solidarity, trust and mutual respect that contribute to the promotion and growth of Fair Trade. Whenever possible, producers are assisted with access to pre-harvest or pre-production advance payment).

In recent times Fair Trade net sales have grown considerably, leading to a mainstreaming of this market phenomenon from its original *niche* dimension.² The reason for this success is the increasing willingness to pay of “concerned” consumers for the social and environmental characteristics of the products.³ A main problem in the Fair Trade economy is that the value creating intangible, which represents its main innovation, cannot be tested. This is because the social and environmental content of FT products is not an experience good and the asymmetric information problem between sellers and buyers may be only partially solved with reputational mechanisms and the intermediation of certifiers and labeling organizations.⁴

² Between 2006 and 2007, total FT sales registered a 127% increase by volume and 72% by estimated retail value. Growth in Europe has averaged 50 % per year in the last 6 years. Even though Fair Trade has been originated by not for profit importers (ATOs), this impressive growth has induced traditional corporations to step in. Coop supermarkets in the UK and Italy created their own Fair Trade product lines since the ‘90es, Nestlè launched its first fair-trade product in 2005. In 2008 Tesco and Sainsbury announced their decision to sell 100% Fair Trade bananas leading the UK market share for this product to 25 percent (for a discussion on competition between fair trade dedicated retailers and supermarkets see also Kohler, 2007). On September the 3rd 2008 Ebay launched a dedicated platform (WorldOfGood.com) for fair trade e-commerce calculating that the U.S. market for such goods was \$209 billion in 2005, and forecasting that it will rise to \$420 billion in 2010.

³ A recent inquiry on a representative sample of Italian consumers finds that around 30% of them are willing to buy FT products even if they have to pay up to 10% more with respect to non FT equivalent ones (Transfair, 2005). The share rises to around 70% when the price is the same. Similar results are found in other inquiries in the UK (Bird and Hughes, 1997), Belgium (De Pelsmacker, Driesen and Rayp, 2003) and Germany (www.fairtrade.net/sites/aboutflo/aboutflo).

⁴ Fairtrade Labelling Organizations International (FLO) is the umbrella organization of 20 labelling initiatives in Europe as well as Canada, the United States, Japan, Australia and New Zealand. By the end of 2007, there were 632 Fair Trade certified producer organizations in 58 producing countries, representing 1.5 million farmers and workers. With their families and dependents, FLO estimates that 7.5 million people directly benefit from Fairtrade. For further details see http://www.fairtrade.net/labelling_initiatives.html.

Given the above mentioned framework, it is easy to understand the importance of methodologically sound impact studies. On the one hand, they can be useful to importers to evaluate, beyond the myth, whether all FT criteria are effectively applied and to understand which factors are more beneficial in terms of producers' inclusion and capacity building. On the other, they can be useful to consumers to obtain more information on the socially responsible content of the products and provide sounder grounds to their willingness to pay.

The empirical literature on FT studies is growing and presents, together with many valuable case studies (Bacon, 2005; Pariente, 2000; Castro, 2001a and b; Nelson and Galvez, 2000; Ronchi, 2002 and 2006), some econometric analyses which evaluate the impact of affiliation against the benchmark of a control group of non FT producers living in the same areas (Ruben, 2009). Among these papers Ronchi (2006), using panel data on 157 mills, finds that FT helped affiliated Costa Rican coffee producers to increase their market power. The author concludes that FT benefits are of vertical integration type and that "the decision to support Fair Trade requires other information about its costs and benefits". Becchetti and Costantino (2008) find that FT affiliates in Kenya enjoy superior product and trade channel diversification, price stability and insurance services. These effects generate social benefits in terms of reduced child mortality, health and social capital (but no significant human capital

effects). Becchetti et al. (2008) observe in Peru that years of affiliation significantly increase productivity and self esteem. Consistently with the luxury axiom (Basu, 1998 and 1999), effects on child schooling materialize only after a given threshold of PPP income is overcome. These papers show that FT may create positive or negative externalities in terms of changes of non affiliated producers' wellbeing and improved bargaining power of affiliated producers with local intermediaries.

One of the limits of FT intervention, if not aimed at improving the capacity of affiliated farmers to face market competition, is that it may create a form of dependence from the (volatile) benevolence of socially responsible consumers.⁵ This is the reason why a more accurate empirical analysis (currently missing) on the impact of FT affiliation on capacity building is of foremost importance. The goal of our paper is to provide a contribution in this direction by analyzing how some specific characteristics of affiliation (anticipated payments, enhanced interactions between producers and training courses) may affect productivity and transition to the optimal scale of production.

⁵ The theoretical debate about pros and cons of Fair Trade revolves around three main points: (i) the discussion on whether the price premium paid to producers is or is not a distortion of market clearing prices; (ii) the comparison of the relative efficiency/effectiveness of fair trade versus donations or subsidies; and (iii) the externalities of Fair Trade introduction on other non affiliated local farmers (for details see Becchetti and Costantino, 2008; Maseland and De Vaal, 2002; Moore, 2004; Hayes, 2004; and Leclair, 2002).

The paper is divided as follows. In the second section we briefly sketch the story of the cooperative of producers (Apicoop) affiliated to Fair Trade and the characteristics and dynamics of the honey market. In the third we present descriptive statistics for the full sample and for the subsamples of affiliated and non-affiliated producers. In the fourth section we focus on the effect of affiliation on training courses, cooperation among producers and advances on payments. In the fifth we present and comment econometric results on productivity. In the sixth we deal with the selection bias problem. The final section concludes.

2. History of Apicoop and Market of Honey

The Chilean economic situation during the military dictatorship of the '70s was very difficult. In order to promote economic development (especially of rural and backward areas) many organizations have been founded, often by use of foreign donations. For the same reason in 1980 it was founded Fundesval (FUNdación DESarrollo VALdivia) with capitals provided by Miserior, a German institution founded in 1958 as agency "against hunger and disease in

the world". Fundesval carried on six development projects, one of which related to the production of honey.⁶

The honey-project aimed at pursuing three objectives: (i) creating an additional source of income to farmers; (ii) improving the feeding of the population through the consumption of the honey produced; and (iii) favoring the creation of a cooperative society (*comité campesino*). In 1998 the members took over the honey-program and founded Apicoop. At present, the cooperative is made up of 127 beekeeping producers partners (123 individuals and 4 cooperatives), distributed mostly in the Los Lagos region. Apicoop members do not simply benefit from commercialization of honey through the cooperative, but receive also free technical assistance, lab tests on the quality of honey, training courses and interest-free credit support.

The usefulness of Fair Trade for honey producers' economic stability is evident when looking at the fluctuations of market production and prices. As a consequence of significant investments by farmers in Southern Chile, the production and export of honey has increased enormously over the last years, but producers are exposed to violent changes in export and prices due to

⁶Chile has a diverse variety of flowers of native species, herbaceous plants and trees that grow only in the central and southern areas of the country. One of these trees is *ulmo*, which stands out due to its pure white flowers, with extraordinary melliferous qualities. These flowers, so abundant as to make the tree appear covered in snow, are pollinated by bees that use the nectar to produce honey of *ulmo*, a specialty of northern Patagonia and of the Los Lagos region.

sudden shocks to the national and international demand and supply. The stabilization of prices and quantities sold represents an important insurance in order to avoid liquidity shortages and realize long-term investment plans.⁷

3. Dataset and summary statistics

Evidence presented in the following sections comes from randomly sampled honey producers interviewed in January and February 2008.⁸ The questionnaire consisted of a set of standard questions on socio-demographic and economic variables, plus other questions related to the production of honey. Honey producers can be classified into three groups: people affiliated to FT (the treatment sample, which we call *Flo producers* and represent 46% of interviewed individuals), people not affiliated to FT (*No Flo producers*, 42%) and people only

⁷ Over the last decade the price of honey has been subject to a positive trend due to the rising demand not only from developed nations but also from developing ones. China, the biggest honey producer in the world, has increased its per-capita consumption thanks to the rising purchasing power of its citizens, thereby contributing to the positive trend. However, there have been large and sudden fluctuations around this positive trend. A noteworthy episode is the sudden rise in the period 2002-2004 due to an antibiotic scandal which led the EU to ban the Chinese and Argentinean honey for two years. Once, in 2005, imports from China and Argentina were allowed again, the price fell by more than 40%. In such a complex international scenario, FT long-term contracts which stabilize the revenues can be a good insurance for farmers.

⁸ We started from the list of all Apicoop affiliated. We randomly extracted a sample corresponding to the number of affiliated farmers in the paper but we had to add an additional 10 percent to replace members who were not found at home. We extracted from a random list of non affiliated neighbors an equal number of control farmers. As it can be seen from Table 3 there are no significant differences in socio-demographic characteristics between the two groups.

indirectly affiliated to FT through another cooperative (*Half Flo producers*, 12%).

Notice that producers not associated to the cooperative can freely choose to sell part of their honey to the cooperative, while people indirectly associated through other producer organizations may sell to Apicoop and get the FT price and premium, but not the other services. This latter group lies between the Flo and the No Flo groups.

Table 1 describes the variables considered, Table 2 shows the descriptive statistics for the full sample while Table 3 provides means and 95 percent confidence intervals for the two subsamples of Flo versus No Flo⁹. The (wholesale) price of honey sold to the FT affiliated cooperative is obviously lower than the retail price, but surprisingly is also lower than the price paid by local, traditional and international intermediaries. Beyond the myth of higher prices, the most valuable services provided by FT organizations are price and demand stabilization, training courses, technical assistance (in this case, lab tests on honey chemical properties) and zero interest advance payments. The local retail price is lower for Apicoop's members, thus there are no positive externalities of FT affiliation on their bargaining power with local buyers.

⁹ In Table 3 we do not consider the intermediate group (Half Flo) in order to focus on the difference between the two extremes of full and no affiliation, but we will control for their characteristics in the econometric estimates which follow. Double starred values (**) indicate non overlapping confidence intervals, that is, 95 percent significance of the difference in means between control and treatment groups. We run the Wilcoxon nonparametric rank test as a robustness check and obtain the same results in terms of significance. Evidence is omitted and available upon request.

Evidence of such externality is provided in Becchetti et al. (2008), for Peruvian FT affiliated in the area of Juliaca, on the Titicaca Lake. Another surprising element is that the average salary paid by FT entrepreneurs to the temporary workers is lower than that paid by independent ones. This is a common problem with FLO and other FT organizations, whose rules and statutes (see footnote 1) establish minimum prices and premiums for FT members but do not deal with the relationship between producers and their seasonal workers.

Although most socio-demographic characteristics are similar, there are some important differences between the two subgroups, especially when looking at production of honey and other economic variables. The three main differences in performance between treatment and control producers concern total yearly income from honey (2,998 against 1,252 thousand of pesos), the quantity of honey produced (4,403 against 1,991 kilos) and the productivity measured as income from honey per hour worked (248 against 110 pesos). This implies that affiliated producers are both larger in size and more productive. One of the puzzles which we will try to disentangle is therefore whether FT affiliation has additional benefits in terms of productivity, net of the effect of size, and whether producers progressed in size and economies of scale, also thanks to FT affiliation.

Since the inclusion in one of the two (treatment and control) samples is non random but depends on a voluntary choice of producers, we must control

whether differences between treated and non-treated depend on implicit or explicit selection bias. On the implicit side, producers' characteristics which affected the affiliation decision may also affect performance, irrespectively of the affiliation effect. On the explicit side, it is reasonable to expect that the cooperative selects the most promising candidates to meet the increasingly high quality standards required by international competition. In 2006 this has been made explicit in the statute of Apicoop which now establishes a set of requisites to obtain membership. The most important of them states that the applicant must have at least 3 years of proven production of honey and 25 beehives. Note however that, exactly for this record of increasing entry standards, we should expect the performance gain to be decreasing in affiliation years (since older producers belong to vintages with less stringent quality requirements). An opposite result would, on the contrary, suggest that this kind of selection bias cannot solely explain the observed differences, which are instead influenced by the services systematically provided by the cooperative. In fact, from Table 3 we can see that only 2 percent of the control sample enjoys advances on payments against around 36 percent of Apicoop farmers. 44 percent of non affiliated farmers declare they have not participated to training courses in the last three years, while this is the case for only 22 percent of Apicoop farmers. 87 percent of Apicoop farmers declare to cooperate with other producers in the area, while this occurs for 71 of non affiliated farmers.

95 percent confidence intervals show that these differences in means are significant. These elements, and especially the training courses, provided by the association have surely played a role in increasing productivity, particularly under the aspect of reducing bees' diseases and increasing their honey production. The variable measuring local interactions among producers may be seen as a proxy of Marshallian externalities if we consider the well known Marshall's definition.¹⁰ If we take into account standard criteria typically adopted in the literature in order to define industrial districts¹¹ we may observe that they apply much more to the treatment than to the control sample. Considering the low density and the geographical distance between producers in the rural areas in which we run our survey, cooperative membership is one of the few opportunities to bridge such distance and promote interactions

¹⁰ "Industry's secrets are ceasing to be secrets: they are, as it were, in the air and children are unwittingly learning many of them. Work well done is immediately recognized and people discuss right away the merits of inventions and improvements made to machines, processes and the general organization of industry: if somebody comes up with a new idea, it is at once taken over by others and combined with their own home-made suggestions; it thus becomes a source of other new ideas" (Marshall, 1920).

¹¹ The main characteristics of industrial districts are generally considered to be: i) the concurring presence of cooperative and competitive features which reduce transaction costs, ii) the high horizontal and vertical mobility of workers (Becattini, 1990), iii) the abundance of *exit* and *voice* mechanisms generated by the intensity of productive relationships and interactions between firms and workers within the district (Brusco, 1982; Dei Ottati, 2000), iv) the local abundance of historically accumulated intangible production factors, from (managerial culture, know how, tacit capabilities) (Maillat, 1998), v) the presence of "social networks" (based on kinship, family and localness) which facilitate the flow of knowledge within district borders (Becattini, 1990). The presence of these socially homogeneous communities is expected to foster the intensity of inter-firm cooperation especially under the form of joint programs for the provision of collective goods (Paniccia, 1998) and of creation of local institutions (Lazerson and Lorenzoni, 1999), thereby increasing social capital, which is currently recognised as one of the crucial factors of growth and conditional convergence (Knack and Keefer, 1997).

among producers. Descriptive evidence on these three points is confirmed by econometric analysis where they are regressed on a series of controls.

4. Training courses, advances of payments and Marshallian externalities: the difference between affiliated and non affiliated producers

In this section we focus our attention on three qualifying differences between affiliated and non affiliated farmers: advances on payments, attendance of training courses and cooperation with local farmers. Looking at Table 3, only 2 percent of control sample farmers enjoy advances on payments against around 36 percent of Apicoop farmers. 44 percent of non affiliated farmers declare they have not participated to any training courses in the last three years, while this is the case for only 22 percent of Apicoop farmers. 87 percent of Apicoop farmers declare to cooperate with other producers in the area, while this is the case for 71 of non affiliated farmers.

95 percent confidence intervals show that these differences in means are significant. Descriptive evidence on these three points is confirmed by econometric analysis (see Table 4).¹² The specifications include as controls

¹² All estimates which follow are with White (1980) heteroskedasticity robust standard errors. We run logit estimates with heteroskedasticity robust standard errors. Since our number of observations is relatively small with respect to the number of regressors, we may have multicollinearity problems. Hence, we calculate the Variance inflation Factor for each

gender, schooling years, family status dummies, number of family members, parents' education, house ownership, land size, total number of hours worked, geographical and type of productive organization dummies.

The regression¹³ in Table 4, column 1, shows that affiliation to FLO certificated cooperatives is significantly and negatively correlated with the probability of not having participated to training courses in the last three years (such probability falls by around 33 percent and by 29 percent for directly and indirectly affiliated producers, respectively). From Table 4, columns 2 and 3, we can see that the same direct affiliation is positive and significant in regressions on the determinants of advances for payment (marginal effect of 50 percent) and declaration to cooperate with other local workers (marginal effect of 12 percent).

Consider here that indirect affiliation has slightly higher effects in magnitude, thereby showing that these two benefits are already attainable with it.¹⁴

Cooperation is also positively and (weakly) significantly related to the number

estimate. The VIF (variance inflation factor) formula is $1/1-R(x)$ where $R(x)$ is the R squared when the independent variable is regressed on all other independent variables (Marquardt, 1970). If $R(x)$ is low (tends to zero) the VIF test is low (equal to one). A VIF value below 10 (or, more restrictively, five) is considered acceptable by rules of thumb broadly adopted in the literature. When we found a VIF above 5 (the commonly adopted more severe rule of thumb for multicollinearity) we dropped insignificant variables with stronger impact on it until no regressors were left with a VIF above 5.

¹³ We introduce the two categories with separate regressors since we want to test the different effect of FT on affiliated and non affiliated producers selling to Apicoop at FT conditions.

¹⁴ The first finding is consistent with the availability of all price benefits to non affiliated producers selling to Apicoop for export in the FT channel.

of hours worked (.2 percent the marginal effect), while advances on payments with schooling years. These associations are reasonable since harder working and committed producers will be more likely, and have more opportunities, of interaction with other producers and more educated producers should possess higher skills which translate into superior creditworthiness.

The effect of FT affiliation has not just a *once for all* effect but also a progressive one. When in our previous specification we replace the affiliation dummy variable with two alternative measures of participation to the FT channel (the length of the relationship with the cooperative and the production share sold to the Apicoop cooperative) we find that years of relationship with Apicoop have positive and significant effects on advances on payments and cooperation with local workers (1 and 1.7 percent are the marginal effects when adding one affiliation year to the mean affiliation value on each of the two variables respectively). Note as well that years of indirect affiliation (sales to Apicoop without membership) have no significant effects confirming that part of the benefits accrue only to fully affiliated producers.

Our findings are confirmed when we proxy closeness to the cooperative with the share of producers' output sold to Apicoop. The latter has negative (positive) and significant effects on the probability of having never received training courses (obtaining advances on payments) (-0.2 and 0.3 percent are,

respectively, the two effects for a one percent increase in the share of the product sold to the cooperative) (Table 4, columns 4-6).

The variable measuring local interactions among producers may be seen as a proxy of Marshallian externalities if we consider the well known Marshall's definition.¹⁵ If we take into account standard criteria typically adopted in the literature in order to define industrial districts¹⁶ we may observe they apply much more to the treatment than to the control sample. Considering the low density and the geographical distance between producers in the rural areas in which we run our survey, cooperative membership is one of the few opportunities to bridge such distance and promote interactions among producers.

¹⁵ “*Industry’s secrets are ceasing to be secrets: they are, as it were, in the air and children are unwittingly learning many of them. Work well done is immediately recognised and people discuss right away the merits of inventions and improvements made to machines, processes and the general organisation of industry: if somebody comes up with a new idea, it is at once taken over by others and combined with their own home-made suggestions; it thus becomes a source of other new ideas?*” (Marshall, 1920).

¹⁶ The main characteristics of industrial districts are generally considered to be: i) the concurring presence of cooperative and competitive features which reduce transaction costs, ii) the high horizontal and vertical mobility of workers (Becattini, 1989), iii) the abundance of *exit* and *voice* mechanisms generated by the intensity of productive relationships and interactions between firms and workers within the district (Brusco, 1982; Dei Ottati, 2000), iv) the local abundance of historically accumulated intangible production factors, from (managerial culture, know how, tacit capabilities) (Maillat, 1998), v) the presence of “social networks” (based on kinship, family and localness) which facilitate the flow of knowledge within district borders (Khalid, 1999). The presence of these socially homogeneous communities is expected to foster the intensity of inter-firm cooperation especially under the form of joint programs for the provision of collective goods (Paniccia, 1998) and of creation of local institutions (Lazerson and Lorenzoni, 1999), thereby increasing social capital, which is currently recognised as one of the crucial factors of growth and conditional convergence (Knack and Keefer, 1997).

5. Productivity and FT affiliation

We measure productivity as income from honey production per hour worked and regress it on measures of FT affiliation and various controls (Table 5, columns 1-4). As it will be shown below, the first four specifications are model free, while the two which follow test a specific theoretical assumption (the inverse U-shaped average product curve). The estimate in column 4 shows that affiliation to FT is associated with an increase of 83,186 pesos of honey income per hour worked. It is a remarkable difference if we consider that average honey income per hour worked is 141,302 pesos.

Other significant factors are schooling years (9,645 pesos per additional year of education), land size (1,429 pesos per hectare), type of productive organization and (weakly) marital status.¹⁷ The link between our productivity variable and affiliation is confirmed if, instead of the two dummy variables, we use a unique synthetic indicator represented by the share of production sold to Apicoop (Table 5, column 1). A one percent higher share of sales to Apicoop is associated to a gain in farmer's honey income per hour worked of 707 pesos.

The importance of the role of the three above described factors characterizing affiliation (advances on payment, cooperation and training courses) is

¹⁷ The significance of the affiliation variable persists if we limit the estimate to producers hiring seasonal workers and therefore include in the estimate cost of seasonal labor as an additional control. Estimates are omitted for reasons of space and available upon request.

confirmed when we instrument the affiliation dummy first with years of affiliation (Table 5, column 2) and, after it, with the three factors (Table 5, column 3). The instrumented variable is significant in the second but not in the first case. The Hansen's J statistic test of overidentifying restrictions does not reject the joint null hypothesis that the instruments are valid instruments, i.e., uncorrelated with the error term. We may wonder whether the affiliation effect is due to the superior capacity of affiliated farmers to reap economies of scale. We therefore make an explicit standard theoretical assumption on the inverse U-shape of the average product function, which implies a U-shaped average cost function with increasing (decreasing) returns of scale in the downward (upward) side of the curve. As a consequence, we estimate the following specification, where Y is the total production, H the number of hours worked and X the other variables affecting productivity:

$$Y / H = \alpha Y + \beta Y^2 + \sum_j \gamma_j X_j \quad \text{with} \quad H_0: \alpha > 0, \beta < 0.$$

Consider as well that, if $\gamma_j > 0$, this implies that the j -th factor (i.e. FT affiliation) produces a significant perpendicular upward shift of the location of the affected producer from the sample average product curve. Estimates in columns 5 and 6 show that the inverse U-shape assumption is not rejected

(both levels and squares of total output are significant and with the expected sign). However, beyond size, years of affiliation (marginal effect of 3,039 pesos per year) and schooling years have an independent positive effect on productivity (even though they are now weakly significant). This implies that FT affiliation years remain significant once we control for the productive scale. It is also interesting to see that the affiliation effect materializes only for fully affiliated producers: the “*FT age half flo*” variable, measuring affiliation years of producers selling to Apicoop at FT price conditions without being full cooperative members, is not significant.

Two issues to be discussed in our results are omitted variable bias and measurement error. As it is well known (Deaton, 1997), in development studies the first problem generally relates to the quality of land¹⁸ and the second to measuring income. Since we are looking at honey production, quality of land is not very important, while productive techniques are much more so. The latter are not exogenous since they are affected by training courses and interaction among local producers which, in turn, have been shown to be affected by FT affiliation years. With regard to the measurement error problem, the main candidate in our case is the dependent variable. This creates fewer problems

¹⁸ In this perspective, economies of scale may be a spurious effect driven by a downward bias of the size coefficient when the omitted quality variable is negatively related with size.

with respect to a measurement error in the regressors and should not alter the sense of our estimates.

5. Controlling for selection bias: three approaches

An obvious problem in our model is the lack of dynamics which makes it hard to distinguish between the impact of FT affiliation and a possible selection bias effect. Does affiliation improve productivity and economies of scale, or are more productive and larger farmers more likely to enter the cooperative? We try to provide one qualitative and two quantitative answers to this question. From a qualitative point of view consider that the competitive race in export markets is becoming progressively tighter and international standards of health and product quality regulation increasingly severe across years. It is therefore highly implausible that Apicoop has affiliated progressively smaller and less efficient producers across years.

Just to give an example of a “vintage” factor (invariant from the first affiliation year to now) which should be correlated with productive skills at the moment of entry, we find that average school years of producers with less than 3 years of affiliation in 2008 are 10.44, against 8.37 of those between 6 and 9 years and 7.64 of those above 12 years. This descriptive finding seems consistent with the progressively more severe (land size based) selection criteria previously

described, assuming the likely correlation between size and producer's education in the entry year.

Hence, the significant effect of any additional year of affiliation on a given performance variable supports the hypothesis of a contribution from the organization and acts against a (vintage driven) selection bias which should operate in the opposite direction by reducing the positive, or even determining a negative, link between years of affiliation and performance.

A first quantitative answer to the selection bias problem is provided by estimating a treatment regression model in which the effect of FT affiliation is controlled for the selection characteristics of affiliates. The treatment regression model shown in Table 6 includes the following two equations¹⁹:

$$\begin{aligned} \text{Honey Productivity}_i = & a_0 + a_1 \text{Age} + a_2 \text{Education} + a_3 \text{Hectars} + a_4 \text{Hours Total} + a_5 \\ & \text{Years pre Apicoop} + a_6 \text{House} + a_7 \text{Flo} + v_i \end{aligned} \quad [1.1]$$

$$\begin{aligned} \text{Flo}_i = & \beta_0 + \beta_1 \text{Age} + \beta_2 \text{Male} + \beta_3 \text{Married} + \beta_4 \text{People In House} + \beta_5 \text{Education} \\ & \text{Mother} + \beta_6 \text{Education Father} + \sum_k \delta_k \text{Prod Structure}_k + z_i \end{aligned} \quad [1.2]$$

¹⁹ In the two equation system (v) and (z) are bivariate normal random variables with zero mean and covariance matrix $\begin{bmatrix} \sigma & \rho \\ \rho & 1 \end{bmatrix}$. The likelihood function for the joint estimation of [1.1] and [1.2] is provided by Maddala (1983) and Greene (2003).

Where *Prod Structure* are k dummies capturing the organizational form of the producer (family, firm, committee,²⁰ lone producer). Note that, in order to meet the requirement of using selection variables not affecting our performance indicator, in both estimates we use regressors which revealed themselves not to be correlated with the dependent variable in single equation estimates. However, some of these variables are significant in the selection equation (gender and firm organization). The hypothesis that the residuals of the two equations are uncorrelated is not rejected. The affiliation variable remains significant both in the first and in a second specification where we control for economies of scale by adding the level and square of honey production.

As a further robustness check we finally propose a second approach for evaluating the effect of FT, net of the selection problem (Tables 7.1 and 7.2). It is well known that when time series are not available and more sophisticated approaches impossible,²¹ propensity score matching (PSM)²² may be a reasonable alternative solution. By matching couples of treatment and control producers which are closest in terms of selected characteristics we may assume, with the PSM approach, that the average treatment effect of the treated

²⁰ The committee is an informal organization of a small group of individual producers who coordinate their sales and purchases of output in order to obtain higher bargaining power with local intermediaries.

²¹ Fair Trade existed in the area before our survey. Therefore it was impossible to perform a randomized experiment on the issue at stake in this paper.

²² For details on this approach see Dehejia and Wahba (2002), Heckman et al. (1996, 1998), Heckman, Ichimura, and Todd (1997, 1998). See Friedlander, Greenberg, and Robins (1997)

captures the specific contribution of FT affiliation on the selected performance variable. Following what is standard in the literature when choosing regressors to build the propensity score, we ensure that the vector of variables on which the matching is conditioned is independent from individual assignment to the treatment sample.

We also check that the second crucial condition (distribution of the outcome conditioned on the set of independent variables from the treatment) is met. Consider that our dependent variable is full affiliation and productive scale is introduced among regressors. In this way we make our test more severe since indirectly affiliated producers are in the control sample and the average treatment effect is evaluated at the same level of productive scale.²³ Obtained findings confirm the difference between affiliated and non affiliated farmers since average treatments of the treated (ATT or differences in means between treatment and control samples) are significant when looking at share of product sold to Apicoop, productivity (income from honey per hours worked), advances on payments and cooperation with local farmers (Tables 7.1 and 7.2).²⁴

²³ Exclusion of indirectly affiliated producers from the test and elimination of the productive scale variables (level and squares of physical production) make differences between treatment and control sample more significant. Results are omitted for reasons of space and available upon request.

²⁴ What the reader might question at this point is why not all producers choose affiliation given its benefits. The answer should be clear from our results. Less risk adverse producers might prefer to take the risk of fluctuating honey prices to the implicit insurance provided by

7. Conclusions

The recent literature on impact studies of FT affiliation is important in two respects: i) it gives to consumers of FT products a test on the validity of the promise to promote inclusion and wellbeing of marginalized producers, thereby reducing the asymmetric information gap between consumers and sellers; ii) it gives relevant insights to importers, labelers and retailers on the application of criteria, emphasizing their strengths and weaknesses and stimulating their discussion and implementation.

Our analysis on Chilean honey producers in a period of high market prices highlights that, beyond the fair price myth, non price conditions are much more important and capable of “*creating opportunities for economically disadvantaged producers*”, as the first point of IFAT criteria announces. More specifically, the case of Apicoop producers illustrates that FT affiliation, in spite of an insignificant price differential in times of rising market prices, has helped local farmers to improve their productive skills across years. In this process more favorable financial conditions (advances on payments at 0% interest rate),

FT. Furthermore, affiliation to a cooperative implies the commitment to sell large part of their production to Apicoop and a series of social obligations that producers with a strong sense of independence may not like. Last but not least, producers not always have full awareness of the potential economic benefits of affiliation.

internalization of Marshallian externalities via interactions among local producers and training courses are the distinguishing features with respect to a control sample of non affiliated producers which seem to have paid an important role. On the overall, our findings show that affiliation years significantly contribute to increase producers' productivity by moving farmers above the inverse U-shaped average product curve in the sample.

These results, together with those on similar projects described in the introduction lead us to believe that Fair Trade identifies the right path of action to promote inclusion of marginalized farmers in LDCs (even though not all projects have the same degree of effectiveness and depend crucially on management abilities of the local cooperatives). This is because they correctly identify that the problem at stake is not just one of underproduction but, mainly one of market power, market access and capacity building. FT by definition offers a diversification of marketing channels, aims to address part of the premium to innovation and part to social needs and has the goal to strengthen local producer organizations and their market power in the value chain with respect to local transportation intermediaries.

This does not occur without problems which need to be carefully tackled. Among them we signal the need for more transparency on full and half membership, the attention to wages of seasonal employees of producers and the necessity to increase awareness of local cooperative affiliates about Fair

Trade. With respect to the first point part of the fair trade labeled products are provided by farmers which just get the final price premium and do not participate to the local producer organizations and therefore to their contribution to farmer benefits. On the second point FT criteria do not cover the case in which producers have seasonal workers and therefore do not explicitly care about working conditions of the latter. On the third we find that many farmers know only the local cooperative and not much about the Fair Trade movement. Progress in this direction may increase awareness and bottom up participation from final beneficiaries of the initiative.

References

- [1] Bacon, C. (2005), "Confronting the Coffee Crisis: Can Fair Trade, Organic, and Specialty Coffees Reduce Small-Scale Farmer Vulnerability in Northern Nicaragua?", *World Development*, No. 33(3), pp. 497-511.
- [2] Basu, K. (1999), "Child Labor: Cause, Consequence and Cure, with Remarks on International Labor Standards", *Journal of Economic literature*, Vol. 37, pp. 1083-1119.
- [3] Basu, K. & Van, P.H. (1998), "The Economics of Child Labor" *American Economic Review*, Vol. 88, pp. 412-427.
- [4] Becattini, G., 1990, The Marshallian industrial district as a socio-economic notion, in F. Pyke et al. (eds.), *Industrial district and Inter-firm cooperation in Italy*, International Institute for Labour Studies, Geneva.
- [5] Becchetti, L. & Costantino, M. (2008), "The Effects of Fair Trade on Marginalised Producers: an Impact Analysis on Kenyan Farmers, *World Development*, No. 36(5), pp. 823-842.
- [6] Becchetti, L., Costantino, M. and Portale, E. (2008), "Human capital, externalities and tourism: three unexplored sides of the impact of FT affiliation on primary producers", CEIS working paper No. 262.

- [7] Bird, K. and D.R. Hughes (1997), "Ethical Consumption: The Case of 'Fairly-Traded' Coffee", *Business Ethics*, No. 6(3), pp. 159-167.
- [8] Brusco, S. (1982), "The Emilian Model: Productive Decentralization and Social Integration", *Cambridge Journal of Economics*, Vol. 6 (2).
- [9] Castro, J.E. (2001a), "Impact assessment of Oxfam's fair trade activities. The case of Productores de miel Flor de Campanilla", Oxford: Oxfam.
- [10] Castro, J.E. (2001b), "Impact assessment of Oxfam's fair trade activities. The case of COPAVIC", Oxford: Oxfam.
- [11] Deaton, A. (1997), "The Analysis of Household Surveys: A Microeconomic Approach to Development Policy", The Johns Hopkins University Press (for the World Bank).
- [12] Dehejia, R. H. & Wahba, S. (2002) "Propensity Score-Matching Methods for Nonexperimental Causal Studies", *The Review of Economics and Statistics*, Vol. 84(1), pp. 151–161.
- [13] Dei Ottati, G. (2000), "Exit, Voice, and Loyalty in the Industrial District: The Case of Prato", University of Cambridge, ESRC Centre for Business Research, Working Paper WP175.
- [14] De Pelsmacker P. & L. Driesen & G. Rayp (2003), "Are Fair Trade Labels Good Business? Ethics and Coffee Buying Intentions", Working Papers of Faculty of Economics and Business Administration, Ghent University.
- [15] Friedlander D., Greenberg D. H. & Robins P. K., (1997), "Evaluating Government Training Programs for the Economically Disadvantaged," *Journal of Economic Literature*, Vol. 35(4), pp. 1809-1855.
- [16] Greene, W. (2003), "Econometric Analysis", 5th Edition, Prentice Hall.
- [17] Hayes, M. (2004), "Strategic Management Implication of the Ethical Consumer", www.fairtraderesearch.org.
- [18] Heckman, J., Ichimura, H. & Todd, P. (1997), "Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme", *Review of Economic Studies*, No. 64(4), pp. 605–654.
- [19] Heckman, J., Ichimura, H. & Todd, P. (1998), "Matching as an Econometric Evaluation Estimator", *Review of Economic Studies*, No. 65(2), pp. 261–294.
- [20] Heckman et al. (1996), "Sources of Selection Bias in Evaluating Social Programs: An Interpretation of Conventional Measures and Evidence on the Effectiveness of Matching as a Program Evaluation Method", *Proceedings of the National Academy of Sciences*, No. 93:23, pp. 13416–13420.
- [21] Heckman et al. (1998), "Characterizing Selection Bias Using Experimental Data," *Econometrica*, No. 66:5, pp. 1017–1098.

- [22] Kohler P. (2007), "The Economics of Fair Trade: For Whose Benefit? An Investigation into the Limits of Fair Trade as a Development Tool and the Risk of Clean-Washing", HEI Working Paper 06-2007.
- [23] Knack, S. & Keefer, P. (1997), "Does Social Capital Have an Economic Payoff? A Cross-Country Investigation", *Quarterly Journal of Economics*, Vol. 112, pp. 1251-88.
- [24] Leclair, M. S. (2002), "Fighting the Tide: Alternative Trade Organizations in the Era of Global Free Trade", *World Development*, Vol. 30(7), pp. 1099–1122.
- [25] Lazerson, M. H. & Lorenzoni, G. (1999), "The Firms that Feed Industrial Districts: A Return to the Italian Source", *Industrial and Corporate Change*, Vol. 8, pp. 36-47.
- [26] Maddala, G. S. (1983), "Limited-Dependent and Qualitative Variables in Econometrics", *Econometric Society Monographs in Quantitative Economics*, Cambridge University Press.
- [27] Maillat, D. (1998), "From the Industrial District to the Innovative Milieu: Contribution to an Analysis of Territorialised Productive Organizations", *Recherches Economiques de Louvain*, 64(1), pp. 111-129.
- [28] Marquardt D. W. (1970), "Generalised Inverses, Ridge Regression, Biased Linear Estimation, and Nonlinear Estimation", *Technometrics*, Vol. 12, pp. 591-612.
- [29] Marshall, A. (1920), "Principles of Economics", Macmillan, London.
- [30] Maseland, R. & De Vaal, A. (2002), "How Fair is Fair Trade?", *De Economist*, 150(3), 251-272.
- [31] Moore, G. (2004), "The Fair Trade Movement: Parameters, Issues and Future Research", *Journal of Business Ethics*, Vol. 53(1-2), pp. 73-86.
- [32] Nelson, V. & Galvez, M. (2000), "Social Impact of Ethical and Conventional Cocoa Trading on Forest-Dependent People in Ecuador". University of Greenwich, mimeo
- [33] Paniccia, I. (1998), "One, a Hundred, Thousands of Industrial Districts", *Organization Studies*, 19(4), pp. 667-699.
- [34] Pariente, W. (2000), "The Impact of Fair Trade on a Coffee Cooperative in Costa Rica. A Producers Behaviour Approach", Université Paris I Panthéon Sorbonne.
- [35] Ronchi, L. (2002), "The Impact of Fair Trade on Producers and their Organizations: a Case Study with Coocafè in Costa Rica", University of Sussex. mimeo
- [36] Ronchi, L. (2006) "Fairtrade" and Market Failures in Agricultural Commodity Markets. World Bank Policy Research Working Paper 4011. Washington: IBRD.

- [37] Ruben, R., (2009), The impact of fair trade, Wageningen Academic Publishers, Wageningen
- [38] White, H. (1980), “A Heteroskedasticity-Consistent Covariance Matrix and a Direct test for Heteroskedasticity”, *Econometrica*, Vol. 48, pp. 817-38.

Table 1. Variables definition

Variable	Description	Variable	Description
Male	DV equal to 1 if the respondent is male	Sale to international intermediaries	Share of honey sold to international intermediaries
Age	Age in years	Price Apicoop	Price paid by Apicoop
Education	Years of school attendance	Price retail	Retail price
Education mother	Education of the mother in years	Price local intermediaries	Price paid by local intermediaries
Education father	Education of the father in years	Price traditional intermediaries	Price paid by traditional intermediaries
Married	DV equal to 1 if the respondent is married	Price international intermediaries	Price paid by international intermediaries
Single	DV equal to 1 if the respondent is single	Price per kilo	Price of honey per kilo
Living together	DV equal to 1 if the respondent lives with the partner	Honey production	Total production of honey in kilos
Divorced	DV equal to 1 if the respondent is divorced	Productivity per hour	Value of honey production per hour worked
Separated	DV equal to 1 if the respondent is separated	Advance payment	DV equal to 1 if the respondent received advance payments
Widowed	DV equal to 1 if the respondent is widowed	Percentage advance	Percentage of the value of the honey production received in advance
Children	Number of children	Interests on advance	Interest rate applied to advance payments DV equal to 1 if the respondent attended training courses in the last 3 years
People in house	Number of people living in the household	Training courses	
Hectares	Property of land in hectares	Loan	DV equal to 1 if the respondent received a loan last year
House	DV equal to 1 if the respondent owns the house	Savings	DV equal to 1 if the respondent was able to save some money last year
Honey	DV if honey is the main economic activity DV if other products from bees are the main economic activity	Credit restriction	DV equal to 1 if the respondent faced credit restrictions last year DV equal to 1 if the producer declares to cooperate with other producers in the area
Other bees		Cooperation	
Agriculture	DV if agriculture is the main economic activity	Wage permanent worker	Average hourly wage of workers employed over the whole year
Breeding	DV if breeding is the main economic activity DV if the main economic activity is not one of those mentioned above	Wage temporary worker	Average hourly wage of seasonal workers
Other activity		Happiness	Self declared happiness level (from 1 to 10)
Hours total	Number of hours devoted to working activities in general	Family satisfaction	Self declared satisfaction with economic conditions of the family (from 1 to 10)
Hours honey	Number of hours devoted to the production of honey	Town	DV equal to 1 if the respondent lives in town
Hours agriculture	Number of hours devoted to agriculture	Santa Barbara	DV equal to 1 if the respondent lives in Santa Barbara
Hours breeding	Number of hours devoted to breeding	Paillaco	DV equal to 1 if the respondent lives in Paillaco
Hours other	Number of hours devoted to other economic activities	Rancagua	DV equal to 1 if the respondent lives in Rancagua
Income necessary	Income considered necessary to live well	Mahiue	DV equal to 1 if the respondent lives in Mahiue
Income total	Total income earned last year	Lone producer	DV equal to 1 if the respondent produces honey alone
Income honey	Income from honey last year	Family	DV equal to 1 if the respondent produces honey with the family
Income bees	Income from other bees' products last year	Company	DV equal to 1 if the respondent created a company to produce honey
Income agriculture	Income from agriculture last year	Committee	DV equal to 1 if the respondent belongs to a honey committee
Income breeding	Income from breeding last year	Years pre Apicoop	Years of affiliation to a cooperative before the birth of Apicoop
Income other	Income from other activities last year	Flo	DV equal to 1 if the respondent is directly associated to FT cooperatives DV equal to 1 if the respondent is not affiliated to Apicoop but sells part of its production to Apicoop for the FT export channel enjoying the FT price benefits
Other sources	DV equal to 1 if the respondent has other sources of income	Half Flo	DV equal to 1 if the respondent is neither a Flo nor an Half Flo producer (not affiliated to Apicoop and not selling to Apicoop for the FT export channel)
Sale Apicoop	Share of honey sold to Apicoop	No Flo	
Sale retail	Share of honey sold to retail	FT age flo	Number of affiliation years of Apicoop members
Sale local intermediaries	Share of honey sold to local intermediaries	FT age half flo	Number of years of trade relationships of non affiliated members selling to Apicoop for the FT export channel
Sale traditional intermediaries	Share of honey sold to traditional intermediaries		

Table 2. Summary Statistics of Socio-Demographic and Economic Variables

Variable	Mean	Std. Dev.	Min	Max
Male	0.84	0.37	0	1
Age	49.74	12.70	24	88
Education	9.92	4.19	0	22
Education mother	4.56	4.01	0	16
Education father	4.66	4.27	0	18
Married	0.65	0.48	0	1
Single	0.20	0.40	0	1
Living together	0.09	0.28	0	1
Divorced	0.01	0.09	0	1
Separated	0.03	0.16	0	1
Widowed	0.03	0.18	0	1
People in house	3.97	1.82	1	12
Children	2.50	1.89	0	11
Hectares	9.60	22.82	0	160
House	0.87	0.34	0	1
Honey	0.61	0.49	0	1
Other bees	0.01	0.11	0	1
Agriculture	0.13	0.34	0	1
Breeding	0.06	0.25	0	1
Other activity	0.20	0.40	0	1
Hours total	42.26	17.54	2	105
Hours honey	18.33	14.28	0	70
Hours agriculture	7.55	13.45	0	60
Hours breeding	3.94	10.59	0	70
Hours other	9.93	17.34	0	89
Income necessary	4,784,549	3,605,721	480,000	36,000,000
Income total	4,988,680	11,400,000	0	110,000,000
Income honey	2,109,031	3,878,463	0	40,000,000
Income bees	346,100	1,016,250	0	10,000,000
Income agriculture	967,496	7,125,316	0	100,000,000
Income breeding	247,122	841,495	0	9,000,000
Income other	1,350,009	6,009,740	0	80,000,000
Other sources	0.61	0.49	0	1
Sale Apicoop	50.70	44.14	0	100
Sale retail	31.61	40.09	0	100
Sale local intermediaries	5.53	21.23	0	100
Sale traditional intermediaries	8.06	25.68	0	100
Sale to international intermediaries	0.86	8.18	0	92
Price Apicoop	767	51	600	950
Price retail	1,536	393	800	2,500
Price local intermediaries	904	352	680	2,000
Price traditional intermediaries	894	260	680	1,600
Price international intermediaries	1,110	385	730	1,500
Price per kilo	1,040	466	0	2,500
Honey production	3,232	6,134	0	60,000
Productivity per hour	141,302	280,286	0	3,333

Advance Payment	0.20	0.40	0	1
Percentage advance	25.07	19.13	5	100
Interests on advance	0.61	3.27	0	20
Training courses	0.29	0.46	0	1
Loan	0.76	0.43	0	1
Savings	0.55	0.50	0	1
Credit restriction	0.17	0.38	0	1
Wage Permanent worker	821	332	170	1,477
Wage Temporary worker	935	258	375	1,900
Happiness	5.55	1.70	3	9
Family satisfaction	6.89	1.70	3	10
Town	0.23	0.42	0	1
Santa Barbara	0.21	0.41	0	1
Paillaco	0.19	0.40	0	1
Rancagua	0.11	0.31	0	1
Mahiue	0.04	0.18	0	1
Years pre Apicoop	2.58	7.054	0	29
Flo	0.46	0.50	0	1
Half Flo	0.12	0.33	0	1
No Flo	0.42	0.49	0	1
FT age flo	3.05	4.76	0	20
FT age half flo	0.47	1.34	0	8

Table 3. Confidence intervals of selected variables for treatment (Flo certified producers) and control samples

Variable	No Flo				Flo			
	Obs	Mean	[95% Conf. Interval]		Obs	Mean	[95% Conf. Interval]	
Male	98	0.78	0.69	0.86	108	0.89	0.83	0.95
Age	98	48.29	45.62	50.95	108	50.60	48.42	52.78
Education	98	10.35	9.49	11.20	107	9.46	8.69	10.23
Children	97	2.47	2.10	2.85	106	2.66	2.28	3.05
Hectares	98	11.83	6.28	17.37	107	8.26	4.44	12.08
House	98	0.88	0.81	0.94	108	0.91	0.85	0.96
Main activity								
Honey	98	0.49**	0.39	0.59	108	0.69**	0.60	0.77
Other bees	98	0.03	0.00	0.07	108	0.00	0.00	0.00
Agriculture	98	0.19**	0.11	0.27	108	0.06**	0.02	0.11
Breeding	98	0.06	0.01	0.11	108	0.07	0.02	0.12
Other activity	98	0.23	0.15	0.32	108	0.18	0.10	0.25
Hours worked								
Hours total	97	40.79	37.10	44.49	107	42.40	39.13	45.68
Hours honey	98	14.89	12.07	17.71	108	20.32	17.62	23.03
Hours agriculture	98	9.16	6.30	12.03	108	5.90	3.66	8.14
Hours breeding	98	3.42	1.18	5.66	108	4.55	2.52	6.57
Hours other	97	10.62	6.86	14.38	108	9.92	6.67	13.16
Income and productivity								
Income necessary	98	5,177,143	4,263,280	6,091,006	107	4,308,785	3,771,018	4,846,552
Income total	95	4,399,368	2,218,092	6,580,645	108	5,787,667	3,266,378	8,308,955
Income honey	94	1,251,649**	860,207	1,643,091	107	2,998,411**	1,997,739	3,999,084
Other sources	95	0.69	0.60	0.79	102	0.54	0.44	0.64
Honey production	95	1,991**	1,208	2,774	103	4,403**	2,867	5,940
Productivity per hour	94	110**	81	140	103	248**	168	328

Table 4. Training courses, cooperation and advances on payments

Dependent Variable	No Tr. Courses	Cooperation	Advances	No Tr. courses	Cooperation	Advances
Age	0.002744 (0.82)	0.000552 (0.23)	0.002294 (1.46)	0.002433 (0.71)	0.000287 (0.14)	0.003358 (1.38)
Male	0.127594 (1.82)	-0.02953 (-0.44)	-0.02184 (-0.42)	0.098782 (1.22)	-0.04913 (-1.02)	-0.01347 (-0.18)
Education	-0.01828 (-1.71)	0.002826 (0.35)	0.014721 (2.22)	-0.01669 (-1.57)	0.004968 (0.69)	0.021693 (2.49)
People in house	0.003324 (0.14)	-0.02554 (-1.72)	-0.00037 (-0.05)	-0.00434 (-0.2)	-0.02037 (-1.65)	0.003198 (0.2)
Years pre Apicoop	0.008647 (1.44)	0.00423 (1.69)	-0.00561 (-1.76)	0.007755 (1.08)		-0.00739 (-1.52)
Hectares	0.000934 (0.74)	-0.00039 (-0.41)	0.001056 (1.62)	0.001425 (1.16)	-0.00071 (-0.94)	0.000768 (0.92)
Hours total	-0.00161 (-0.87)	0.002709 (1.74)	0.00233 (2.45)	-0.00108 (-0.53)	0.001535 (1.02)	0.003534 (2.42)
House	0.003914 (0.06)	-0.04396 (-1.75)	-0.00155 (-0.11)	-0.01689 (-0.29)	-0.0265 (-1.16)	0.004571 (0.18)
Committee	-0.12921 (-1.04)	0.0234 (0.35)	0.0124 (0.42)	-0.0394 (-0.16)		
Family	-0.33382 (-2.99)	-0.06276 (-0.38)	-0.12723 (-1.65)	-0.2578 (-1.73)	0.057209 (0.6)	
Lone producer	-0.24701 (-2.05)	-0.09215 (-0.55)	-0.10316 (-1.34)	-0.15077 (-0.97)	0.056929 (0.58)	-0.00777 (-0.15)
Married	0.079892 (1.09)	0.099542 (1.57)	0.037972 (1.54)	0.073485 (0.93)	0.129684 (2.14)	0.038053 (0.85)
Education mother	-0.02657 (-1.93)	0.00189 (0.18)	-0.00056 (-0.11)	-0.02653 (-1.93)	0.001443 (0.17)	-0.00271 (-0.31)
Education father	0.014405 (1.16)	-0.00237 (-0.24)	-0.00689 (-1.48)	0.011153 (0.94)	-0.00015 (-0.02)	-0.00646 (-0.94)
Flo	-0.32695 (-4.29)	0.122269 (2.22)	0.500728 (5.69)			
Half flo	-0.28922 (-6.57)	0.155487 (3.89)	0.83293 (7.73)			
Company	-0.3523 (-0.36)	-0.28435 (-0.77)				
FT age flo				-0.00978 (-0.99)	0.017394 (2.34)	0.009978 (2.49)
FT age half flo				-0.01871 (-0.27)	0.068681 (1.84)	-0.00257 (-0.17)
Sale Apicoop				-0.0025 (-2.3)	-0.00036 (-0.52)	0.002654 (3.45)
N. of obs.	206	188	196	200	195	182
Wald χ^2	χ (20)	χ (18)	χ (19)	χ (21)	χ (20)	χ (19)
Prob > χ^2	0.00	0.00	0.00	0.00	0.00	0.00
Pseudo R2	0.28	0.17	0.4	0.21	0.35	0.19

Note: Results are from Logit regressions with heteroskedasticity robust standard errors. The table reports (for continuous variables) marginal effects calculated at means of the regressors on the probability that the dependent variable take value of one. For dummy variables it measures the effect of a (0/1) discrete change. T-stats of the marginal effect standard errors are in round brackets.

Table 5. FT affiliation and productivity

Methodology	OLS	IV ¹	IV ²	OLS	OLS	OLS
Age	1461.68 (1.20)	1430.049 (1.17)	1749.772 (1.44)	1412.735 (1.16)	1262.617 (1.16)	1129.963 (1.06)
Male	29366.53 (0.69)	32409.79 (0.81)	29083.76 (0.71)	29004.14 (0.69)	9989.349 (0.24)	13533.15 (0.33)
Education	9841.432 (2.44)	9727.202 (2.36)	10516.9 (2.58)	9645.027 (2.32)	7168.604 (1.70)	7051.898 (1.82)
People in house	21212.95 (1.73)	17661.57 (1.55)	18482.59 (1.58)	16383.14 (1.31)	15888.28 (1.34)	16494 (1.41)
Years pre Apicoop	479.9462 (0.17)	-418.222 (-0.12)	-877.652 (-0.26)	-659.778 (-0.22)	-123.802 (-0.04)	
Hectares	1392.406 (1.88)	1406.562 (1.97)	1434.656 (2.01)	1429.959 (2.06)	1558.551 (2.16)	1526.899 (2.07)
Hours total	-1278.8 (-1.21)	-1091.59 (-1.08)	-1144.96 (-1.10)	-1077.23 (-1.05)	-1189.69 (-1.20)	-1215.72 (-1.17)
House	-7271.37 (-0.85)	-6153.53 (-0.71)	-4004.99 (-0.47)	-6032.88 (-0.69)	3751.059 (0.52)	4438.612 (0.57)
Company	178068 (2.27)	182037.1 (2.30)	181836.1 (2.39)			
Committee				-180958 (-2.32)	42.98725 (0.00)	7557.346 (0.12)
Family	26773.31 (0.69)	33588.98 (0.77)	28574.35 (0.64)	-148362 (-1.87)	8152.503 (0.14)	14491.53 (0.24)
Lone producer	-11754.3 (-0.35)	-7377.43 (-0.20)	-8539.08 (-0.23)	-188880 (-2.47)	-16830.5 (-0.30)	-12418.2 (-0.23)
Married	38823.37 (1.48)	46030.58 (1.76)	42445.18 (1.61)	48098.75 (1.81)	32344.73 (1.20)	31000.45 (1.16)
Sale Apicoop	707.2168 (2.07)					
Flo		73320.94 (1.63)	92071.26 (2.08)	83186.04 (2.65)	50589.85 (1.72)	
Half Flo		15758.02 (0.32)	-1374.85 (-0.04)	21872.81 (0.55)		
Honey production					11.66654 (2.76)	12.51163 (3.02)
[Honey production] ²					-6.51E-06 (-2.78)	-6.97E-06 (-3.04)
FT age Flo						3039.482 (1.83)
FT age half Flo						-3087.28 (-0.40)
Constant	-157930 (-1.51)	-153029 (-1.39)	-185688 (-1.71)	29074.59 (0.25)	-119713 (-0.98)	-110535 (-0.87)
N	211	213	209	213	209	209
F	F(18,194)	F(18,190)	F(18,193)	F(18,193)	F(18,188)	F(18,188)
Prob> F	0	0	0	0	0	0
Hansen's J statistic*			7.302 X ² (3) P-val = 0.16287			
Pseudo R ²	0.38	0.39	0.38	0.38	0.43	0.43

Legend: the dependent variable is productivity measured as value of honey production per hour worked. For the legend of the other variables see Table

1. All regressions use DVs for the location and robust standard errors.

1: Instruments for Flo: FTageflo;

2: Instruments for Flo: FTageflo, Cooperation, Advance Payment, No training courses.

Robust t-stat in parentheses. * Hansen's J statistic test of overidentifying restrictions. The joint null hypothesis is that the instruments are valid instruments, i.e., uncorrelated with the error term, and that the excluded instruments are correctly excluded from the estimated equation.

Table 6. Treatment regression model

MAIN EQUATION (dependent variable: Productivity per hour)			TREATMENT EQUATION (dependent variable: Flo)		
	(1)	(2)		(1)	(2)
Age	3642.398 (2.01)	3154.087 (1.93)	Male	0.62947 (2.11)	0.60253 (2.01)
Education	12486.05 (2.22)	4993.997 (0.96)	Married	0.000852 (0.002)	-0.02002 (-0.09)
Hectares	1866.273 (1.94)	2518.979 (2.91)	People in house	0.126561 (2.23)	0.112921 (2.01)
Hours total	1764.776 (1.44)	419.7689 (0.38)	Education mother	-0.0447 (-1.28)	-0.04585 (-1.31)
Year pre Apicoop	-2732.66 (-0.73)	845.4519 (0.25)	Education father	0.01 (0.3)	0.006944 (0.21)
House	-16829.9 (-0.78)	6473.995 (0.33)	Committee	-6.24014 (0.02)	-12.1316 (0.03)
Flo	209624.4 (2.49)	124489.8 (1.91)	Family	0.086591 (0.16)	0.226867 (0.43)
Honey production		34.17662 (5.9)	Single	-0.10485 (-0.2)	0.045886 (0.09)
[Honey production] ²		-0.00047 (-3.7)			
Constant	-279262 (-1.78)	-268420 (-1.9)	Constant	-1.04967 (-1.64)	-1.06971 (-1.65)
N. of obs.		184			182
Wald χ^2		20.30			67.51
Prob. > χ^2		(0.00)			(0.00)
LR test of indep. eqns. ($\rho^* = 0$)		0.86(.352)			0.56(.522)

* ρ : correlation coefficient of the residuals of the two equations
Variable legend: see Table 1

Table 7.1 Differences among affiliated and non affiliated farmers (Propensity Score Matching)

Variable	N. treat.	N. contr.	ATT*	T-stat
Honey per hour worked	87	119	1.02E+05	2.111
Cooperation with local producers	87	119	0.167	2.58
Comparative standard of living	87	119	0.438	1.436
Professional self-esteem	87	119	0.381	1.503
Advances on payments	87	119	0.242	3.309
Share sold to Apicoop	87	119	55.71	11.245

Note: ATT is the average treatment of the treated. Regressors in the ATT estimate: age, education, hectares, people in house, family, company, married, honey production and honey production squared. The balancing property is satisfied. Standard errors with bootstrapping and 50 replications.

Table 7.2 Propensity score estimate
(Dependent variable: Flo)

Regressor	Coeff.	T-stat
Age	-0.00195	-0.23
House	-0.00465	-0.04
Male	0.499989	2.05
Company	0.029337	0.03
Family owned	0.364339	0.54
Single	0.185419	0.27
Married	-0.26474	-1.18
People in house	0.113956	2.32
Education mother	-0.05083	-1.32
Education father	0.001631	0.05
Constant	-0.95792	-1.14
N. of observations	176	
LR χ^2 (9)	25.43	
Prob > χ^2	0.002	
Log likelihood	-109.86812	
Pseudo R ²	0.0707	