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Do sustainability standards benefit smallholder farmers also when accounting for cooperative effects? Evidence from Cote d'Ivoire

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Abstract

While many studies analyzed effects of sustainability standards – such as Fairtrade or Rainforest Alliance – on smallholder farmers in developing countries, most did not sufficiently account for systematic differences between certified and non-certified farmers. Certified farmers are typically organized in cooperatives. When sampling only from a small number of cooperatives, as previous studies did, it is not easy to disentangle certification effects from possible cooperative effects. Here, we address this shortcoming by randomly sampling from a large number of cooperatives, thus capturing a wide range of institutional heterogeneity. In particular, we collect and use data from cocoa farmers in Cote d'Ivoire that are organized in Fairtrade-certified and non-certified cooperatives. Regression models with instrumental variables show that Fairtrade has positive and significant effects on cocoa yields, prices, and living standards. These effects remain significant also after controlling for cooperative characteristics, but the magnitude of the estimates changes. We draw two conclusions. First, in Cote d'Ivoire Fairtrade certification benefits farmers economically. Second, and more generally, cooperative characteristics are jointly correlated with certification and relevant outcomes, which needs to be accounted for to avoid bias when evaluating the benefits of sustainability standards in the small farm sector.

JEL codes: O12, Q01, Q12, Q13

Key words: Certification, cocoa, cooperatives, Cote d'Ivoire, Fairtrade, sustainability standards

1. Introduction

Sustainability standards – such as Fairtrade and Rainforest Alliance – are claimed to be effective mechanisms to link smallholder farmers in developing countries to high-value markets while promoting environmentally-friendly and socially acceptable production and trading patterns. Many studies tried to test these claims by analyzing whether or not certification under sustainability standards actually leads to benefits for farmers. Empirical research was conducted in various countries of Africa, Asia, and Latin America (Dragusanu, Giovannucci, and Nunn 2014; De Fries et al. 2017; Oya, Schaefer, and Skalidou 2018). The results are mixed. While several studies suggest that sustainability standards contribute to higher prices and incomes for participating farmers (e.g., Bacon 2005; Jena et al. 2012; Chiputwa and Qaim 2016; Meemken, Spielman, and Qaim 2017; Mitiku et al. 2017; Tran and Goto 2019), other studies find very small or no effects at all (Valkila 2009; Beuchelt and Zeller 2011; Chiputwa, Spielman, and Qaim 2015; Ibanez and Blackman 2016; Akoyi and Maertens 2018). To some extent, differences in effects can be explained by the fact that the studies refer to different countries, different years, and partly also to different standards. As is well known, the effects of standards can vary between settings with different conditions (Oya, Schaefer, and Skalidou 2018). However, even within one setting the estimated effects may be unreliable when not properly controlling for confounding factors, such as institutional heterogeneity.

Existing studies on the effects of sustainability standards in developing countries differ substantially in terms of the methodologies used. While much of the early work was rather qualitative and descriptive (e.g., Raynolds 2002; Raynolds, Murray, and Taylor 2004; Bacon 2005; Muradian and Pelupessy 2005; Valkila 2009), more recent studies tried to evaluate the net effects of standards through larger samples and more sophisticated tools of quantitative data analysis (e.g., Ruben and Fort 2012; Jena et al. 2012; Becchetti, Castriota, and Michetti 2013;

Chiputwa, Spielman, and Qaim 2015; Ibanez and Blackman 2016; Haggar et al. 2017; Meemken, Spielman, and Qaim 2017; Akoyi and Maertens 2018; Vanderhaegen et al. 2018). However, even these more recent studies did not sufficiently account for systematic differences between certified and non-certified farmers, which may lead to biased impact estimates. One possible source of bias is related to the fact that certification in the small farm sector usually happens through agricultural cooperatives (Oelofse et al. 2010; Fenger et al. 2017; Snider et al. 2017). Oftentimes, being member of a cooperative is a pre-condition for smallholders to participate in certification, as the transaction costs can otherwise be prohibitive. However, cooperative membership can influence farm performance and household welfare also without certification (Bernard and Spielman 2009; Ragasa and Golan 2014; Verhofstadt and Maertens 2014). Hence, when evaluating the effects of certification, it is important to account for cooperative effects, which is only possible through proper sampling designs.

Previous studies used different approaches to sample and compare certified and non-certified farmers. Some compared certified farmers that are organized in a cooperative with non-certified farmers that are not member of a cooperative (e.g., Becchetti, Castriota, and Michetti 2013). In that case it is not possible to disentangle certification effects from possible cooperative effects, as cooperative membership and certification are perfectly correlated. Other studies compared farmers in a certified cooperative with farmers in a non-certified cooperative (van Rijsbergen et al. 2016), or they compared observations from a few certified and non-certified cooperatives (Jena et al. 2012; Ibanez and Blackman 2016; Haggar et al. 2017; Mitiku et al. 2017; Akoyi and Maertens 2018; Ssebunya et al. 2019). While this has clear advantages, bias through cooperative effects can still occur, because cooperatives differ in terms of how they are endowed

and how well they function, which may affect outcomes irrespective of certification.[1] In all cases, the number of sampled cooperatives was small, and the few cooperatives included were not selected randomly. Without random selection of cooperatives, external validity may suffer, especially when the criteria for selecting cooperatives are not well explained. For instance, it is possible that sustainability standards have beneficial effects for farmers in cooperatives with very specific characteristics, but that these results are not representative for cooperatives on average. We are not aware of previous studies that were able to properly control for cooperative effects. This is a major drawback, as sustainability standards are strongly promoted by various types of public and private sector organizations (Dragusanu, Giovannucci, and Nunn 2014; Meemken et al. 2019). Hence, it is important to better understand whether standards actually deliver on their promise to help smallholder farmers.

Here, we contribute to the literature by proposing and using a new sampling design that better accounts for the institutional heterogeneity in agricultural cooperatives. In particular, we collected data from certified and non-certified farmers in a large number of randomly selected cocoa cooperatives in Cote d'Ivoire, West Africa, to analyze the effects of Fairtrade certification. As our sample includes cooperatives with a broad range of characteristics, we reduce the possibility that the results only hold under very specific institutional conditions. In other words, our sampling design increases external validity. Moreover, by comparing results with and without controlling for cooperative characteristics we can test to what extent ignoring institutional heterogeneity can lead to omitted variable bias.

[1] A few studies included certified and non-certified farmers from the same cooperative (Chiputwa and Qaim 2016; Meemken et al. 2017). While this is a neat approach to control for cooperative effects, it is rarely possible to sample in this way, because in most cases all farmers belonging to the same cooperative are either certified or not certified. Exceptions can occur in large cooperatives where certification is sometimes implemented only for subgroups of the total membership. However, such comparisons within the same cooperative can suffer from limited external validity, unless a larger number of cooperatives is included.

Cote d'Ivoire is the largest cocoa-producing country in the world with a global production share of over 40% (ICCO 2018). As in other tropical countries, the role of sustainability standards has grown substantially in the Ivorian cocoa sector, with Fairtrade being the most important standard in terms of the number of certified cooperatives and farmers. The aim of Fairtrade is to improve the livelihoods of smallholder producers (Fairtrade 2015). If a cooperative wants to be certified, it has to hand in an application and is physically inspected against the Fairtrade standards, which involve certain rules on labor conditions and agricultural practices, as well as recommendations for capacity building and community development (Chiputwa et al. 2015). Fairtrade certification guarantees producers a minimum floor price (for the quantities sold in certified markets) and a Fairtrade premium that is paid to the cooperative to support collective services, such as input supply, agricultural extension, or other cooperative activities. We hypothesize that Fairtrade certification has positive effects on cocoa yields, prices, and living standards of the smallholder farm households. Furthermore, we hypothesize that cooperative characteristics are jointly correlated with certification and the outcome variables, so that not controlling for cooperative characteristics leads to omitted variable bias.

2. Materials and Methods

2.1. Sampling Design

Our survey of cocoa cooperatives and farmers was conducted in the Southeast of Cote d'Ivoire, covering the country's traditional cocoa belt. Most of the cocoa farmers in this region are members of cooperatives, which provide inputs and other agricultural services to farmers and through which the cocoa is marketed (Foundjem-Tita et al. 2017). Important to note is that farmers can choose which cooperative to join, meaning that membership is not determined by geographic location alone. While kinship and social ties play a certain role, farmers also decide

which cooperative to join based on expected costs and benefits. If a chosen cooperative does not meet the expectations, farmers are free to leave and join a different cooperative operating in their vicinity.[2]

In order to capture a wide range of institutional heterogeneity, we randomly sampled 50 cooperatives in the Southeast of Cote d'Ivoire, differentiating between Fairtrade certified and non-certified cooperatives. For the sampling procedure, we first compiled complete lists of all active cocoa cooperatives in this part of the country, using official national registries (MADR 2017) as well as data and information from Fairtrade and regional extension offices. We also called all listed cooperative headquarters to verify that the cooperative is active and to identify additional cooperatives that might have been missed on the official lists. The final list included 59 Fairtrade certified cooperatives and 74 non-certified cooperatives located in three districts of Southeast Cote d'Ivoire, namely Comoe, Lacs, and Lagunes. From this list we randomly selected 25 certified and 25 non-certified cooperatives. Among the 25 Fairtrade certified cooperatives, 16 were additionally certified under UTZ or Rainforest Alliance. We will test for the effect of these other standards in a robustness check. All 25 cooperatives that were sampled as "non-certified" were not certified under any sustainability standard.

In Cote d'Ivoire, cooperatives are organized in sections, which are non-legal geographic groupings that can comprise one or several villages. All cooperatives provided us complete membership lists by section. In small cooperatives with only one section, we randomly selected 10 farmers in that section. However, most of the cooperatives have more than one section. In those cases, we first randomly selected two sections in each cooperative, and then randomly selected five farmers in each section. Hence, in total we sampled 500 farmers from the 50 cooperatives: 250 that are Fairtrade certified and 250 that are non-certified. The locations of the

[2] While geographical closeness to the cooperative headquarters is not a precondition to join, long distances are impracticable to deliver the cocoa and benefit from cooperative services.

sample farmers are shown in the map in Figure 1. In all three districts, there are overlaps of certified and non-certified cooperatives, meaning that certification is not perfectly correlated with regional characteristics, which is an advantage for the evaluation of certification effects. Moreover, Table A1 in the Appendix shows that the three districts are very similar in terms of average climate and soil conditions.

[Figure 1 around here.]

2.2. Survey

All sampled farm households were visited for a personal interview using a structured questionnaire designed and pre-tested for this purpose. The questionnaire was programmed with ODK (Open Data Kit) for use with tablet computers. The interviews were conducted by local enumerators who were carefully trained and supervised by the researchers. The questionnaire included sections on general household characteristics, asset ownership, production and marketing of cocoa and other agricultural activities, non-agricultural economic activities, as well as infrastructure and institutional details. To capture household living standards, we asked for details of food and non-food consumption expenditures (including consumption of own-produced foods). The interviews were conducted with the household head. For the part on food consumption, the person in the household responsible for food purchases and food preparation was additionally asked to join the interview.

In addition to the household interviews, we also designed a cooperative-level questionnaire for interviews with the cooperative leader in each of the 50 cooperatives. The cooperative questionnaire captured data on personal characteristics of the leader and detailed information on the cooperative's size, governance structure, asset ownership, service provision, sustainability certification, operational costs, and cocoa commercialization for the last 12 months

prior to the interview. The farm household and cooperative-level interviews were conducted in May and June 2018.

2.3. Outcome Variables

We want to analyze the effects of Fairtrade certification on cocoa yields, prices, and farm household living standards. Cocoa yields are measured in kg harvested per ha during the 12 months prior to the survey, as reported by farmers during the interviews. As Fairtrade encourages agricultural training, and the Fairtrade premium can be used by cooperatives to provide inputs and other services to its members, we expect certification to have a positive effect on yield.

Cocoa prices are measured in West African Francs (CFA) per kg. Farmers deliver their cocoa to the cooperative and receive a price that is set by the government independent of product quality. All farmers receive this fixed price at the time of delivery. Later on, certain additional payments can be made by the cooperative based on dividends from selling in certified markets or other types of profits made by better-performing cooperatives. Our price calculations include these additional payments per kg of cocoa on top of the base price that is set by the government. Given the Fairtrade premium and floor price in certified channels, we expect certification to have a positive effect on cocoa prices.

Household living standard is measured in terms of consumption expenditure expressed in CFA per capita and day. Consumption expenditure is a widely used indicator of household welfare and living standard in the development economics literature (Klasen 2000). We calculate expenditure as the value of all food and non-food goods and services consumed by the household for specified recall periods. Food consumption was captured through a 7-day recall, covering all food items consumed by the household regardless of whether these were purchased, home-produced, or obtained from other sources. As cocoa is the main source of income for most sample

households, we expect that cocoa yield and price gains through Fairtrade certification will also result in positive effects on consumption expenditure.

2.4. Cooperative Heterogeneity and Certification

Agricultural cooperatives can be very heterogeneous in terms in terms of their size, structure, asset ownership, capacity of the leadership, decision-making rules, types of services provided, and various other characteristics. This is also true for cocoa cooperatives in Cote d'Ivoire. Many of these cooperative characteristics may jointly influence farm and household-level outcomes and also whether or not a cooperative is certified. Hence, not controlling for cooperative characteristics in the impact evaluation may possibly lead to omitted variable bias. To test and control for such bias, we consider a set of cooperative-level variables for which data were obtained through the cooperative leadership survey. In particular, we consider the age and the size of the cooperative, the education level of the leader, as well as the number of vehicles owned centrally as a proxy of physical capital. In addition, we look at the number of agricultural service providers (inputs, training, etc.) to the cooperative and the share of cooperative decisions made democratically.

We also collected data for various other cooperative-level variables, many of which proved to be closely correlated with the mentioned ones. Hence, we feel that the chosen set of cooperative characteristics captures the existing institutional heterogeneity quite comprehensively. One aspect that is important to note is that cooperative characteristics cannot only influence certification, but can also be influences by certification. For instance, cooperatives may grow in size after certification through new members entering, or they may intensify their membership services. We tried to define and measure the cooperative variables in such a way that issues of reverse causality are reduced. For instance, we consider cooperative size at the time

prior to certification and measure the number of service providers rather than service intensity. Nevertheless, reverse causality for some of the cooperative characteristics cannot be ruled out completely, which should be kept in mind when interpreting the results.

2.5. Regression Models

In order to evaluate the effects of Fairtrade certification, we estimate regression models of the following type:

$$Y_{ijk} = \alpha + \beta X_{ijk} + \gamma FT_{jk} + \theta D_k + \varepsilon_{ijk} \quad (1)$$

where Y_{ijk} is the outcome variable of interest (yield, price, consumption expenditure) for household i in cooperative j and district k. X_{ijk} is a vector of household-level control variables, FT_{jk} is a dummy variable that indicates whether or not cooperative j is Fairtrade certified, and D_k is a set of district dummies. Even though the three districts are very similar in terms of agroecological conditions, district dummies capture possible differences in terms of infrastructure, market access, and other possible regional factors. ε_{ijk} is a random error term. For the estimates, standard errors are clustered at the cooperative level.

For the cocoa yield and price models, equation (1) is estimated in linear form. For the consumption expenditure model, the dependent variable is log-transformed due to its skewed distribution. Of particular interest in all models is the coefficient γ. If our hypotheses are true and Fairtrade has positive effects on cocoa yields, prices, and consumption expenditures, this should be reflected in γ being positive and statistically significant.

Equation (1) is estimated without controlling for cooperative characteristics. However, as mentioned above, cooperative characteristics may be jointly correlated with Y_{ijk} and FT_{jk}, which may lead to omitted variable bias in the estimate of γ. Therefore, in a second set of regressions we estimate models of the following type:

(2) $$Y_{ijk} = \alpha + \beta X_{ijk} + \gamma FT_{jk} + \theta D_k + \delta W_{jk} + \varepsilon_{ijk}$$

where W_{jk} is a vector of cooperative characteristics, and the other variables are as defined above. Here, we are not particularly interested in the estimate for δ, as our intention is not to analyze the role of cooperative characteristics for farm performance and household welfare *per se*. Rather, we are interested in whether or not the effects of Fairtrade certification (γ) remain positive and significant also after controlling for cooperative characteristics. Comparing the estimates for γ in equations (1) and (2) can furthermore provide an indication of the direction of bias when not controlling for cooperative characteristics. If γ in equation (2) is smaller than in equation (1), this would indicate that better-endowed or better-performing cooperatives benefit more from certification than less-endowed cooperatives, so that the certification effect in equation (1) would be overestimated.[3]

2.6. Dealing with Endogeneity

As cooperatives choose whether or not they apply for Fairtrade certification, and farmers choose the cooperative they want to be member of, FT_{jk} in equations (1) and (2) may be endogenous, which could lead to biased estimates of the coefficient γ. The most likely source of endogeneity is unobserved heterogeneity, although reverse causality can also not be ruled out without additional tests. Inclusion of cooperative characteristics in equation (2) may reduce issues of unobserved heterogeneity at the cooperative level. At the farmer level, in addition to standard control variables – such as farm size, education, age, and market access – we also include measures of farmers' risk aversion (Dohmen et al. 2011) and trust (Naef and Schupp 2009) that may proxy for unobserved factors related to personality.

[3] As mentioned above, several of the Fairtrade certified cooperatives are also certified under UTZ and/or Rainforest Alliance. To test whether these other sustainability standards have additional effects, or change the effects of Fairtrade, we carry out a robustness check where the models in equation (2) are re-estimated with an additional dummy to control for double or triple certification.

In addition to including a broad set of control variables, we also use an instrumental variable (IV) approach to test and control for endogeneity. This requires finding at least one exogenous instrument that is correlated with Fairtrade certification but does not influence the outcome variables through other mechanisms. As selectivity issues can occur at two levels – the cooperative level and the farmer level – we use two instruments, one for each level. At the cooperative level, the instrument is the cellphone network provider of the cooperative leader. At the farmer level, the instrument is the share of Fairtrade certified farmers in a specified neighborhood radius around the respective farmer himself/herself. Both instruments are explained and tested for validity below.

There are three cellphone network providers in the study region – namely Orange, MTN, and Moov – that all offer similar services at similar costs. For the individual, the choice which provider to use is mainly a question of the strength of the network signal in the particular location and the provider that peers in the own social network use. Positive network externalities occur because all three phone providers offer price discounts for calls and text messages exchanged within the provider's network (Meemken et al. 2019). Hence, it is fair to assume that more information is exchanged within one network than across the networks of different providers. Our data show a significantly positive correlation between the cooperative leader using Orange and the cooperative being Fairtrade certified (Table A2 in the Appendix).[4] We attribute this to informal flows of information about Fairtrade that are more intense among people using Orange than among people using other cellphone providers. And better access to information about Fairtrade increases the likelihood of certification. In principle, causality could also run in the opposite direction, meaning that Fairtrade certification would affect the choice of which phone provider to use. However, this is unlikely in our case, as people do not seem to switch their phone

[4] In some cases, cooperative leaders used more than one network provider. In those cases, we asked to specify the main provider that they use for most of their cellphone calls and text messages.

provider frequently. Out of the 25 leaders of certified cooperatives in our sample, only three stated that they had switched their phone provider during the last few years, after their cooperative became certified.

At the individual farmer level, the instrument for Fairtrade certification is the share of certified neighbors in a 5 km radius around each farmer, which we calculated using GPS data.[5] This variable also captures social network effects, as farmers located closer to several certified farmers are more likely to learn about certification and its possible advantages. Even though farmers cannot get Fairtrade certified individually, they can decide to join (or leave) a Fairtrade certified cooperative, as discussed above. As one would expect, our data show a positive and significant correlation between the share of certified farmers in the neighborhood and own certification (Table A2). Hence, both instruments pass the test of instrument relevance.

However, for the instruments to be valid it is also required that they are both not correlated with the outcome variables. Due to some geographic clustering of Fairtrade cooperatives and farmers, it is generally possible that these "Fairtrade" settings have stronger economic activities, better flows of information, or more favorable access to infrastructure and markets. However, the map in Figure 1 shows that the geographic clustering of certified and non-certified farmers is not very pronounced. Moreover, in the models we control for regional effects through district dummies and variables measuring the distance to roads and other infrastructure elements. Using the falsification test proposed by Di Falco, Veronesi, and Yesuf (2011), we show that both instruments do not influence cocoa yields, prices, and household consumption expenditures through mechanisms other than certification (Table A2 in the Appendix). In addition, we verified that both instruments are not significantly correlated with other variables that could affect household welfare, such as distance to schools, distance to roads, or average

[5] We also tested smaller (2 km) and larger (10 km) radii to construct the instrument with very similar results.

rainfall in a location (Table A3 in the Appendix). Finally, as we have two instruments for one endogenous variable, we performed formal tests of the over-identifying restriction (Tables A4-A6 in the Appendix). The null hypothesis that the instruments are uncorrelated with the error term cannot be rejected in any of the models. Hence, we conclude that the two instruments are valid.

3. Results and Discussion

3.1. Household Characteristics

General descriptive statistics for the set of socioeconomic variables that we use as household-level controls in the regression models are shown in Table A7 in the Appendix. The two groups of certified and non-certified farmers are very similar in terms of most variables, including farm size, household size, farmer's age, and education.

More notable differences between Fairtrade certified and non-certified farmers are observed for the outcome variables of interest in this study, which are shown in Table 1. We see statistically significant differences for all three outcome variables. Mean cocoa yields are around 550 kg/ha, which is similar to other recent yield estimates for cocoa in Cote d'Ivoire (Wessel and Quist-Wessel 2015). However, cocoa yields of Fairtrade certified farmers are around 13% higher than those of non-certified farmers. Fairtrade farmers also obtain higher prices for their cocoa, with a 3.5% difference on average. While this price difference is small in magnitude, certification seems to be one of the few opportunities to achieve a significant price markup at all. As mentioned, in Cote d'Ivoire the base price is fixed by the government without any quality differentiation. At the time of the survey, the government price was set at 700 CFA/kg.

[Table 1 around here.]

Finally, we also observe a difference of around 20% in per capita consumption expenditure between Fairtrade certified and non-certified households. For both groups, mean

expenditures are above the national poverty line of 737 CFA per capita and day (World Bank 2018). Nevertheless, 45% of the total sample of farm households live below the poverty line, with poverty rates being significantly higher in the group of non-certified households (Table 1).

3.2. Cooperative Characteristics

Table 2 shows descriptive statistics for the cooperative characteristics, also differentiating by certification status. The average cocoa cooperative is around 8 years old and has more than 400 members. Fairtrade certified cooperatives are significantly older than non-certified cooperatives. Certified cooperatives also have better educated leaders, own more physical assets, and have more providers of services to its members. In terms of democratic decision-making, no statistically significant differences are observed. Noteworthy in Table 2 are also the relatively large standard deviations for several of the cooperative characteristics. Large standard deviations imply considerable institutional heterogeneity within and across groups, which cannot be captured when only sampling from a small number of cooperatives, as previous studies did.

[Table 2 around here.]

The comparison between certified and non-certified cooperatives in Table 2 suggests that several of the cooperative characteristics are correlated with Fairtrade certification. This is confirmed in column (1) of Table 3. As the cooperative characteristics are not normally distributed, we show Spearman's correlation coefficients. As can be seen, certification is positively and significantly correlated with the age of the cooperative, the education of the leader, physical capital, and the number of service providers. At the same time, several of the cooperative characteristics are also significantly correlated with the outcome variables – cocoa yield, price, and consumption expenditure – as is shown in columns (2) to (4) of Table 3. This

joint correlation means that the estimated effects of certification on the outcome variables may be biased when not controlling for cooperative characteristics.

[Table 3 around here.]

3.3. Regression Results

Full results of the regression models to estimate the effects of Fairtrade certification on cocoa yield, prices, and per capita consumption expenditure – obtained with OLS and IV estimators – are shown in Tables A4-A6 in the Appendix. We show specifications with and without controlling for cooperative characteristics. For all models, the Hausman test indicates that the OLS and IV estimates do not differ significantly, so that the OLS estimates also seem to be consistent (and more efficient than the IV estimates).

The estimated effects of Fairtrade certification on the three outcome variables are summarized in Table 4. Columns (1) and (2) show effects without controlling for cooperative characteristics. The IV estimates suggest that certification increases cocoa yield by 70 kg/ha, which is a gain of 14% compared to the mean yield of non-certified farmers. This yield effect can be explained by certified cooperatives offering more services to its members, which improves farmers' access to agricultural inputs, information, and training. Fairtrade certification also increases the average cocoa price that farmers receive by about 22 CFA/kg, equivalent to a gain of 3% over the mean price received by non-certified farmers. As mentioned, Fairtrade certification seems to be one of the few opportunities for cocoa farmers in Cote d'Ivoire to achieve a price higher than the government-fixed price at all. Finally, Fairtrade certification has a significantly positive effect on per capita consumption expenditure, raising household living standards by 18%.

[Table 4 around here.]

Columns (3) and (4) of Table 4 show the effects of Fairtrade certification with the cooperative characteristics included as additional controls. The first important result of these alternative model estimates is that certification has positive and significant effects also after controlling for cooperative characteristics. That is, the benefits of Fairtrade certification for farmers are not solely driven by certified cooperatives being systematically different from non-certified cooperatives. This is an important result, as previous research on Fairtrade was not able to disentangle certification effects from cooperative effects.

The second important result of these alternative specifications is that some of the estimates in columns (3) and (4) are notably different from those in columns (1) and (2) of Table 4. This means that the estimates in columns (1) and (2) suffer from omitted variable bias, as expected, given the joint correlation of cooperative characteristics with certification and the outcome variables. More surprising may be the direction of the bias. For cocoa yield and prices, the effects increase after controlling for cooperative characteristics. Interpreting the IV estimates, the yield gain increases from 70 kg/ha (14%) in column (2) to 101 kg/ha (20%) in column (4). This implies that farmers in cooperatives with less favorable initial conditions (physical capital, leadership education, service providers, etc.) actually benefit more from certification than farmers in cooperatives with more favorable initial conditions. One could have expected the opposite, namely that farmers in better-endowed cooperatives would benefit over-proportionally from certification. However, our results are not implausible: better-endowed cooperatives are more beneficial for farmers with and without certification, but the net effect of certification seems to be larger in less-endowed cooperatives. This is a welcome finding from an equity perspective.

3.4. Robustness Checks

As mentioned above, several of the cooperatives that are Fairtrade certified are also certified under UTZ and/or Rainforest Alliance (RA) standards. In the analysis so far we have ignored such double and triple certification, so that it is not clear whether the observed effects are really due to Fairtrade alone. In order to test whether certification under one of the other standards changes the findings, we run alternative models in which we control for UTZ/RA through an additional dummy variable on top of the regular household-level and cooperative-level controls. These alternative estimates are shown in Table A8 in the Appendix, with the main results summarized in Table 5. UTZ and/or RA certification is not significant in any of the models, whereas the Fairtrade effects on all three outcome variables remain positive, significant, and in the same magnitude as in Table 4. We conclude that double or triple certification does not change our findings concerning the effects of Fairtrade.

[Table 5 around here.]

4. Conclusion

In this article, we have analyzed whether Fairtrade certification has beneficial effects on smallholder farmers also when controlling for cooperative characteristics. Most of the certification for sustainability standards in the small farm sector happens through cooperatives or other types of farmer groups. Cooperatives differ in terms of their size, structure, human and physical capital endowment, and other institutional characteristics. These cooperative characteristics may influence farm productivity and income with and without certification. At the same time, they may also determine whether or not a cooperative is certified. Hence, not controlling for cooperative characteristics may lead to omitted variable bias when analyzing the net effects of certification. Previous research on the effects of Fairtrade and other sustainability

standards could hardly control for cooperative characteristics. Even when using a large number of farm observations, existing studies had typically sampled these observations from only a small number of purposively selected cooperatives. We have added to the literature by proposing and using a more suitable sampling design. In particular, we randomly sampled farmers from a large number of randomly selected cooperatives. This approach has two advantages. First, it allows controlling for cooperative characteristics in the estimated impact models. Second, due to the large institutional heterogeneity that our data capture, external validity is increased. In other words, we can rule out that our results are driven by the peculiarities of a small number of cooperatives.

The empirical research has focused on the cocoa sector in Cote d'Ivoire, where large numbers of Fairtrade certified and non-certified cooperatives exist in the same regions. Regression models have shown that Fairtrade certification contributes to higher cocoa yields, higher cocoa prices, and higher household living standards (measured in terms of per capita consumption expenditures). The estimated benefits for farmers remain positive and significant also after controlling for cooperative characteristics. However, the magnitude of the effects differs with and without controlling for cooperative characteristics, confirming that estimates that do not account for institutional heterogeneity suffer from omitted variable bias.

Interesting is also the direction of the bias. Better-endowed cooperatives are more beneficial for member farmers than less-endowed cooperatives, which is true independent of certification. But better-endowed cooperatives are also more likely to be certified, which might mean that the benefits of certification might be overestimated when not controlling for cooperative characteristics. However, we find bias in the opposite direction, that is, the estimated effects of certification increase after controlling for cooperative characteristics. This is especially true for cocoa yield, where the effect of Fairtrade certification increases from 14% to 20% after

controlling for cooperative characteristics. This unexpected effect can be explained by farmers in less-endowed cooperatives benefiting more from certification than farmers in better-endowed cooperatives, which is good news from an equity perspective and is actually quite plausible in the local context. Better-endowed cooperatives can offer more beneficial services to their members – such as input provision and training – also when not being Fairtrade certified. Hence, the additional effect of certification is smaller than in less-endowed cooperatives where an increase in service provision is possible only through the Fairtrade premium, the better prices in Fairtrade markets, and certification-related organizational support.

The result on the direction of bias may be specific to Cote d'Ivoire and should not be generalized. But the finding that cooperatives and their institutional characteristics matter, and that institutional heterogeneity deserves more explicit focus in future research on the effects of sustainability standards in the small farm sector, is certainly true also beyond the concrete study setting. Improved sampling frameworks – such as suggested here – should be used for data collection to facilitate disentangling certification effects from cooperative effects.

In closing, we mention two limitations of our study that could be addressed in follow-up research. First, while we have controlled for cooperative characteristics, we have not analyzed in more detail what particular cooperative characteristics matter most for the size and distribution of certification benefits. This could be a useful extension to better understand under what institutional conditions sustainability standards are most successful in terms of meeting their socioeconomic and environmental objectives. Second, cooperative characteristics influence the benefits of certification, but – on the other hand – they may also be influenced by certification. For instance, certification may lead to capital accumulation and to a higher intensity of cooperative services. While we tried to measure cooperative characteristics in a way that reduces issues of reverse causality, we cannot rule out completely that some level of endogeneity

remains. Noteworthy in this connection is that – if some of the benefits of certification were channeled through changes in the variables that we used for measuring cooperative characteristics – the estimated effects of certification should decrease after controlling for cooperative characteristics. In our models, the opposite is true, namely the effects increase after controlling for cooperative characteristics. This is not a proof that issues of reverse causality do not exist, but it clearly suggests that any related bias would unlikely overturn the finding that Fairtrade certification benefits farmers also after controlling for cooperative effects. Dealing with endogeneity more rigorously would require panel data with observations of farm, household, and cooperative characteristics before and after certification.

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Figures and Tables

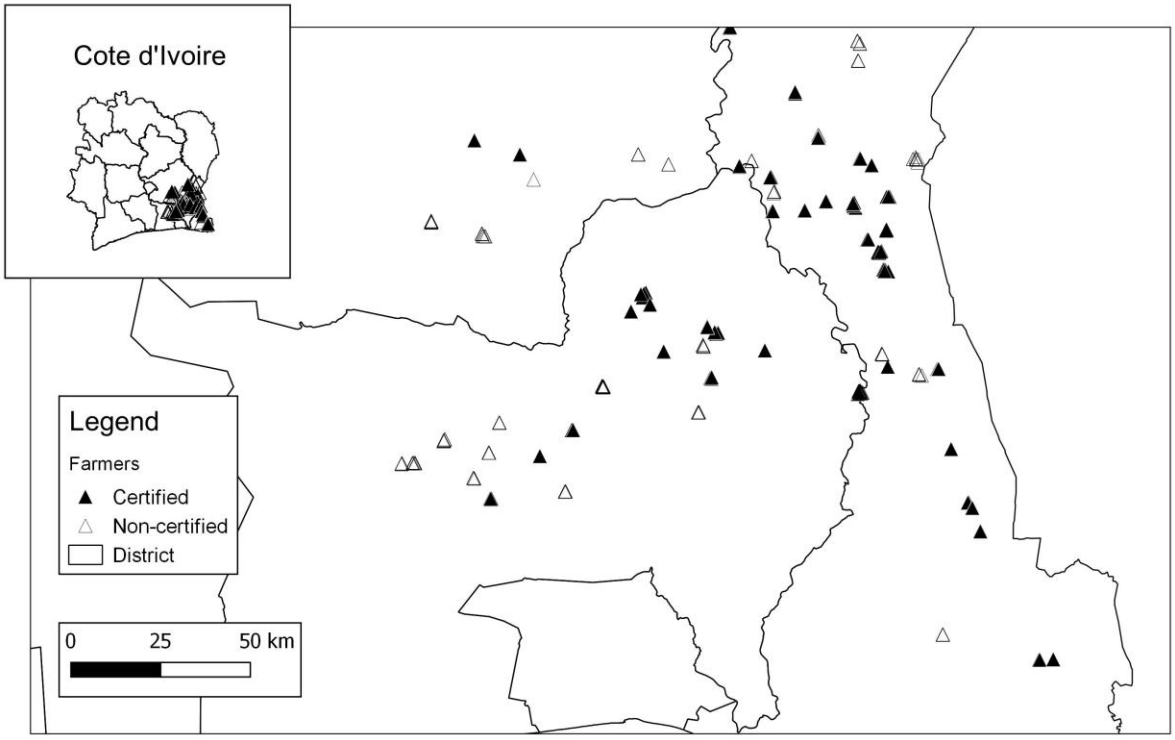

Figure 1. Geographical distribution of sampled farmers by certification status

Table 1. Descriptive Statistics for Outcome Variables and Poverty Incidence by Certification Status

	(1) Full sample	(2) Certified	(3) Non-certified	(4) Mean difference
Cocoa yield (kg/ha)	540.31	573.58	507.03	66.55***
	(250.36)	(265.70)	(229.76)	(0.00)
Cocoa price (CFA/kg)	715.83	728.06	703.20	24.86***
	(51.23)	(65.37)	(24.82)	(0.00)
Consumption expenditure (CFA/capita)	1074.64	1173.04	976.24	196.80**
	(901.43)	(974.47)	(812.03)	(0.01)
Below poverty line (1/0)	0.45	0.37	0.52	-0.15***
	(0.50)	(0.48)	(0.50)	(0.00)
Observations	500	250	250	500

Note: Mean values are shown with standard deviations in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01

Table 2. Descriptive Statistics for Cooperative Characteristics by Certification Status

	(1) Full sample	(2) Certified	(3) Non-certified	(4) Mean diff.
Age of the coop (yrs.)	7.70	9.48	5.92	3.56**
	(5.04)	(4.55)	(4.97)	(0.01)
Coop members before certification (number)	420.12	511.28	328.96	182.32
	(399.42)	(533.55)	(154.04)	(0.11)
Share of decisions made democratically	0.39	0.41	0.37	0.04
	(0.15)	(0.16)	(0.13)	(0.36)
Education of coop leader (yrs.)	14.34	15.60	13.08	2.52***
	(3.13)	(2.78)	(2.98)	(0.00)
Service providers for inputs, training etc. (number)	1.56	2.24	0.88	1.36***
	(1.49)	(1.45)	(1.20)	(0.00)
Coop vehicles (number)	5.00	8.48	1.52	6.96***
	(6.03)	(6.85)	(1.48)	(0.00)
Observations	50	25	25	50

Note: Mean values are shown with standard deviations in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3. Correlation between Cooperative Characteristics, Certification Status, and Outcome Variables

Cooperative characteristics	(1) Certified [a]	(2) Yield	(3) Price	(4) Expenditure
Age of the coop (yrs.)	0.421***	0.052	0.348***	-0.047
	(0.002)	(0.245)	(0.000)	(0.299)
Coop members before certification (number)	0.115	-0.107**	-0.050	-0.090**
	(0.426)	(0.016)	(0.270)	(0.045)
Share of decisions made democratically	0.227	-0.026	0.270***	0.137***
	(0.113)	(0.555)	(0.000)	(0.002)
Education of coop leader (yrs.)	0.445***	-0.002	0.120***	0.139***
	(0.001)	(0.972)	(0.008)	(0.002)
Service providers for inputs, training etc. (number)	0.517***	0.012	0.428***	0.168***
	(0.000)	(0.796)	(0.000)	(0.000)
Coop vehicles (number)	0.673***	0.066	0.459***	0.133***
	(0.000)	(0.142)	(0.000)	(0.003)
Observations	50	500	490	500

Note: Spearman's correlation coefficients are shown with *p*-values in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
[a] Correlations in this column calculated at the cooperative level.

Table 4. Effect of Fairtrade Certification Outcome Variables

Outcome variables	Not controlling for cooperative characteristics		Controlling for cooperative characteristics	
	(1) OLS	(2) IV	(3) OLS	(4) IV
Cocoa yield (kg/ha)	63.32**	69.60**	97.92**	100.98**
	(27.20)	(35.27)	(36.89)	(48.24)
Cocoa price (CFA/kg)	21.39***	21.92***	23.90***	24.36***
	(4.71)	(6.12)	(4.04)	(4.01)
Per capita consumption expenditure (log)	0.14*	0.17*	0.13*	0.12
	(0.08)	(0.09)	(0.07)	(0.10)
Household controls included	Yes	Yes	Yes	Yes
Cooperative controls included	No	No	Yes	Yes

Note: Coefficient estimates for the effect of Fairtrade certification (1/0) are shown with cluster robust standard errors in parentheses. Separate models were estimated for each of the three outcome variables. Yield and per capita consumption expenditure models were estimated with 500 observations; price models were estimated with 490 observations. Full model results are shown in Tables A4-A6 in the Appendix.
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5. Effects of Fairtrade Certification on Outcome Variables Controlling for Other Standards

	Cocoa yield (kg/ha)		Cocoa price (CFA/kg)		Per capita consumption expenditure (log)	
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
Fairtrade certified (1/0)	111.35**	109.29**	23.54***	24.21***	0.17*	0.14
	(42.98)	(54.65)	(4.25)	(4.82)	(0.09)	(0.11)
UTZ and/or RA certified (1/0)	-38.39	-37.27	1.03	0.67	-0.10	-0.09
	(54.56)	(54.44)	(5.65)	(6.55)	(0.13)	(0.13)
Household controls included	Yes	Yes	Yes	Yes	Yes	Yes
Cooperative controls included	Yes	Yes	Yes	Yes	Yes	Yes
Observations	500	500	490	490	500	500

Note: Coefficient estimates are shown with cluster robust standard errors in parentheses. Full model results are shown in Table A8 in the Appendix. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Table A1. Agroecological Characteristics by District

	(1) Comoe	(2) Lacs	(3) Lagunes
Annual mean temperature (°C)	26.54	26.65	26.65
	(0.17)	(0.12)	(0.12)
Mean temperature of wettest quarter (°C)	26.99	27.19	27.19
	(0.28)	(0.13)	(0.12)
Mean temperature of driest quarter (°C)	27.03	27.10	27.15
	(0.18)	(0.10)	(0.11)
Annual precipitation (mm)	1,390.17	1,118.38	1,328.78
	(167.89)	(30.97)	(39.17)
Precipitation of wettest quarter (mm)	582.58	475.30	572.75
	(85.84)	(11.21)	(21.09)
Precipitation of driest quarter (mm)	100.48	70.95	96.59
	(25.31)	(4.29)	(6.21)
Good soil (1/0)	0.81	0.72	0.73
	(0.39)	(0.45)	(0.45)
Steep terrain (1/0)	0.37	0.45	0.46
	(0.48)	(0.50)	(0.50)
Observations	260	40	200

Notes: Mean values are shown with standard deviations in parentheses. Temperature and precipitation data were obtained from WorldClim (Fick, S.E., & Hijmans, R.J. (2017). WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. *International Journal of Climatology*, *37*(12), 4302–4315) and matched with the GPS coordinates of the sample farmers. These variables represent historical averages for the years 1970-2000.

Table A2. First-Stage IV Regression and Instrument Falsification Tests

	(1) First-stage IV certification (1/0)	(2) Yield	(3) Price	(4) Expenditure (log)
Phone operator of coop leader (1= Orange)	0.06**	-8.10	0.19	-0.12
	(0.03)	(47.21)	(2.26)	(0.11)
Share of certified farmers (5 km radius)	0.83***	37.13	3.06	0.09
	(0.03)	(87.85)	(8.15)	(0.30)
Land owned 10 yrs. ago (ha)	0.00	-0.15	-0.25	0.02***
	(0.00)	(1.11)	(0.21)	(0.00)
Household size	0.00	2.79	-0.08	-0.06***
	(0.00)	(2.28)	(0.29)	(0.01)
Age	-0.00*	0.47	-0.10*	0.00*
	(0.00)	(1.10)	(0.06)	(0.00)
Female (1/0)	0.13***	18.21	-7.63	0.28
	(0.04)	(51.85)	(5.56)	(0.16)
Education (yrs.)	-0.00	-6.39**	-0.24	0.02**
	(0.00)	(2.67)	(0.34)	(0.01)
Risk aversion (1-10)	-0.01**	10.11	0.95	0.00
	(0.00)	(7.33)	(0.95)	(0.02)
Trust on people (1-4)	-0.00	5.78	-3.90	0.00
	(0.01)	(15.89)	(2.93)	(0.04)
Distance to road (km.)	-0.00*	1.23	-0.09	-0.01
	(0.00)	(1.16)	(0.10)	(0.00)
Akan ethnicity (1/0)	-0.02	-29.04	5.07*	-0.03
	(0.03)	(45.99)	(2.61)	(0.12)
Cocoa experience (yrs.)	0.00	0.71***	0.01	-0.00**
	(0.00)	(0.10)	(0.01)	(0.00)
Age cocoa trees (yrs.)	-0.00*	1.18	-0.14	-0.00
	(0.00)	(1.14)	(0.09)	(0.00)
Good soil (1/0)	0.04*	60.95	-0.41	0.01
	(0.02)	(36.84)	(2.40)	(0.07)
Distance to water sources (km)	0.00	0.87	-0.18	0.00*
	(0.00)	(1.37)	(0.11)	(0.00)
Lacs district (1/0)	-0.04	167.64**	9.90*	-0.40*
	(0.04)	(63.64)	(5.40)	(0.21)
Lagunes district (1/0)	-0.03	66.70*	-9.36***	-0.44***
	(0.03)	(35.43)	(3.21)	(0.11)
Age of the coop (yrs.)	0.01***	-2.36	0.71**	-0.03***
	(0.00)	(4.27)	(0.28)	(0.01)
Coop members before certification (number)	0.00***	-0.05	-0.00	-0.00
	(0.00)	(0.09)	(0.01)	(0.00)
Share of decisions made democratically	0.02	-138.36	24.99**	-0.33
	(0.08)	(123.13)	(11.64)	(0.30)
Education of coop. leader (yrs.)	0.00	0.91	-0.72*	0.02
	(0.00)	(6.09)	(0.36)	(0.02)
Service providers for inputs, training etc. (number)	0.01	-38.31**	0.24	0.12***
	(0.01)	(15.70)	(1.26)	(0.03)
Coop vehicles (number)	0.01***	37.41***	1.66*	0.01
	(0.00)	(11.40)	(0.91)	(0.02)
Constant	-0.07	326.38**	714.87***	6.96***
	(0.10)	(120.03)	(12.69)	(0.30)
Wald test on instruments. F-stat	388.75***	0.12	0.07	0.67
Observations	500	250	241	250

Note: Clustered standard errors are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A3. Possible Effects of Instruments on Other Sources of Welfare

	(1) Distance to secondary school	(2) Distance to tarmac road	(3) Annual precipitation
Phone operator of coop leader (1= Orange)	-1.54	-4.24	-66.22
	(2.16)	(4.12)	(39.84)
Share of certified farmers (5 km radius)	-3.63	4.10	-3.75
	(2.88)	(4.72)	(46.41)
Land owned 10 yrs. ago (ha)	-0.10***	0.10**	0.54
	(0.03)	(0.05)	(0.55)
Household size	0.06	-0.12	-2.83**
	(0.12)	(0.19)	(1.34)
Age	-0.01	-0.06	-0.38
	(0.05)	(0.06)	(0.51)
Female (1/0)	-1.24	-0.54	-25.55
	(1.80)	(3.07)	(20.27)
Education (yrs.)	0.14	-0.13	-3.40*
	(0.12)	(0.13)	(1.85)
Risk aversion (1-10)	0.12	-0.12	1.65
	(0.21)	(0.30)	(1.85)
Trust on people (1-4)	0.43	0.50	7.65
	(0.46)	(0.67)	(5.95)
Distance to road (km)	0.16*		1.99*
	(0.09)		(1.16)
Akan ethnicity (1/0)	0.25	-0.62	9.46
	(1.31)	(2.20)	(12.95)
Cocoa experience (yrs.)	0.03***	-0.01	-0.06
	(0.00)	(0.01)	(0.05)
Age cocoa trees (yrs.)	-0.03	0.08	-0.56
	(0.03)	(0.06)	(0.47)
Good soil (1/0)	-0.06	0.20	9.38
	(0.96)	(1.73)	(13.88)
Distance to water source (km)	0.01	0.03	-0.43
	(0.03)	(0.04)	(0.35)
Lacs district (1/0)	-2.38	-16.58***	-268.14***
	(3.92)	(4.23)	(42.31)
Lagunes district (1/0)	1.03	-10.32**	-57.65
	(2.22)	(4.69)	(37.05)
Age of the coop (yrs.)	0.16	-0.33	-2.60
	(0.19)	(0.34)	(3.13)
Coop members before certification (number)	0.00	0.01	-0.01
	(0.00)	(0.00)	(0.03)
Share of decisions made democratically	3.92	11.07	-49.62
	(6.88)	(15.18)	(166.87)
Education of coop leader (yrs.)	-0.53	-0.61	-1.26
	(0.41)	(0.74)	(6.22)
Service providers for inputs, training etc. (number)	-1.08	0.76	-12.10
	(1.00)	(1.70)	(13.38)
Coop vehicles (number)	0.21	-0.25	1.62
	(0.21)	(0.41)	(3.77)
Constant	13.57*	28.20**	1513.86***
	(7.39)	(13.39)	(129.99)
Wald test on instruments. F-stat	1.21	1.03	1.44
Observations	500	500	500

Note: Clustered standard errors are shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table A4. Effects of Fairtrade Certification on Cocoa Yield (kg/ha)

	(1) OLS	(2) IV	(3) OLS	(4) IV
Certified (1/0)	63.32**	69.60**	97.92**	100.98**
	(27.20)	(35.27)	(36.89)	(48.24)
Land owned 10 yrs. ago (ha)	1.06	1.06	0.89	0.89
	(1.78)	(1.73)	(1.76)	(1.70)
Household size	1.62	1.58	1.25	1.23
	(1.97)	(1.95)	(1.95)	(1.92)
Age of household head (yrs.)	-1.61*	-1.62*	-1.39	-1.38
	(0.93)	(0.91)	(0.96)	(0.92)
Female household head (1/0)	31.64	31.00	25.12	24.81
	(45.58)	(44.79)	(46.49)	(45.38)
Education of household head (yrs.)	-0.89	-0.91	-0.92	-0.92
	(2.71)	(2.64)	(2.73)	(2.65)
Risk aversion (1-10)	7.59	7.69	8.18	8.22
	(5.11)	(5.07)	(5.12)	(5.03)
Trust on people (1-4)	15.26	15.08	14.14	14.04
	(12.84)	(12.61)	(13.06)	(12.74)
Distance to road (km)	1.16	1.16	1.23	1.22
	(0.84)	(0.82)	(0.79)	(0.77)
Akan ethnicity (1/0)	-34.87	-35.35	-28.64	-28.52
	(22.76)	(22.19)	(22.50)	(21.85)
Cocoa experience (yrs.)	0.75***	0.75***	0.74***	0.74***
	(0.12)	(0.12)	(0.12)	(0.12)
Age cocoa trees (yrs.)	-0.89	-0.86	-0.73	-0.72
	(1.02)	(1.01)	(1.03)	(1.01)
Good soil (1/0)	89.19***	88.59***	83.98***	83.67***
	(27.76)	(26.99)	(26.26)	(25.38)
Distance to water source (km)	-0.01	-0.01	0.01	0.01
	(0.90)	(0.87)	(0.89)	(0.86)
Lacs district (1/0)	11.32	14.15	19.66	20.59
	(61.61)	(63.66)	(64.05)	(65.22)
Lagunes district (1/0)	30.66	32.67	36.53	37.10
	(24.55)	(24.21)	(28.91)	(27.63)
Age of the coop (yrs.)			1.73	1.70
			(3.13)	(3.04)
Coop members before certification (number)			-0.05	-0.05
			(0.04)	(0.04)
Share of decisions made democratically			34.56	34.46
			(103.25)	(100.05)
Education of coop leader (yrs.)			-3.34	-3.46
			(3.97)	(3.96)
Service providers for inputs, training etc. (number)			-8.42	-8.62
			(16.07)	(15.85)
Coop vehicles (number)			-1.42	-1.49
			(2.76)	(2.70)
Constant	413.69***	410.14***	443.28***	444.27***
	(72.60)	(72.38)	(88.48)	(85.32)
F-value	5.85***	5.88***	5.59***	5.43***
Wu-Hausman F-statistic. [a]		0.177		0.015
Kleibergen-Paap Wald F statistic [b]		207.836***		50.029***
Hansen J statistic. [c]		0.626		0.449
Observations	500	500	500	500

Note: Cluster robust standard errors shown in parentheses. First-stage results for the IV regressions are shown in Table A1 (column 1).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
[a] Test of endogeneity (H_0: certified variable is exogenous)
[b] Test for weak instruments (H_0: coefficients of instruments in first stage are not different from zero)
[c] Test of over-identifying restrictions (H_0: instruments are uncorrelated with the error term)

Table A5. Effects of Fairtrade Certification on Cocoa Price (CFA/kg)

	(1) OLS	(2) IV	(3) OLS	(4) IV
Certified (1/0)	21.39***	21.92***	23.90***	24.36***
	(4.71)	(6.12)	(4.04)	(4.01)
Land owned 10 yrs. ago (ha)	-0.20	-0.20	-0.19	-0.19
	(0.15)	(0.15)	(0.13)	(0.13)
Household size	0.19	0.19	0.16	0.16
	(0.32)	(0.31)	(0.30)	(0.28)
Age	0.05	0.05	0.03	0.03
	(0.17)	(0.17)	(0.16)	(0.15)
Female (1/0)	-5.24	-5.29	-6.92	-6.98*
	(4.93)	(4.85)	(4.26)	(4.20)
Education (yrs.)	0.68	0.68	0.52	0.52
	(0.46)	(0.45)	(0.43)	(0.41)
Risk aversion (1-10)	-0.08	-0.07	0.32	0.32
	(0.84)	(0.80)	(0.91)	(0.86)
Trust on people (1-4)	-6.80**	-6.82**	-7.06**	-7.08***
	(2.97)	(2.85)	(2.81)	(2.68)
Distance to road (km.)	-0.09	-0.09	-0.13	-0.13
	(0.14)	(0.14)	(0.11)	(0.10)
Akan ethnicity (1/0)	7.83	7.78	9.63	9.65
	(6.76)	(6.69)	(6.95)	(6.67)
Cocoa experience (yrs.)	-0.00	-0.00	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
Age cocoa trees (yrs.)	-0.26	-0.26	-0.22	-0.22
	(0.17)	(0.16)	(0.17)	(0.16)
Good soil (1/0)	9.09	9.04	7.42	7.38
	(6.50)	(6.48)	(5.47)	(5.49)
Distance to water source (km)	-0.19*	-0.19*	-0.27**	-0.27***
	(0.10)	(0.10)	(0.10)	(0.10)
Lacs district (1/0)	-3.13	-2.89	-4.22	-4.08
	(10.89)	(10.92)	(5.17)	(5.35)
Lagunes district (1/0)	-15.14**	-14.97**	-16.07**	-15.97**
	(6.78)	(7.08)	(6.42)	(6.45)
Age of the coop (yrs.)			0.93***	0.93***
			(0.27)	(0.26)
Coop members before certification (number)			-0.00	-0.00
			(0.00)	(0.00)
Share of decisions made democratically			34.80***	34.77***
			(10.75)	(10.50)
Education of coop leader (yrs.)			-1.73***	-1.75***
			(0.44)	(0.39)
Service providers for inputs, training etc. (number)			2.91**	2.88**
			(1.38)	(1.41)
Coop vehicles (number)			-0.80	-0.81
			(0.68)	(0.61)
Constant	717.64***	717.34***	723.14***	723.30***
	(18.16)	(17.20)	(16.67)	(16.76)
F-value	8.83***	11.13***	17.95***	22.81***
Wu-Hausman F-statistic [a]		0.030		0.008
Kleibergen-Paap Wald F statistic [b]		201.572***		49.019***
Hansen J statistic [c]		0.778		0.011
Observations	490	490	490	490

Note: Cluster robust standard errors shown in parentheses. First-stage results for the IV regressions are shown in Table A1 (column 1).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
[a] Test of endogeneity (H_0: certified variable is exogenous)
[b] Test for weak instruments (H_0: coefficients of instruments in first stage are not different from zero)
[c] Test of over-identifying restrictions (H_0: instruments are uncorrelated with the error term)

Table A6. Effects of Fairtrade Certification on Per Capita Consumption Expenditure (Log)

	(1) OLS	(2) IV	(3) OLS	(4) IV
Certified (1/0)	0.14*	0.17*	0.13*	0.12
	(0.08)	(0.09)	(0.07)	(0.10)
Land owned 10 yrs. ago (ha)	0.01**	0.01***	0.01**	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Household size	-0.08***	-0.08***	-0.07***	-0.07***
	(0.01)	(0.01)	(0.01)	(0.01)
Age	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Female (1/0)	0.25**	0.25***	0.27***	0.27***
	(0.09)	(0.09)	(0.09)	(0.09)
Education (yrs.)	0.02***	0.02***	0.02***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)
Risk aversion (1-10)	0.01	0.01	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Trust on people (1-4)	-0.00	-0.00	-0.00	-0.00
	(0.03)	(0.03)	(0.03)	(0.03)
Distance to road (km.)	-0.01**	-0.01**	-0.01**	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Akan ethnicity (1/0)	-0.03	-0.04	-0.04	-0.04
	(0.07)	(0.07)	(0.07)	(0.07)
Cocoa experience (yrs.)	-0.00**	-0.00**	-0.00**	-0.00***
	(0.00)	(0.00)	(0.00)	(0.00)
Age cocoa trees (yrs.)	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Good soil (1/0)	-0.17**	-0.17***	-0.14**	-0.14**
	(0.06)	(0.06)	(0.06)	(0.06)
Distance to water source (km)	0.00	0.00*	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Lacs district (1/0)	-0.13	-0.12	-0.11	-0.11
	(0.13)	(0.13)	(0.15)	(0.14)
Lagunes district (1/0)	-0.37***	-0.36***	-0.33***	-0.33***
	(0.09)	(0.09)	(0.07)	(0.07)
Age of the coop (yrs.)			-0.02***	-0.02***
			(0.01)	(0.01)
Coop members before certification (number)			-0.00	-0.00
			(0.00)	(0.00)
Share of decisions made democratically			-0.09	-0.09
			(0.28)	(0.27)
Education of coop leader (yrs.)			0.01	0.01
			(0.01)	(0.01)
Service providers for inputs, training etc. (number)			0.05*	0.05*
			(0.03)	(0.03)
Coop vehicles (number)			0.00	0.00
			(0.01)	(0.01)
Constant	7.14***	7.13***	7.08***	7.08***
	(0.18)	(0.18)	(0.25)	(0.24)
F-value	15.27***	14.95***	15.03***	14.78***
Wu-Hausman F-statistic [a]		7.8e-06		0.037
Kleibergen-Paap Wald F statistic [b]		207.836***		50.029***
Hansen J statistic. [c]		0.063		0.007
Observations	500	500	500	500

Note: Cluster robust standard errors shown in parentheses. First-stage results for the IV regressions are shown in Table A1 (column 1).
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$
[a] Test of endogeneity (H_0: certified variable is exogenous)
[b] Test for weak instruments (H_0: coefficients of instruments in first stage are not different from zero)
[c] Test of over-identifying restrictions (H_0: instruments are uncorrelated with the error term)

Table A7. Descriptive Statistics for Household Characteristics by Certification Status

	(1) Full sample	(2) Certified	(3) Non-certified	(4) Mean diff.
Age of household head (yrs.)	49.51	49.67	49.34	0.33
	(10.90)	(10.56)	(11.24)	(0.73)
Education of household head (yrs.)	6.11	5.87	6.34	-0.48
	(4.90)	(4.82)	(4.98)	(0.28)
Female household head (1/0)	0.06	0.08	0.04	0.04*
	(0.24)	(0.27)	(0.21)	(0.10)
Household size	7.13	7.31	6.94	0.36
	(3.92)	(3.85)	(3.99)	(0.30)
Akan ethnicity (1/0)	0.70	0.68	0.72	0.04
	(0.46)	(0.47)	(0.45)	(0.28)
Risk aversion (1-10)	18.79	5.99	6.28	-0.29
	(12.79)	(2.31)	(2.36)	(0.17)
Trust on people (1-4)	6.13	2.35	2.25	0.10
	(2.34)	(0.79)	(0.83)	(0.17)
Off-farm employment (1/0)	2.57	0.39	0.33	0.06
	(0.87)	(0.49)	(0.47)	(0.14)
Access to credit (1/0)	0.36	0.82	0.78	0.04
	(0.48)	(0.38)	(0.42)	(0.22)
Distance to road (km)	0.80	16.56	13.27	3.28**
	(0.40)	(16.01)	(15.41)	(0.02)
Land owned (ha)	9.81	9.62	10.00	-0.38
	(10.12)	(11.29)	(8.82)	(0.67)
Land owned 10 yrs. ago (ha)	8.76	8.80	8.72	0.08
	(10.82)	(12.17)	(9.29)	(0.93)
Land under cocoa (ha)	4.95	5.35	4.56	0.79*
	(4.55)	(5.63)	(3.10)	(0.05)
Age cocoa trees (yrs.)	20.32	19.79	20.85	-1.06
	(10.64)	(10.79)	(10.47)	(0.26)
Distance to water source (walking min.)	10.00	9.46	10.55	-1.09
	(13.75)	(12.41)	(14.97)	(0.37)
Good soil (1/0)	0.77	0.82	0.73	0.09**
	(0.42)	(0.39)	(0.45)	(0.02)
Soil steep (1/0)	0.41	0.38	0.44	-0.05
	(0.49)	(0.49)	(0.50)	(0.24)
Observations	500	250	250	500

Note: Mean values are shown with standard deviations in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01

Table A8. Effects of Fairtrade Certification on Outcome Variables Controlling for Other Standards

	Cocoa yield (kg/ha)		Cocoa price (CFA/kg)		Per capita expenditure (log)	
	OLS	IV	OLS	IV	OLS	IV
Fairtrade certified (1/0)	111.35**	109.29**	23.54***	24.21***	0.17*	0.17*
	(42.98)	(54.65)	(4.25)	(4.82)	(0.09)	(0.09)
UTZ and/or RA certified	-38.39	-37.27	1.03	0.67	-0.10	-0.10
	(54.56)	(54.44)	(5.65)	(6.55)	(0.13)	(0.13)
Land owned 10 yrs. ago (ha)	0.88	0.89	-0.19	-0.19	0.01**	0.01**
	(1.74)	(1.68)	(0.13)	(0.13)	(0.00)	(0.00)
Household size	1.33	1.34	0.16	0.15	-0.07***	-0.07***
	(1.99)	(1.94)	(0.30)	(0.28)	(0.01)	(0.01)
Age	-1.49	-1.49	0.04	0.04	0.00	0.00
	(0.99)	(0.95)	(0.17)	(0.16)	(0.00)	(0.00)
Female (1/0)	25.58	25.74	-6.93	-6.99*	0.27***	0.27***
	(46.42)	(45.32)	(4.26)	(4.16)	(0.09)	(0.09)
Education (yrs.)	-0.99	-0.99	0.52	0.52	0.02***	0.02***
	(2.71)	(2.62)	(0.43)	(0.42)	(0.01)	(0.01)
Risk aversion (1-10)	8.06	8.05	0.32	0.33	0.01	0.01
	(5.04)	(4.90)	(0.91)	(0.87)	(0.01)	(0.01)
Trust on people (1-4)	13.44	13.52	-7.04**	-7.07***	-0.01	-0.01
	(13.09)	(12.80)	(2.82)	(2.68)	(0.03)	(0.03)
Distance to road (km.)	1.17	1.17	-0.13	-0.13	-0.01**	-0.01**
	(0.78)	(0.76)	(0.11)	(0.11)	(0.00)	(0.00)
Akan ethnicity (1/0)	-28.51	-28.57	9.63	9.65	-0.04	-0.04
	(22.89)	(22.26)	(6.95)	(6.67)	(0.07)	(0.07)
Cocoa experience (yrs.)	0.74***	0.74***	0.00	0.00	-0.00**	-0.00**
	(0.13)	(0.12)	(0.01)	(0.01)	(0.00)	(0.00)
Age cocoa trees (yrs.)	-0.74	-0.74	-0.22	-0.22	0.00	0.00
	(1.02)	(1.00)	(0.17)	(0.16)	(0.00)	(0.00)
Good soil (1/0)	83.18***	83.37***	7.44	7.38	-0.14**	-0.14**
	(26.48)	(25.49)	(5.49)	(5.51)	(0.07)	(0.07)
Distance to water source (km)	-0.00	-0.00	-0.27**	-0.27***	0.00	0.00
	(0.89)	(0.86)	(0.10)	(0.10)	(0.00)	(0.00)
Lacs district (1/0)	8.74	8.56	-3.93	-3.86	-0.14	-0.14
	(64.75)	(62.99)	(5.38)	(5.29)	(0.15)	(0.15)
Lagunes district (1/0)	35.13	34.86	-16.03**	-15.93**	-0.33***	-0.33***
	(29.16)	(28.18)	(6.43)	(6.40)	(0.08)	(0.08)
Cooperative controls	Yes	Yes	Yes	Yes	Yes	Yes
Constant	447.03***	446.39***	723.04***	723.27***	7.09***	7.09***
	(87.49)	(84.31)	(16.99)	(16.98)	(0.25)	(0.25)
F-value	5.58***	5.09***	17.64***	21.95***	15.68***	15.68***
Observations	500	500	490	490	500	500

Note: Cluster robust standard errors shown in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$