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Private Sustainability Standards and Child Schooling in the African Coffee Sector

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Abstract

Private sustainability standards are spreading rapidly in global value chains, especially in the coffee sector, and commonly aim at promoting environmental, economic and social sustainability. The social sustainability component is often overlooked in studies on the impact of private standards. In this paper, we investigate a particular social outcome and analyse how adoption of private sustainability standards affects the welfare of children in coffee-producing farm-households in Ethiopia and Uganda. We specifically analyse school enrolment and schooling efficiency of primary and secondary school-aged children. We find that participation in Fairtrade certification schemes increases the likelihood of children to be enrolled in secondary school and improves their schooling efficiency, although it is not associated with higher incomes nor with a reduced child labour time in the farm-household. We find that participation in Rainforest Alliance certification schemes has no effect on schooling outcomes of boys and slightly reduces the schooling of girls, while it does correlate with higher incomes and a reduced workload of children. Results suggest that effects on schooling emerge through social capital and awareness-raising about the importance of schooling among Fairtrade certified households, rather than from the mere prohibition of child labour and the enforcement of a child-labour-free production process.

Key words: Sustainability standards, private standards, social impact, child schooling, coffee, Africa

1. Introduction

Private Sustainability Standards (PSS) have expanded rapidly over the past two decades and, given the attention to increasing the share of cropland under 'sustainable agriculture' in the Sustainable Development Goals (target 2.4 in SDG 2), are likely to continue to proliferate (Maertens, 2019). Coffee is the most certified tropical commodity, with between 26% and 45% of the global cultivated area certified to one or multiple PSS and with Fairtrade, Organic, 4C, Utz and Rainforest Alliance being the main PSS (Lernoud *et al*, 2018). PSS transmit information regarding food safety, ethical and environmental aspects of food production, processing and trade between producers and consumers in global food supply chains (Holzapfel & Wollni, 2014). PSS make promises to consumers in high-income countries about their economic, social and environmental impacts. There is a growing body of empirical literature investigating economic effects, including productivity, income and poverty effects, of smallholder adoption of PSS – as reviewed by Oya *et al* (2018) and Bray & Neilson (2017) – and ecological effects – as reviewed by DeFries *et al* (2017). Various economic and ecological impact studies focus on coffee in particular (e.g. Akoyi & Maertens, 2017; Bolwig, 2009; Chiputwa *et al*. 2015; Dragussanu et al, 2014; Jena & Grote, 2017; Meemken *et al* (2019); Mendez *et al*, 2010; Mitiku *et al*, 2017 & 2018; Vanderhaegen *et al*, 2018; Van Rijsbergen *et al*, 2016). Yet, studies on the social implications of PSS are scantier, especially for Africa. In this paper, we investigate a particular social outcome and analyse how adoption of PSS affects child schooling in smallholder coffee-producing households in Ethiopia and Uganda.

The rather scarce empirical literature on social and ethical aspects of PSS, focuses on how PSS contribute to gender equality and women's empowerment (Chiputwa & Qaim, 2016; Krumbiegel *et al*, 2019; Meemken & Qaim, 2018), to workers' empowerment (Schuster & Maertens, 2017 & 2016), to food security and nutrition (Chiputwa & Qaim, 2016; Meemken *et al*, 2017), and to child labour and schooling (Arnould *et al.*, 2009; Becchetti *et al.*, 2013; Gitter *et al.*, 2012; Meemken *et al*, 2017; Mendez *et al*, 2010). Among the latter studies only one focuses on Africa (Meemken *et al*, 2017). Yet, particularly in Sub-Saharan Africa (SSA) school enrolment remains low and child labour problematic; 58% of children out of school and 28% of child labourers are from SSA (ILO, 2015; UN, 2015;

UNICEF, 2016). Most PSS impact studies focus on a single standard in a specific case-study region. Most studies on child labour and schooling focus exclusively on Fairtrade (FT) and point to positive effects of smallholder FT-certification on child schooling[1]. An exception is the study by Meemken *et al* (2017) who apply a more comparative approach and find that FT certification does improve child schooling among smallholder coffee farmers in Uganda while Organic (Org) certification does not. We further advance such comparative evidence on the child schooling outcomes of PSS by combining data from a broader range of PSS and from two different countries in SSA. Our study includes the two main SSA coffee exporters, Ethiopia and Uganda, for whom coffee is the single most important source of foreign exchange earnings (Minten, *et al*, 2014; UCDA, 2014), and covers the five most important PSS in the coffee sector, including Fairtrade, Organic, Rainforest Alliance, Utz and 4C, in single, double or triple certification schemes. This comparative approach allows for nuanced findings and insights on the channels of effects. In examining how adoption of PSS affects child schooling, we distinguish between primary and secondary school-aged children, between boys and girls, and between school enrolment and schooling efficiency, which further contributes to nuanced findings. We use original cross-sectional household survey data and regression and propensity score matching (PSM) techniques to estimate effects; and descriptive statistics and qualitative data from interviews with different stakeholders in the coffee supply chains to interpret estimated effects. The paper continues with a conceptual discussion in the next section, some background information and a description of the data in section three, an explanation of the econometric approach in section four, a discussion of the results in section five, and a short conclusion in section six.

2. Conceptual discussion

Improving child school enrolment and performance requires attention to both the supply side of schooling – referring to school infrastructure, teachers and school materials – and parents' demand for child schooling (Handa, 2002; Maertens and Verhofstadt, 2013). Demand for schooling is determined by household income levels and intra-household control over income, parental education and occupation, and the return to child labour or opportunity cost of schooling (Chakrabarty & Grote,

[1] Except Mendez *et al* (2010) who find no differences in the percentage of school-going children between

2009; Chakrabarty, *et al*, 2011; Gitter & Barham, 2008; Handa, 2004; Lancaster *et al*, 2006; Lincove, 2009; Maertens & Verhofstadt, 2013; Zhao and Glewwe, 2010; Edmonds, 2006). Also the health and nutrition status of the child, and his or her intelligence matter (Kremer, 2013; Langsten, 2017). The adoption of PSS among coffee-producing farm-households may affect child school enrolment and performance through different demand and supply side channels.

First, a common requirement in all main coffee PSS is the prohibition of child labour to guarantee a child-labour-free production process. This could increase the demand for schooling by reducing the return to child labour in coffee production and processing, and hence the opportunity cost of schooling (Edmonds, 2006). This is the reasoning that many PSS follow in prohibiting child labour: the eradication of child labour is not only a development goal in itself (target 8.7, SDG8 in the SDG framework) but is also instrumental for achieving other goals, such as inclusive education for all children (target 4.1, SDG 4). Yet, prohibiting child labour on coffee fields can result in labour reallocation to other productive and reproductive tasks in the farm-household, resulting in no or even adverse effects on schooling. Baland and Duprez (2009) argue that PSS are less effective against child labour because they result not only in replacing child labour by adult labour in export sectors where PSS prevail but also in replacing adult labour by child labour in domestic sectors. Various studies point to the importance of labour substitution effects in understanding child labour (Basu, 1999; Krueger, 2007; Gitter & Barham, 2007). In addition, PSS may include specifications of agricultural practices, such as the prohibition of chemical inputs in Organic coffee production or soil fertility management practices in Utz certification. This may change the labour intensity of coffee production, and interfere with household labour constraints. The effect may run in either direction, more or less intensive use of child labour, depending on whether the agricultural practices promoted or required by PSS are labour-saving or –intensive, with positive or negative implications for child schooling.

Second, most PSS intend to improve productivity and income levels of farmers, either through guaranteed prices or price premium, as in Fairtrade, Organic and Rainforest Alliance, or through improved agricultural practices and better yields, as in Utz and 4C. On the one hand, this may increase

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certified and non-certified farm-households in a purely descriptive analysis.

the demand for schooling and relax parents' constraints to pay school fees and costs. On the other hand, this also increases the return to (child) labour in coffee production and hence the opportunity cost of school enrolment and attendance, which would reduce schooling. Empirical studies mostly document a positive relation between household income (or asset possession and living standards) and child school enrolment (Gitter & Barham, 2008; Handa, 2004; Lincove, 2009; Zhao and Glewwe, 2010). Studies indicating a positive effect of FT-certification on child schooling argue that this mainly comes from a positive income effect (Arnould *et al.*, 2009; Becchetti *et al.*, 2013; Gitter *et al.*, 2012). Yet, empirical studies on PSS include very diverse findings on the income effect of coffee certification, with some studies pointing to substantial positive effects and others to only marginal, no or even negative effects (Bray & Neilson, 2017; Oya *et al*, 2018).

Third, PSS can affect child schooling through social capital, empowerment and awareness raising. Certification of smallholder farmers is mainly done in group certification schemes, either through the formation of new groups or through existing associations and cooperatives. Forming new groups or strengthening existing groups through certification may reinforce trust, reciprocity and networks among farm-households, and thereby increase their social capital (Coleman, 1988). As social capital has been argued to be important in stimulating the formation of human capital and child schooling (Coleman, 1988) – which has for example been demonstrated for Cameroon (Tabi Atemnkeng, 2011) – standards can contribute to child schooling through this channel. Standards such as FT is specifically committed to strengthening producer cooperatives and includes specifications on democracy, participation and transparency in cooperatives. Moreover, certification schemes may empower producers through trainings and awareness-raising (Novkovic & Power, 2005). FT especially, includes specifications on creating awareness among producers on the reasoning behind the child-labour-free condition – as well as on other issues such as biodiversity conservation and threatened species. Increased producer empowerment and increased awareness about the importance of child schooling may lead to a change in preferences for child education among farm-households, and an increased demand for schooling. In addition, strengthened cooperative structures may give rise to social or cooperative initiatives, such as saving and lending services, that allow farm-households to

overcome cash and credit constraints. This can be important to smooth household consumption and reduce cash constraints for meeting school expenses, as observed by Beegle *et al* (2003) and Gitter and Barham (2007). An impact through this channel might be standard-specific as not all PSS focus on strengthening cooperatives, awareness raising and empowering producers to the same extent.

Fourth, PSS can affect the supply side of schooling. Some PSS, e.g. Utz and FT, include access to education in their mandate and refer to investment in school infrastructure as a social responsibility (Utz-certified, 2016; Fairtrade International, 2011). FT certification includes the payment of a social premium to certified cooperatives and requires a democratic decision-making process on how to spend this premium in the best interest of cooperative members and the whole community. Various studies point out that this social premium is often used to invest in education (Jena & Grote, 2016; Valkila & Nygren, 2010). These investment and supply side effects play at the larger community level and are not easily detectable in a comparative approach. In this paper we mainly focus on household-level and demand-side effects. The ultimate demand-side effect of PSS on child school enrolment and performance is ambiguous as it is the combination of a labour substitution effect, an income effect and an awareness effect, and hence, remains an empirical question.

3. Background and data

3.1 Coffee sectors and private sustainability standards

Ethiopia and Uganda are, respectively, the first and second most important producer and exporter of coffee in Africa, and respectively, fifth and tenth in the world. In both countries coffee accounts for about one fourth of foreign exchange earnings (Minten *et al.*, 2014; UCDA, 2016). In the period 1990 – 2016, coffee production in Ethiopia increased from 2.9 to 6.6 million bags (60kg bags), and in Uganda from 2 to 5 million bags (60kg bags) (ICO, 2017). Ethiopia has a rich coffee drinking culture and about 50% of the total coffee production is consumed domestically while for Uganda, with an entrenched tea drinking culture, this is less than 5% (ICO, 2017). While Ethiopia is the homeland of Arabica coffee and almost the entire coffee production is Arabica, Uganda is the origin of Robusta coffee and 80% of the coffee production is Robusta. In both countries, coffee is mainly (for over 90%)

produced by smallholder farmers with less than 2.5 ha of agricultural land (Francom & Tefera, 2016; ITC, 2012). Ethiopia counts four million smallholder coffee producer households, and Uganda 1.7 million. In both countries, a large share of smallholder coffee producers are organised in cooperatives or farmer organisations but independent smallholder coffee production is also common. Coffee production contributes substantially to total farm-household income – estimated at about 50% in both Ethiopia (Mitiku *et al*, 2017) and Uganda (Akoyi & Maertens, 2017). Along the whole value chain, coffee is estimated to provide a livelihood for about 21% of the Ugandan population and 25% of the Ethiopian population (MAAIF, 2015; Tefera & Tefera, 2014).

Table 1: The five main private coffee standards and their spread in Ethiopia and Uganda

	4C	Fairtrade	Organic	Utz	Rainforest Alliance
Year of establishment	2003	1988	1972	2002	1986
Prohibiting child labour	yes	yes	yes	yes	yes
Prohibiting use of inorganic inputs	no	no	yes	no	no
Strengthening smallholder cooperatives	no	yes	yes	no	no
Premium price or social premium	no	yes	yes	no	yes
Global					
Certified coffee area (ha)	1,826,825	1,297,206	881,982	567,336	387,265
Share of global coffee area	16.60%	13.50%	8.00%	5.16%	3.52%
Certified production volume (ton)	2,764,002	560,902	447,012	870,102	508,632
Share of global production volume	30.00%	6.09%	4.85%	9.44%	5.52%
Certified producers (#)	569,222	844,311	n.a.	226,424	222,850
Ethiopia					
Certified coffee area (ha)	11,655	207,975	159,850	22,677	40,900
Share of total coffee area in Ethiopia	1.66%	29.69%	22.82%	3.23%	5.83%
Rank in certified area among all countries	13th	2nd	2nd	11th	2nd
Certified production volume (ton)	6,333	18,025	85,650	13,488	15,166
Share of total production volume in Ethiopia	1.35%	3.84%	18.26%	2.88%	3.23%
Certified producers (#)	6	145,963	n.a.	3,628	18,270
Uganda					
Certified coffee area (ha)	27,397	64,369	59,000	24,173	9,362
Share of total coffee area in Uganda	7.14%	16.78%	15.38%	6.30%	2.44%
Rank in certified area among all countries	9th	7th	6th	10th	14th
Certified production volume (ton)	8,946	4,755	25,050	15,593	9,469
Share of total production volume in Uganda	4.29%	2.28%	12.02%	7.48%	4.54%
Certified producers (#)	26,811	44,692	n.a.	49,236	27,589

Source: Authors' derivation from various sources; *Notes*: Figures on certified area, production and producers for the different standards are for 2016 and are derived from Lernoud, *et al* (2018). Shares of total area and total production volume, Ethiopia and Uganda coffee area and production are calculated using FAOstat figures (FAO, 2017). Information on the year of establishment and codes of conduct is derived from Fairtrade International (2017), Willer & Lernoud (2017), Global Coffee Platform - GCP (2017), Rainforest Alliance (2017) and Utz-certified (2017), n.a. = not available.

The five main coffee standards, FT, Org, 4C, Utz and Rainforest Alliance (RA), focus on various aspects of coffee production and trade but they all prohibit child labour on coffee fields and in coffee post-harvest handling activities and some (Utz, FT), even claim to support children to attend school. In Ethiopia, PSS are spreading rapidly in the coffee sector after their first emergence in 2002. Ethiopia ranks second in the world in terms of FT, Org and RA certified coffee area (Table 1). Utz and especially 4C certification are less common in Ethiopia, and the latter is oriented towards the few large-scale plantations in the country. In Uganda, PSS emerged in the 1990s already, starting with FT, and followed by Org early 2000s, then RA, Utz and 4C more recently. In both countries, FT covers the largest area – 17% and 30% of the coffee area in Uganda and Ethiopia, respectively – but Org is most important in terms of production volume.

3.2 Child education and schooling system

Huge progress has been made towards universal primary education (UPE) as part of the Millennium Development Goals (MDGs), including important progress in Ethiopia and Uganda. Between 2000 and 2014, the net primary school enrolment rate in Ethiopia increased from 53% to 89% (UNESCO, 2017) and in Uganda from 85% to 93% (World Bank, 2017). Both countries have thereby a net primary school enrolment rate that is above the SSA average of 80%. Yet, challenges remain. Primary school enrolment still falls short of universal primary education goals in both countries. Secondary school enrolment is generally low, about 31% net enrolment in Ethiopia and 24% in Uganda (UNESCO, 2017). In Ethiopia, 32% of school-aged children are still out of school and schooling efficiency is rather low with a large number of over-age enrolment, high repetition rates and large drop-out rates (UNESCO, 2017). In Uganda, only about 9% of school-aged children are out of school but the quality of education is questionable (EDC, 2017; Deininger, 2003; Nishumura et al, 2008).

The schooling system differs slightly across the two countries. A complete primary school education takes eight years, in two cycles of four years, in Ethiopia while it takes seven years in one cycle in Uganda. The age of entry into primary school is seven in Ethiopia and six in Uganda. A complete secondary school education takes four years, including two cycles of two years, in Ethiopia while this is six years, including a lower secondary cycle of four years and an upper one of two years,

in Uganda. Hence, a completely efficient primary plus secondary education runs from the age of seven to the age of 18 in Ethiopia and from the age of six to the age of 18 in Uganda. In Ethiopia school fees have been abandoned for primary and first cycle secondary education since 1994. In Uganda, primary school tuition was banned since 1997 and tuition for lower secondary school since 2007 but school materials must be purchased. In both countries the cost of books, uniforms and other scholastic materials are at the expense of the parents. In Uganda, private schools are more widespread, more popular and overall, more expensive, than public ones.

3.3 Data

We study the implications of coffee certification for schooling of children in coffee producing farm-households in two case-study regions. The first region is located in Kaffa and Jimma zones in Southwestern Ethiopia; the second is the Mount Elgon region in Eastern Uganda. In both regions, Arabica coffee is produced – the area around Mount Elgon is one of the few Arabica producing regions in Uganda. In both regions a FT coffee certification scheme and a RA coffee certification scheme are implemented. In Uganda, the FT scheme combines FT with Org certification and the RA scheme combines RA, 4C and Utz certification – with all farmers being either double or triple certified. In Ethiopia, the FT scheme combines FT certification partially with Org certification – with about half of the farmers being double certified and the other half being single FT certified – and the RA scheme is a single certification scheme.

We use original cross-sectional household survey data from the two regions, that were collected in 2014 using a structured quantitative questionnaire and a multi-stage stratified random sampling strategy. In Ethiopia, we first purposively selected four districts (*woredas*) in the adjacent Kaffa and Jimma zones, where *Coffea arabica* originates from and where the first certification schemes emerged in the early 2000s. We listed all coffee cooperatives in these districts and stratified them according to the different certification schemes, including FT, Org, double FT-Org, RA, and non-certified cooperatives. We randomly selected one certified cooperative in each district and one non-certified cooperative in all but one district in which we could not identify a non-certified coffee cooperative. Our sample includes seven cooperatives of which four are certified and three are not certified. Finally,

we randomly selected farmers from the cooperative membership lists. The final sample includes 454 coffee producing farm-households, of which 126 are FT certified, 81 are RA certified and 247 non-certified. In Uganda, the sampling design was developed using information from company databases of certified producers and village Local Council (LC) lists of coffee producers. In the first stage, the five most intensive coffee growing districts were purposively selected out of the seven rural districts in the Mount Elgon region. In the second stage, four or five sub-counties per district were selected in a stratified random way with the certification schemes as strata. In each district two or three sub-counties were selected with either FT or RA certification and two sub-counties without certification. In the third stage, we randomly selected two or three villages per sub-county and 10 coffee farmers in each village. The final sample includes 600 coffee producing farm-households, of which 170 are FT certified, 130 are RA certified and 300 are not certified.

The survey was implemented using a structured questionnaire, consisting of detailed modules on: (i) household characteristics; (ii) child schooling; (iii) land ownership and use; (iv) coffee production and marketing; (v) other crop production; (vi) livestock ownership and production; (vii) forest use; (viii) off-farm income; (ix) asset ownership and living conditions; (x) social capital and credit; and (xi) decision-making in the household. In Ethiopia, the questionnaire had an extra module asking for detailed information on child labour (for children in the 4-18 age cohort) and probing the perception towards child schooling and child labour. The surveys were implemented in both countries, through structured interviews with household heads, by well-trained enumerators and under close supervision of the authors. In addition, semi-structured interviews were conducted with cooperative committees, district officials, coffee companies, coffee unions and some coffee experts in both countries.

The analysis in this paper is done excluding households whose coffee shrubs were still too young to be productive and households without school-aged children, resulting in a sample of 906 households, including 397 Ethiopian and 509 Ugandan households, and 426 certified and 480 non-certified households (Table 2 in section 5.1). This sample includes detailed information on 2,909 school-aged children, including 1,215 Ethiopian and 1,694 Ugandan children, 1,348 children from certified and 1,561 children from non-certified households, and 1,786 primary school-aged and 1,123

secondary school-aged children. Given that the schooling systems differ slightly in the two countries (section 3.2.), the age categories used to define primary and secondary schooling differ accordingly. Primary school-aged children include the age cohort 7 to 14 in Ethiopia and 6 to 12 in Uganda; secondary school-aged children include the age cohort 15 to 18 in Ethiopia and 13 to 18 in Uganda.

4. Econometric methods

We assess the impact of coffee certification on the schooling of children using different econometric techniques, including probit and tobit models and propensity score matching (PSM) estimation. First, we estimate the following reduced form equation:

$$S_{ijkm} = \beta_0 + \beta_1 C_{jkm} + \beta_2 Z_{ijkm} + \beta_3 X_{jkm} + \beta_4 V_{km} + \beta_5 W_m + \mu_{ijkm} \quad (1)$$

The outcome variable S_{ijkm} is the schooling of child i in household j, village k and country m and is measured using the following indicators: 1/ primary school enrolment, measured as a dummy equal to one if in the previous year, a child in age cohort 7-14 was enrolled in primary school (grade 1-8) for Ethiopia or a child in age cohort 6-12 was enrolled in primary school (grade P1-P7) for Uganda, and zero otherwise; 2/ secondary school enrolment, measured as a dummy equal to one if in the previous year, a child in age cohort 15-18 was enrolled in secondary school (grade 9-12) for Ethiopia or a child in age cohort 13-18 was enrolled in secondary school (grade S1-S6) for Uganda, and zero otherwise; 3/ primary schooling efficiency for children in age cohort 7-14 for Ethiopia and 6-12 for Uganda; 4/ secondary schooling efficiency for children in age cohort 15-18 for Ethiopia and 13-18 for Uganda. Schooling efficiency is measured as the ratio of a child's current grade to the child's expected grade, had s/he started school at the right entry age (7 in Ethiopia and 6 in Uganda) and gone through school without repeating or dropping out. The indicator captures both school attendance and progression through school over the years, and ranges from zero (for children who never attended school), to less than one (for children repeating school years, starting late or dropping out early), to one (for children following a the most efficient track for their age).

The main explanatory variable of interest C_{jkm} is a vector of two dummy variables indicating the participation of household j in village k and country m in either an FT or an RA coffee certification

scheme. These variables are mutually exclusive since producers hold coffee production contracts with only one company or cooperative, implementing either FT or RA and never both, and possibly combined with other standards in multiple certification schemes. We control for possible selection bias from observed heterogeneity by including a large set of observable characteristics at the child level Z_{ijkm} including age, gender, and perceived intelligence by the parents; at the household level X_{jkm} including gender, age, education, and religion of the household head, education of the mother, number of siblings of different age-gender cohorts, number of adults, land cultivated, livestock units and asset poverty; at the village level V_{km} including the presence of a secondary school in the village and the distance between village in which the producer resides and the nearest district town; and a country dummy W_m. The distance variable is derived through combining survey data with GIS data. We use probit estimations for the first two binary school enrolment indicators, and tobit estimations for the last two censored schooling efficiency indicators. In all estimations we use household level clustered standard errors.

Second, we estimate average treatment effects on the treated (ATT) for the two certification variables on all four outcome variables using PSM (Rosenbaum and Rubin, 1983), combined with a sensitivity analysis that tests the assumption of selection on observables. We first estimate the propensity scores (PS), or the probability of a household to be certified, using a multinomial probit model for the two mutually exclusive treatments of FT and RA certification. In this model we include the vectors of household- and village- level variables X_{jkm} and V_{km} as specified above – apart from the variable 'presence of a secondary school' – and consider them not influenced by the treatment. We use a kernel matching method with the default Gaussian kernel to match certified and non-certified households. This allows to use information from all non-certified households and a weighting function to construct the counterfactual outcome, and reduces variance (Caliendo and Kopeinig, 2008). After matching, we estimate the ATT as the weighted difference between children of treated and children of matched control households, and bootstrapped standard errors, to make inferences.

The validity of PSM relies on two essential assumptions. First, the common support or overlap condition requires that treatment observations have comparison control observations nearby in the PS

distribution (Caliendo & Kopeinig, 2008). We only use observations in the common support region, in which the PS of treated observations is not lower than the PS of control observations and the PS of control observations is not larger than the PS of treated observations. We address overlap in the propensity score distribution between certified and non-certified observations, and assess balancing properties by comparing covariate means between treated and matched controls using two-sided *t*-tests. Second, the Conditional Independence (CI) assumption requires that, given observable variables, potential outcomes are independent of treatment assignment (Imbens, 2004, Lampach and Morawetz, 2016). This implies that selection into treatment is based entirely on observable covariates, which is a strong assumption. We test the robustness of our results against violation of this assumption, using a simulation-based sensitivity analysis as proposed by Ichino *et al* (2008). The method entails simulating a binary confounder (we use a neutral confounder) to mimic a possible unobserved influential factor and comparing these PSM results with the baseline PSM results. This allows to test the sensitivity of the results to failure of the assumptions. We use these two different methods in order to exploit the strengths of each of them in reducing potential bias in estimated effects. We estimate the models for all children in a specific age-cohort jointly, and for girls and boys, separately. We estimate all models using pooled, as well as country specific data.

5. Results

5.1 Mean comparison

In table 2 we present summary statistics for child-, household- and village-level characteristics, and compare these across countries and across certified and non-certified households. First, the average age among sampled children is 12; 50% are boys; and 73% is judged to be of average intelligence by the parents and 18% above average. There are some slight differences in age, gender and intelligence perception between the countries and between certified and non-certified households. Most remarkable is the significantly higher intelligence perception among RA-certified households. Second, there are some important differences in household characteristics between the countries. The education level of both spouses is significantly higher in Uganda than in Ethiopia, where it is very low. Households are larger with both more adults and children in Uganda. The significantly larger number of primary

school-aged children in Ethiopia relates to the longer primary school cycle. Households in Ethiopia have significantly larger land- and livestock-holdings but are more likely to be asset deprived, which corresponds to a lower per capita income level in Ethiopia[2]. Third, certified and non-certified households differ significantly in some specific characteristics. There is a remarkably higher share of female-headed households in the FT scheme. There is no significant difference in landholdings but certified households have slightly less livestock and are less likely to be asset deprived. Fourth, the prevalence of village secondary schools is similar across the countries but much lower for certified households while the distance to the district town is similar across certified and non-certified households but much larger in Uganda.

Table 2: Child, household and village characteristics

	Total sample	Ethiopia	Uganda		Non-certified	FT-certified		RA-certified	
Child characteristics									
Number of observations	2,909	1,215	1,694		1,561	805		543	
Age of child	12.1	12.0	12.1		12.1	12.4	**	11.6	***
Male child (%)	50%	53%	49%	**	50%	50%		52%	
Intelligence below average (%)	9%	6%	11%	***	9%	7%	*	9%	
Intelligence average (%)	73%	77%	71%	***	76%	77%		61%	***
Intelligence above average (%)	18%	17%	19%		15%	16%		30%	***
Household characteristics									
Number of observations	906	397	509		480	253		173	
Female-headed household (%)	9%	7%	11%	*	6%	16%	***	6%	
Age of head (years)	48	46	49	***	47	50	***	46	
Education of head (years)	6.16	3.54	8.21	***	6.52	5.66	*	5.91	
Education of mother (years)	3.68	1.56	5.34	***	3.45	3.41		4.72	**
# adults (> 18 years)	3.84	2.92	4.56	***	3.83	3.91		3.77	
# children (< 18 years)	6.43	6.16	6.64	**	6.49	6.31		6.45	
# girls below school age	0.48	0.28	0.64	***	0.47	0.49		0.50	
# boys below school age	0.43	0.27	0.55	***	0.41	0.46		0.43	
# girls primary school age	1.77	2.02	1.57	***	1.82	1.64	*	1.81	
# boys primary school age	1.70	1.99	1.47	***	1.73	1.58		1.77	
# girls secondary school age	0.95	0.74	1.12	***	0.95	1.04		0.83	
# boys secondary school age	1.10	0.86	1.28	***	1.10	1.09		1.10	
Christian religion (%)	82%	67%	94%	***	88%	79%	***	71%	***
Muslim religion (%)	18%	33%	6%	***	13%	21%	***	29%	***
Total area cultivated (ha)	1.82	2.74	1.10	***	1.87	1.89		1.57	
Livestock units (TLU)	3.28	4.74	2.14	***	3.63	3.20	*	2.42	***
Asset deprivation (%)	38%	45%	32%	***	41%	34%	*	34%	*
Village characteristics									
Secondary school in village (%)	20%	21%	20%		28%	13%	***	11%	***
Distance to district town (km)	18.3	7.17	27.0	***	17.9	18.4		19.4	

Source: Authors' calculation from survey data; *Notes:* Two-sided t-test are reported. Significant differences between FT- or RA-certified and non-certified households and between the two countries are indicated by * $p < 0.15$, ** $p < 0.10$, *** $p < 0.05$. Child intelligence refers to parents' perception. Asset deprivation is measured with a multi-dimensional index for asset poverty - a household is asset poor if it does not own more than one radio, TV, telephone, refrigerator, bicycle or motorbike and does not own a

[2] The 2014 per capita income in Ethiopia was 550 US$ and in Uganda 690 US$ (World Bank, 2018).

car or tractor. The variable Secondary school in village indicates the percentage of villages with secondary school. Distance to district town indicates the distance in Km between the village in which the producer resides and the district town.

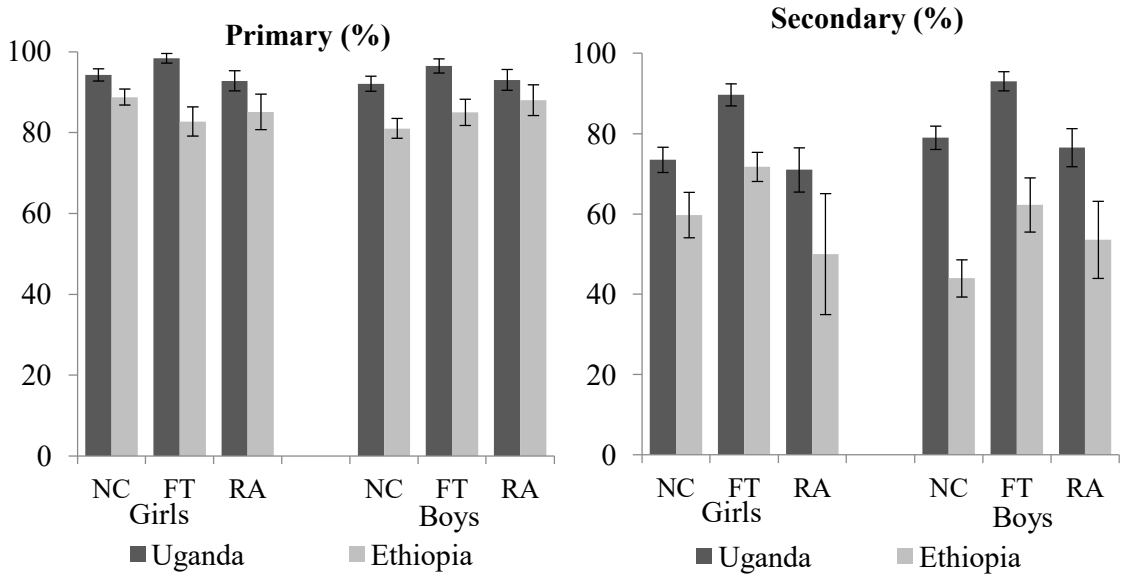

Figure 1: Mean comparison of primary and secondary school enrolment (percentage)
Source: Authors' calculation from survey data. Primary school age cohort is 7-14 years for Ethiopia and 6-12 years for Uganda; Secondary school age cohort is 15-18 years for Ethiopia and 13-18 years for Uganda. NC = Non-certified, Fairtrade = Fairtrade or Fairtrade-Organic, RA = Rainforest alliance or Utz-Rainforest-4C.

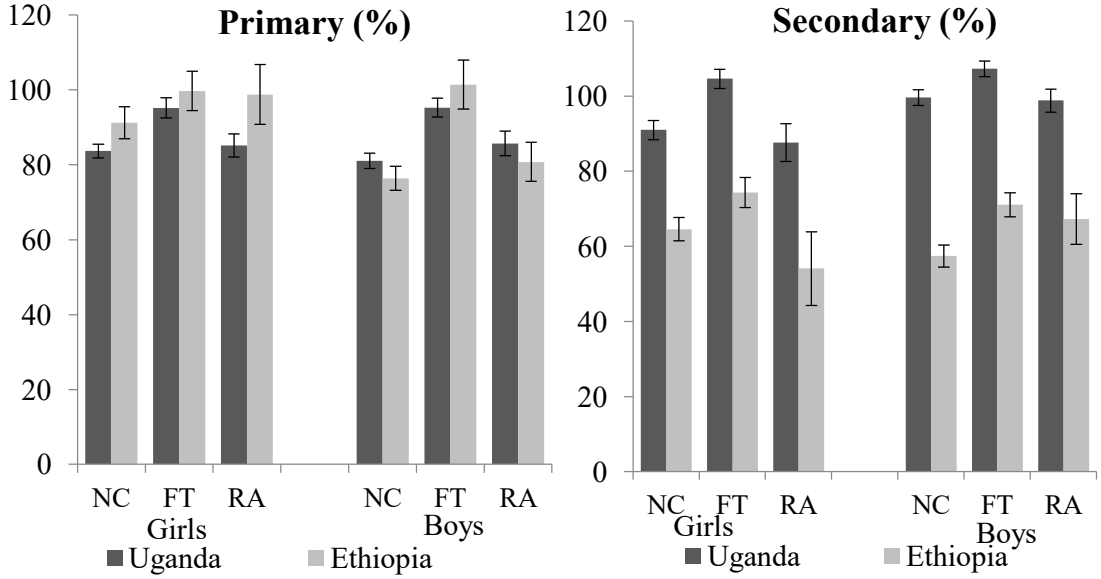

Figure 2: Mean comparison of primary and secondary schooling efficiency (percentage)
Source: authors' calculation from survey data; *Notes:* Primary school age cohort is 7-14 years for Ethiopia and 6-12 years for Uganda; Secondary school age cohort is 15-18 years for Ethiopia and 13-18 years for Uganda. NC = Non-certified, Fairtrade = Fairtrade or Fairtrade-Organic, RA = Rainforest alliance or Utz-Rainforest-4C.

In figure 1 we present a mean comparison of primary and secondary school enrolment of boys and girls for FT- and RA-certified and non-certified households, and for the two countries. In general, primary school enrolment is relatively high, above 80% in both countries, but much higher in Uganda (94%) than in Ethiopia (84%). Secondary school enrolment is lower than primary school enrolment and is substantially lower in Ethiopia (54%) than in Uganda (80%). This is in line with national school enrolment figures. There are no large differences in school enrolment between boys and girls but there are some differences between certified and non-certified households, especially for secondary enrolment. Secondary enrolment is higher among FT-certified households, for both boys and girls and in both Uganda and Ethiopia. Figure 2 includes a similar mean comparison analysis for schooling efficiency. There are some slight differences in primary schooling efficiency between Ethiopia and Uganda and between certified and non-certified households. At secondary school level, efficiency is substantially higher in Uganda than in Ethiopia and slightly higher in FT-certified households, for both boys and girls.

5.2 Econometric results

In table 3, we present a summary of the main estimated effects of FT and RA certification on the different schooling outcome indicators from probit and tobit regressions (REG) and propensity score matching (PSM). For probit regression we report marginal effects. Estimates based on pooled and country specific data are reported for all children in primary or secondary school age cohorts, and for boys and girls separately. The estimates from different econometric models point in the same direction, indicating the robustness of our results. For the PSM analysis, we report the results of the first stage multinomial probit estimation of the propensity score (Tables A1, A4 & A7), the propensity score distribution for certified and non-certified households (Figure A1), balancing properties before and after matching (Tables A2, A5 & A8), and the results of the simulation-based sensitivity analysis testing robustness to violations of the conditional independence (CI) assumption (Tables A3, A6 & A9). The propensity score distributions show sufficient overlap between certified and control observations for both FT and RA. Balancing properties are satisfied with no significant differences in covariates between certified and matched control observations for all covariates and all treatment

groups. The results of the sensitivity analysis for pooled data show that the estimated treatment effects of FT certification on primary school enrolment for girls and of RA certification on secondary school enrolment for girls deviate by 6.63% and 4.16%, respectively, from the baseline estimation. This implies that these results are less robust to failure of the CI assumption. In the other cases, the estimated treatment effects deviate between 0.02% and 2.98% from the baseline estimations – which is an indication of rather robust results. Full probit and tobit regression results are reported in Tables A10 to A15 in annex.

The pooled data results (first four columns in Table 3) indicate that participation in an FT coffee certification scheme significantly increases the primary school enrolment of boys, the secondary school enrolment of both boys and girls, and the primary and secondary schooling efficiency of both boys and girls but there is no significant effect on primary school enrolment for girls. The effect on boys' primary school enrolment is modest with an increase of 4 to 5 percentage points (pp) while other estimated effects are much larger. FT certification increases the likelihood of secondary school enrolment with 15 to 19 pp and increase primary schooling efficiency with 10 to 22 pp and secondary schooling efficiency with 12 to 13 pp. The estimated effects on secondary school enrolment and primary schooling efficiency are somewhat larger for boys than girls but differences are small. On the contrary, participation in RA certification has few positive effects on the schooling indicators. For girls, there is even a negative effect of RA certification on secondary schooling efficiency. For boys, RA certification increases primary school enrolment and primary, and secondary schooling efficiency somewhat. Estimated effects are much smaller than for FT certification, in the range of 3 to 7 pp, and only significant at the 10% level.

Table 3: Summary of estimated effects of coffee certification on school enrolment and schooling efficiency for primary and secondary school-aged children, estimated from probit and tobit regression models (REG) and propensity score matching (PSM)

	Pooled data				Ethiopia data				Uganda data			
	FT Certified		RA Certified		FT Certified		RA Certified		FT Certified		RA Certified	
	REG	PSM	REG	PSM	REG	PSM	REG	PSM	REG	PSM	REG	PSM
Primary school enrolment (all)	0.012	0.019	-0.002	0.015	-0.055	-0.010	-0.022	0.017	0.053 ***	0.042 ***	0.002	-0.003
	(0.018)	*(0.017)*	*(0.024)*	*(0.015)*	*(0.038)*	*(0.030)*	*(0.059)*	*(0.033)*	*(0.018)*	*(0.017)*	*(0.016)*	*(0.022)*
primary school enrolment (girls)	-0.019	-0.005	-0.024	-0.015	-0.121 ***	-0.060 *	-0.105 *	-0.037	0.034 *	0.041 **	-0.009	-0.014
	(0.022)	*(0.023)*	*(0.028)*	*(0.023)*	*(0.045)*	*(0.034)*	*(0.064)*	*(0.045)*	*(0.019)*	*(0.019)*	*(0.016)*	*(0.025)*
primary school enrolment (boys)	0.044 *	0.045 **	0.028	0.048 *	0.025	0.040	0.104	0.070 *	0.070 ***	0.044 *	0.004	0.009
	(0.026)	*(0.020)*	*(0.032)*	*(0.025)*	*(0.046)*	*(0.048)*	*(0.063)*	*(0.041)*	*(0.025)*	*(0.025)*	*(0.024)*	*(0.033)*
Secondary school enrolment (all)	0.172 ***	0.163 ***	-0.016	0.017	0.079	0.164 **	-0.078	0.022	0.171 ***	0.150 ***	-0.023	-0.022
	(0.035)	*(0.032)*	*(0.041)*	*(0.045)*	*(0.085)*	*(0.066)*	*(0.123)*	*(0.086)*	*(0.035)*	*(0.031)*	*(0.036)*	*(0.038)*
Secondary school enrolment (girls)	0.172 ***	0.152 ***	-0.071	-0.018	0.055	0.120	-0.470 *	-0.097	0.195 ***	0.162 ***	-0.047	-0.025
	(0.047)	*(0.046)*	*(0.055)*	*(0.058)*	*(0.132)*	*(0.079)*	*(0.250)*	*(0.151)*	*(0.050)*	*(0.037)*	*(0.054)*	*(0.053)*
Secondary school enrolment (boys)	0.193 ***	0.172 ***	0.021	0.045	0.120	0.183 **	0.078	0.096	0.166 ***	0.140 ***	-0.026	-0.025
	(0.053)	*(0.043)*	*(0.057)*	*(0.045)*	*(0.115)*	*(0.085)*	*(0.141)*	*(0.108)*	*(0.047)*	*(0.042)*	*(0.042)*	*(0.047)*
Primary schooling efficiency (all)	0.159 ***	0.147 ***	0.020	0.038	0.153 **	0.167 ***	-0.018	0.054	0.131 ***	0.128 ***	0.036	0.030
	(0.036)	*(0.027)*	*(0.035)*	*(0.030)*	*(0.068)*	*(0.043)*	*(0.075)*	*(0.050)*	*(0.027)*	*(0.028)*	*(0.035)*	*(0.027)*
Primary schooling efficiency (girls)	0.097 **	0.098 ***	-0.029	0.027	0.023	0.085	-0.156	0.075	0.097 ***	0.115 ***	0.006	0.014
	(0.042)	*(0.035)*	*(0.052)*	*(0.049)*	*(0.084)*	*(0.067)*	*(0.122)*	*(0.086)*	*(0.036)*	*(0.032)*	*(0.044)*	*(0.032)*
Primary schooling efficiency (boys)	0.224 ***	0.199 ***	0.073 *	0.051 *	0.281 ***	0.250 ***	0.117	0.044	0.162 ***	0.143 ***	0.058	0.047
	(0.047)	*(0.039)*	*(0.042)*	*(0.029)*	*(0.088)*	*(0.073)*	*(0.090)*	*(0.061)*	*(0.034)*	*(0.025)*	*(0.046)*	*(0.038)*
Secondary schooling efficiency (all)	0.121 ***	0.123 ***	-0.018	0.034	0.104 **	0.123 ***	0.022	0.030	0.111 ***	0.106 ***	-0.041	-0.016
	(0.022)	*(0.023)*	*(0.034)*	*(0.029)*	*(0.047)*	*(0.032)*	*(0.080)*	*(0.064)*	*(0.027)*	*(0.023)*	*(0.039)*	*(0.027)*
Secondary schooling efficiency (girls)	0.131 ***	0.129 ***	-0.096 *	-0.010	0.033	0.098 **	-0.298 **	-0.105	0.148 ***	0.136 ***	-0.080	-0.033
	(0.033)	*(0.030)*	*(0.054)*	*(0.054)*	*(0.066)*	*(0.038)*	*(0.133)*	*(0.093)*	*(0.043)*	*(0.032)*	*(0.063)*	*(0.056)*
Secondary schooling efficiency (boys)	0.129 ***	0.117 ***	0.031	0.066 *	0.146 **	0.137 ***	0.115	0.098	0.103 ***	0.076 **	-0.023	-0.008
	(0.029)	*(0.029)*	*(0.038)*	*(0.039)*	*(0.057)*	*(0.050)*	*(0.089)*	*(0.080)*	*(0.033)*	*(0.033)*	*(0.039)*	*(0.041)*

Source: Authors' estimation based on survey data; *Notes:* Robust Standard errors are reported in parentheses. Estimates significantly different from zero are indicated with * $p < 0.1$, ** $p < 0.05$, *** $p < .0.01$. Average marginal effects are reported for probit regressions.

Results for Uganda specifically (last four columns in Table 3) are largely in line with those from the pooled sample. FT certification significantly increases all schooling indicators – also girls' primary school enrolment. Estimated effects on primary school enrolment and efficiency are slightly larger for boys (4 to 7 pp and 14 to 16 pp, respectively) than for girls (3 to 4 pp and 10 to 11 pp for enrolment and efficiency) while for secondary school enrolment and efficiency, the effects for girls (16 to 20 pp and 14 to 15, respectively) are slightly larger than for boys (14 to 15 pp and 8 to 10 pp, respectively). In addition, estimated effects on enrolment are larger for primary school than for secondary school levels while this is the other way round for efficiency. RA certification has no significant effect on any of the schooling indicators in Uganda. Results for Ethiopia specifically (middle four columns in Table 3) are more ambiguous. There is a robust effect of FT certification on the schooling efficiency of boys, with estimated effects in the range of 14 to 15 pp for secondary schooling efficiency and 25 to 28 pp for primary schooling efficiency. Yet, FT certification significantly decreases girls' primary school enrolment with 6 to 12 pp. Apart from a rather small and marginally significant effect on primary school enrolment for boys, RA certification has no positive effects on child schooling in Ethiopia – and even negative (but not or marginally significant) effects for girls.

Other factors also influence the likelihood of primary and secondary school enrolment and the schooling efficiency of children – as can be revealed from the full regression results reported in Tables A10 to A13. We only discuss some effects. Gender does not matter for primary school enrolment but the likelihood for girls to be enrolled in secondary school is 18 pp lower than for boys in Ethiopia while in Uganda girls' likelihood of secondary school enrolment is 6 pp higher. Also the secondary schooling efficiency is larger for girls than for boys in Uganda. A child's perceived intelligence matters, especially for girls in secondary school age in Uganda. The household composition, the gender and age of the household head, and religion matter to some extent. Having young siblings negatively affects the schooling efficiency of girls, which possibly relates to the involvement of school age girls in childcare. In line with other empirical studies (e.g. Emerson and Souza 2007; Handa, 2002; Langsten, 2014; Maertens and Verhofstadt, 2013; Nishimura et al., 2008), we find a positive effect of parental education on schooling indicators. Mother's education is associated with secondary school

enrolment and efficiency, especially for boys (in both countries), and with primary schooling efficiency for girls in Ethiopia. Father's education is not important for school enrolment but has a positive effect on secondary schooling efficiency, especially for boys. Being asset deprived has a negative effect on some schooling indicators and larger landholdings negatively influence school enrolment and efficiency, especially for boys in secondary school age. This is consistent with the empirically documented positive relation between wealth and schooling (e.g. Maertens and Verhofstadt, 2013, Mani, et al, 2013; Zhao and Glewwe, 2010; Lincove, 2009) and with the idea of a higher opportunity cost of child schooling in farm-households with more land. Presence of a village secondary school negatively influences some schooling indicators. This counterintuitive result could stem from a low quality of education in rural schools, resulting in demotivation and attrition.

5.3 Discussion

Our results imply that participation in an FT coffee certification scheme improves child education, especially through improved schooling efficiency and increased secondary school enrolment, while participation in an RA coffee certification scheme does not, apart from small effects on the schooling of boys. Our results for FT certification are qualitatively in line with results from other studies: with Meemken *et al* (2017) who show that FT coffee certification increases schooling and school expenditures in Uganda; Gitter *et al* (2012) who document that FT-Org coffee certification increases girls' schooling in Mexico; Arnould *et al* (2009) who document for several Latin-American countries, that FT coffee certification increases school enrolment. It is difficult to compare the magnitude of our estimates with those from other studies as schooling indicators and age cohorts are not specified in the same way. Only one other study analyses education and schooling implications of PSS other than FT: Meemken *et al* (2017) compare the impact of FT and Org coffee certification and only find a positive effect on child schooling outcomes for FT. Our results corroborate the finding that it is specifically FT and not PSS in general that create positive education outcomes – which was unclear from other studies focussing only on FT. Given that all coffee certification schemes in the study regions prohibit child labour in coffee production and processing, our result that only FT certification (including single FT and double FT-Org certification) has an effect on child school enrolment and schooling efficiency

while RA certification (including single RA and triple RA-Utz-4C certification) hardly has an impact, implies that the condition of prohibiting child labour in PSS does not guarantee improved child schooling.

The conceptual discussion in section 2 puts forward that the effect of PSS on (the demand-side of) schooling is the result of an income effect, a labour substitution effect and an awareness effect. Although we are unable to completely unravel these channels of effects, we can shed some light on them, based on additional descriptive statistics. First, income is highlighted as an important demand side determinant of education (Mani, et al, 2013; Zhao and Glewwe, 2010; Lincove, 2009) and studies have mainly attributed an estimated positive effect of FT certification on schooling to an income effect (Arnould *et al.*, 2009; Becchetti *et al.*, 2013; Gitter *et al.*, 2012). Yet, it is highly unlikely that income drives the effects we find. In both countries, coffee income as well as total and per capita household income are significantly and substantially higher for RA-certified than for non-certified producers (Table 4) – a difference that is mainly driven by higher yields, especially in schemes that combine RA certification with 4C and Utz certification, which put a lot of emphasis on good agricultural practices. Incomes of FT-certified producers are higher (but less so than for RA-certified households) compared to those of non-certified producers in Ethiopia but not in Uganda[3]. In both countries, prices FT farmers receive are slightly higher than prices non-certified farmers receive, but in Uganda this price effect is off-set by a negative effect on coffee yields that arises from organic production practices in the double FT-Org certification scheme. Consequently, the positive schooling effects we find for FT certification cannot be driven by a positive income effect and subsequent relaxed budget constraints for school fees and costs. The small negative effect we observe of RA certification on girls' schooling, especially in Ethiopia, could be driven by a positive effect on income resulting in an increased opportunity cost of child labour, which is further touched on in the next paragraph. In an additional analysis, we include household income as an additional control variable in the regression models. Results, reported in table A16 in appendix, are qualitatively equal and quantitatively very similar to the results reported in table 3. This corroborates the plausible inference that the observed positive effects of FT certification on

schooling, and the small negative effects of RA certification on girls' schooling, are not driven by an income effect. The observed effects likely emerge through other channels.

[3] Earlier studies in these study regions point to these income differences between certified and non-certified households in a more causal way (see Akoyi & Maertens, 2017 and Mitiku *et al*, 2017).

Table 4: Income for certified and non-certified households in Ethiopia and Uganda

	Ethiopia					Uganda				
	NC	FT		RA		NC	FT		RA	
Number of observations	222	111		64		258	142		109	
Total household income	952	1,207	*	2,769	***	3,694	3,706	n.s.	5,201	***
	(71)	*(125)*		*(346)*		*(186)*	*(243)*		*(355)*	
Coffee income	426	703	***	1,970	***	1,641	1,515	n.s.	2,866	***
	(51)	*(74)*		*(279)*		*(121)*	*(114)*		*(243)*	
Income per capita	116	154	*	321	***	544	534	n.s.	762	***
	(10)	*(22)*		*(40)*		*(30)*	*(41)*		*(62)*	

Source: Authors' calculation from survey data; *Notes:* Two-sided t-test are reported. Standard errors in parentheses. Significant differences between certified and non-certified households are indicated by * $p < 0.15$, ** $p < 0.10$, *** $p < 0.05$. NC = Non-certified, FT = Fairtrade, RA = Rainforest Alliance, n.s. = not significant. Ethiopian income is reported in Ethiopian Birr (ETB) x 10^{-1} and 1 Euro = 32.23 ETB ; Ugandan income is reported in Uganda shillings (UGX) x 10^{-3} and 1 Euro = 4,124.35

Table 5: Weekly labour time allocation of primary and secondary school-aged children in certified and non-certified farm-households in Ethiopia

	Mean	All					Girls					Boys				
		NC	FT		RA		NC	FT		RA		NC	FT		RA	
Primary school-age																
Number of observations	883	511	230		142		258	110		67		253	120		75	
Hours spent on	7.278	6.46	9.79	***	6.16	n.s.	6.93	9.81	***	6.76	n.s.	5.98	9.77	***	5.624	n.s.
reproductive activities	*(0.25)*	*(0.31)*	*(0.59)*		*(0.49)*		*(0.47)*	*(0.87)*		*(0.85)*		*(0.40)*	*(0.81)*		*(0.51)*	
Hours spent on	4.64	4.19	7.26	***	2.03	***	4.38	5.82	*	2.25	*	4.00	8.58	***	1.82	**
productive activities	*(0.26)*	*(0.31)*	*(0.69)*		*(0.39)*		*(0.43)*	*(0.84)*		*(0.73)*		*(0.43)*	*(1.06)*		*(0.36)*	
Secondary school-age																
Number of observations	332	193	99		40		77	46		12		116	53		28	
Hours spent on	8.02	7.26	9.80	***	7.33	n.s.	6.80	11.28	***	8.01	n.s.	7.56	8.51	n.s.	7.04	n.s.
reproductive activities	*(0.43)*	*(0.53)*	*(0.85)*		*(1.20)*		*(0.78)*	*(1.36)*		*(1.71)*		*(0.72)*	*(1.04)*		*(1.57)*	
Hours spent on	6.69	5.88	9.11	***	4.65	n.s.	4.73	6.28	n.s.	3.00	n.s.	4.00	11.57	***	5.36	n.s.
productive activities	*(0.55)*	*(0.63)*	*(1.18)*		*(1.53)*		*(0.92)*	*(1.47)*		*(1.83)*		*(0.43)*	*(1.75)*		*(2.04)*	

Source: Authors' calculations from survey data; *Notes:* Two-sided t-test are reported. Standard errors in parentheses. Significant differences between certified and non-certified households are indicated by * $p < 0.15$, ** $p < 0.10$, *** $p < 0.05$. NC = Non-certified, FT = Fairtrade, RA = Rainforest Alliance, n.s. = not significant. Primary school age cohort = 7-14 years, Secondary school age cohort = 15-18 years.

Second, prohibiting child labour on coffee fields and coffee processing activities does not necessarily reduce child labour as reallocation to other productive and reproductive activities might take place (Baland & Duprez, 2009). Especially when requirements in PSS increase productivity and the labour-intensity of coffee production, prohibiting child labour may result in substituting child labour for adult labour in other activities. Comparing child labour time allocation in productive and reproductive activities for certified and non-certified households in Ethiopia[4], reveals that FT certification is associated with increased labour time allocation in both productive and reproductive activities for both boys and girls while RA certification is associated with reduced labour time in reproductive activities for boys and girls (Table 5). There is a gendered pattern of child labour time use in FT-certified households, as girls spend more time on reproductive activities and boys on productive activities. This implies that FT certification indeed leads to labour substitution while RA does not, which might relate to the coffee production and management practices. The FT schemes have high quality requirements for green coffee beans and, especially because of the combination with Org, promote organic production practices, which increases the labour intensity of production, harvesting and post-harvesting handling, in the quest to comply with certification conditions. Given that FT has a positive effect on secondary school enrolment and schooling efficiency, the higher workload for children in FT-certified households implies that child labour and child schooling are not two sides of the same coin, and that children's labour time does not necessarily interfere with schooling. In addition, the small negative effect of RA certification on girls' schooling in Ethiopia is associated with a slightly reduced workload, especially for primary school-aged girls. Hence, labour substitution resulting from prohibiting child labour in coffee production or from higher productivity and opportunity costs of schooling, cannot explain our results.

Third, the positive effects of FT certification on child schooling might emerge though social capital and awareness raising as explained in the conceptual discussion in section 2. In figure A2 in appendix we summarize for Ethiopia, information on respondents' perception on child schooling and child labour. This figure shows that FT certified households are most convinced about the importance

[4] Survey data from Uganda are not detailed enough to perform a similar analysis.

of schooling. For schooling in general and for secondary schooling there are no large differences in perception between FT certified households on the one hand and RA certified households or non-certified households on the other hand. Yet, FT certified households have a much more positive attitude towards the schooling of girls while RA certified households disagree more strongly on the use of child labour. The FT scheme pays more attention to group trainings, cooperative strengthening, peer pressure mobilising to monitor compliance with FT conditions, and awareness-raising on the reasoning behind the child-labour-free (and other) conditions. These efforts might result in increased social capital and changing preferences, as well as increased demand for child schooling. The RA scheme pays more attention to meeting the requirements as such, including child-free production, but likely contributes less to social capital formation and awareness. These differences between the certification schemes are likely important in explaining the estimated positive effects of FT on schooling outcomes and the lack of a positive effect for RA certification. This is in line with Jena and Grote (2016) who stress the importance of the capacity building aspect of FT certification; and with Meemken et al (2017) who attribute the difference between FT and Org in improving education outcomes to differences in the income effect as well as differences in the principles of the standards.

The estimated effects of FT on school enrolment are stronger in Uganda than in Ethiopia, where there is even a negative impact of FT on the likelihood of girls' primary school enrolment. This could be due to the fact that FT has been implemented in Uganda over a much longer period (14 years) than in Ethiopia (8 years). Effects may take longer to materialize especially because they emerge through awareness raising and changes in people's preferences, rather than through short-term income gains. The negative impact on girls' primary school enrolment in Ethiopia likely relates to the high demand on family labour that complying with FT certification conditions imposes, in order to achieve high quality of green coffee beans. Yet, for both countries we find no effect of RA certification on schooling outcomes, despite the fact that in Uganda the RA scheme is a triple RA-Utz-4C certification while it is a single RA certification scheme in Ethiopia. This is a strong indication that improving child welfare through PSS requires more specific attention to extra efforts in grounding the understanding of the principles behind these standards among participants.

5. Conclusion

In this paper, we analyse how adoption of private sustainability standards affects school enrolment and schooling efficiency of primary and secondary school-aged children in coffee producing farm-households in Ethiopia and Uganda. We find that participation in Fairtrade certification schemes increases the likelihood of children to be enrolled in secondary school and improves their schooling efficiency, although it is not associated with higher incomes or reduced child labour in productive and reproductive household activities. On the contrary, we find that participation in Rainforest Alliance certification schemes has no effect on schooling outcomes of boys and slightly reduces the schooling of girls, while it does correlate with higher incomes and reduced workload of children. Results suggest that effects on schooling emerge through social capital and awareness-raising about the importance of schooling among Fairtrade certified coffee-producing households. Our results imply that prohibition of child labour in private sustainability standards does not guarantee that these standards improve schooling among children; and that awareness creation on the reasoning behind this prohibition might be more effective than strict enforcement of a child-labour-free production process.

Using a comparative approach, including the two main coffee exporting countries in Africa and different certification schemes, we are able to shed some light on how private sustainability standards affect schooling outcomes. While results point in the same direction in the two countries, they remain specific for the research areas. As estimated income effects of smallholder coffee certification vary substantially over different studies in different contexts, schooling effects and the channels through which they emerge may vary as well.

6. References

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Appendix

Table A1: First stage PSM results explaining the probability of participating in a certification scheme (pooled data)

Variable	FT		RA	
Head sex	0.82	***	-0.151	
	(0.233)		*(0.284)*	
Head age	0.011	**	-0.004	
	(0.005)		*(0.006)*	
Head education	-0.028	**	-0.043	***
	(0.014)		*(0.016)*	
Girls below school age	0.033		-0.114	
	(0.091)		*(0.100)*	
Boys below school age	0.159		0.018	
	(0.098)		*(0.107)*	
Girls primary school age	-0.088	*	-0.021	
	(0.049)		*(0.053)*	
Boys primary school age	-0.057		0.013	
	(0.050)		*(0.054)*	
Girls secondary school age	0.081		-0.119	
	(0.069)		*(0.077)*	
Boys secondary school age	-0.033		0.025	
	(0.064)		*(0.071)*	
Wife education	0.016		0.048	***
	(0.017)		*(0.018)*	
Muslim	0.609	***	1.018	***
	(0.184)		*(0.198)*	
Adult older than 18	-0.010		0.014	
	(0.038)		*(0.041)*	
Total area	0.020		-0.017	
	(0.030)		*(0.044)*	
Livestock (TLU)	-0.042	*	-0.128	***
	(0.022)		*(0.029)*	
Asset deprived	-0.377	***	-0.343	**
	(0.144)		*(0.157)*	
Distance to district town (km)	0.005		0.018	**
	(0.007)		*(0.007)*	
Secondary school dummy	-0.762	***	-0.866	***
	(0.175)		*(0.200)*	
Constant	-0.688	*	-0.234	
	(0.356)		*(0.409)*	
Number of observations	906			
Wald Chi^2	135.1			
Probability Chi^2	0.00			
Log Likelihood	-837.8			

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A2: Balancing properties in the matched sample (pooled data)

			FT				RA		
Variable		**Treated**	**Control**	**%bias**		**Treated**	**Control**	**%bias**	
Head sex	Unmatched	0.158	0.065	30.0	***	0.064	0.065	-0.4	
	Matched	0.155	0.121	13.6		0.064	0.069	-1.9	
Head age	Unmatched	50.24	47.43	19.6	**	45.705	47.433	-12.8	
	Matched	50.23	49.82	2.9		45.637	46.433	-5.9	
Head education	Unmatched	5.664	6.521	-15.1	*	5.908	6.521	-11.2	
	Matched	5.679	5.669	-6.1		5.895	6.069	-3.2	
Girls below school age	Unmatched	0.494	0.469	3.3		0.503	0.469	4.6	
	Matched	0.486	0.542	-7.2		0.503	0.510	-0.9	
Boys below school age	Unmatched	0.470	0.396	10.5	*	0.445	0.396	7.4	
	Matched	0.458	0.494	-5.1		0.444	0.460	-2.3	
Girls primary school age	Unmatched	1.636	1.819	-12.9	*	1.809	1.819	-0.7	
	Matched	1.641	1.671	-2.1		1.819	1.827	-0.6	
Boys primary school age	Unmatched	1.581	1.733	-10.9		1.769	1.733	2.5	
	Matched	1.586	1.612	-1.9		1.766	1.686	5.6	
Girls secondary school age	Unmatched	1.040	0.954	8.5		0.832	0.954	-12.4	
	Matched	1.036	1.054	-1.8		0.830	0.848	-1.8	
Boys secondary school age	Unmatched	1.095	1.098	-0.3		1.098	1.098	0.0	
	Matched	1.088	1.077	0.9		1.094	1.147	-5.1	
Wife education	Unmatched	3.409	3.450	-0.9		4.717	3.450	18.9	**
	Matched	3.404	3.736	-7.6		4.152	4.427	-4.1	
Muslim	Unmatched	0.206	0.125	21.8	***	0.289	0.125	41.2	***
	Matched	0.199	0.191	2.1		0.287	0.238	12.2	
Adult older than 18	Unmatched	3.909	3.825	4.0		3.775	3.825	-2.4	
	Matched	3.912	3.937	-1.2		3.778	3.950	-8.1	
Total area	Unmatched	1.892	1.869	1.0		1.570	1.869	-14.0	
	Matched	1.870	1.916	-2.0		1.563	1.497	3.1	
Livestock (TLU)	Unmatched	3.201	3.630	-13.6	*	2.422	3.630	-38.7	***
	Matched	3.201	3.095	3.4		2.434	2.412	0.7	
Asset deprived	Unmatched	0.340	0.410	-14.6	*	0.341	0.410	-14.3	
	Matched	0.343	0.314	5.9		0.345	0.337	1.7	
Distance to district town (km)	Unmatched	18.38	17.87	4.0		19.38	17.87	11.8	
	Matched	18.39	18.99	-4.7		19.46	21.08	-12.6	
Secondary school dummy	Unmatched	0.130	0.275	-36.5	***	0.110	0.275	-42.8	***
	Matched	0.131	0.115	4.1		0.111	0.111	-0.1	
Number of observations		253.0	480.0			173.0	480.0		
Pseudo R^2 matched sample		0.004	0.079			0.005	0.118		
P-value LR test		1.00	0.00			1.00	0.00		
Mean bias		4.20	12.9			4.60	15.4		
Median bias		3.10	11.9			3.10	12.1		

Source: Authors' estimation based on survey and interview data; *Notes:* The two-sided *t*-tests compare the matched samples of FT and RA households, against non-certified households. Significant differences are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A3: Simulation-based sensitivity analysis of PSM estimates to violation of the conditional independence assumption for primary and secondary school enrolment of children and their schooling efficiency by certification categories (pooled data)

	FT			RA		
Variables	**Estimator Effect [a]**	**Outcome Effect [b]**	**Selection Effect [c]**	**Estimator effect**	**Outcome Effect**	**Selection Effect**
Primary school enrolment (all)	0.51%	0.998	1.016	1.66%	1.075	0.994
primary school enrolment (girls)	6.63%	1.166	1.025	1.93%	1.116	0.993
Primary school enrolment (boys)	0.52%	1.042	1.030	1.51%	1.009	1.029
Secondary school enrolment (all)	0.16%	1.022	1.037	1.02%	1.022	0.994
Secondary school enrolment (girls)	0.06%	1.000	1.055	4.16%	1.053	1.050
Secondary school enrolment (boys)	0.03%	1.013	1.003	0.07%	1.020	1.040
Primary schooling efficiency (all)	0.02%	1.003	1.012	0.05%	1.010	1.021
Primary schooling efficiency (girls)	0.37%	1.003	1.022	0.39%	1.084	0.986
Primary schooling efficiency (boys)	0.23%	1.036	0.996	0.39%	1.022	1.004
Secondary schooling efficiency (all)	0.09%	1.051	1.024	0.70%	1.022	0.998
Secondary schooling efficiency (girls)	0.21%	1.039	0.981	2.98%	1.038	1.069
Secondary schooling efficiency (boys)	0.26%	0.970	1.029	0.43%	1.056	1.052

Source: Authors' estimation from survey data ; *Notes:* Primary school age is 7-14 years in Ethiopia and 6-12 years in Uganda. Secondary school age is 15-18 years in Ethiopia and 13-18 years in Uganda. [a] The estimator effect indicates the extent of change in the treatment effect under the presence of a binary confounder compared to the baseline estimate. [b] The outcome effect measures the effect of the binary confounder on the untreated outcome. [c] The selection effect measures the effect of the binary confounder on the relative probability of selection into treatment.

Table A4: First stage PSM results explaining the probability of participating in a certification scheme (Ethiopia data)

Variable	FT		RA	
Head sex	0.481		0.517	
	(0.401)		*(0.505)*	
Head age	0.012		-0.009	
	(0.008)		*(0.011)*	
Head education	-0.004		-0.015	
	(0.030)		*(0.040)*	
Girls below school age	-0. 067		-0.266	
	(0.198)		*(0.259)*	
Boys below school age	0.222		0.106	
	(0.187)		*(0.242)*	
Girls primary school age	-0.108		-0.001	
	(0.071)		*(0.089)*	
Boys primary school age	-0.067		0.032	
	(0.073)		*(0.096)*	
Girls secondary school age	0.104		-0.173	
	(0.119)		*(0.164)*	
Boys secondary school age	-0.082		0.064	
	(0.112)		*(0.144)*	
Wife education	0.062		0.082	*
	(0.039)		*(0.047)*	
Muslim	1.016	***	1.928	***
	(0.223)		*(0.271)*	
Adult older than 18	-0.134		-0.212	*
	(0.093)		*(0.129)*	
Total area	0.016		-0.112	
	(0.034)		*(0.069)*	
Livestock (TLU)	-0.050		-0.134	***
	(0.033)		*(0.046)*	
Asset deprived	-0.581	***	-0.563	**
	(0.211)		*(0.261)*	
Distance to district town (km)	-0.008		-0.096	**
	(0.017)		*(0.043)*	
Constant	-0.402		0.706	
	(0.581)		*(0.779)*	
Number of observations	397			
Wald Chi^2	103.2			
Probability Chi^2	0.00			
Log Likelihood	-318.8			

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01. Secondary school dummy was dropped due to non-convergence.

Table A5: Balancing properties in the matched sample (Ethiopia data)

		FT				RA			
Variable		**Treated**	**Control**	**%bias**		**Treated**	**Control**	**%bias**	
Head sex	Unmatched	0.090	0.063	10.1		0.063	0.063	-0.2	
	Matched	0.092	0.081	4.2		0.063	0.070	-2.7	
Head age	Unmatched	47.60	45.86	13.0		42.73	45.87	-25.0	
	Matched	47.24	49.80	-19.0		42.57	45.88	-26.4	
Head education	Unmatched	3.451	3.563	-3.2		3.641	3.563	2.4	
	Matched	3.514	3.393	3.5		3.603	3.928	-10.2	
Girls below school age	Unmatched	0.270	0.297	-4.9		0.234	0.297	-11.3	
	Matched	0.275	0.247	5.1		0.238	0.183	9.9	
Boys below school age	Unmatched	0.288	0.257	5.6		0.266	0.257	1.6	
	Matched	0.294	0.334	-7.2		0.270	0.190	14.0	
Girls primary school age	Unmatched	1.865	2.050	-13.0		2.172	2.050	8.2	
	Matched	1.899	1.834	4.5		2.175	2.462	-19.2	
Boys primary school age	Unmatched	1.874	2.009	-9.4		2.109	2.009	6.7	
	Matched	1.881	1.741	9.8		2.111	2.057	3.7	
Girls secondary school age	Unmatched	0.802	0.752	5.7		0.594	0.752	-19.8	
	Matched	0.780	0.778	0.2		0.587	0.681	-11.6	
Boys secondary school age	Unmatched	0.793	0.896	-11.0		0.844	0.896	-6.1	
	Matched	0.789	0.802	-1.3		0.841	0.857	-1.8	
Wife education	Unmatched	1.761	1.297	17.3		2.094	1.297	30.3	
	Matched	1.711	1.604	4.0		2.064	1.815	9.5	
Muslim	Unmatched	0.405	0.176	52.1	***	0.750	0.176	140.1	***
	Matched	0.404	0.352	11.6		0.746	0.727	4.5	
Adult older than 18	Unmatched	2.847	3.005	-12.7		2.734	3.005	-25.6	*
	Matched	2.853	2.791	5.0		2.746	3.003	-24.3	
Total area	Unmatched	2.917	2.845	2.6		2.062	2.845	-29.0	*
	Matched	2.885	3.369	-17.2		2.077	2.372	-10.9	
Livestock (TLU)	Unmatched	4.425	5.372	-28.4	**	3.079	5.372	-64.3	***
	Matched	4.377	4.583	-6.2		3.123	2.864	7.3	
Asset deprived	Unmatched	0.369	0.505	-27.4	**	0.391	0.505	-22.9	
	Matched	0.376	0.349	5.4		0.381	0.405	-4.8	
Distance to district town (km)	Unmatched	6.594	8.200	-23.0	*	4.617	8.200	-55.2	***
	Matched	6.641	6.310	4.7		4.683	3.932	11.6	
Number of observations		111	222			64	222		
Pseudo R^2 matched sample		0.020	0.107			0.056	0.320		
P-value LR test		0.987	0.000			0.878	0.000		
Mean bias		6.8	15.0			10.8	28.0		
Median bias		11.8	5.0			21.3	10.0		

Source: Authors' estimation based on survey and interview data; *Notes:* The two-sided *t*-tests compare the matched samples of FT and RA households, against non-certified households. Significant differences are indicated with * p<0.1, ** p<0.05, *** p<0.01. Secondary school dummy was dropped due to non-convergence.

Table A6: Simulation-based sensitivity analysis of PSM estimates to violation of the conditional independence assumption for total primary, and total secondary school children enrolment and schooling efficiency by certification categories (Ethiopia data)

	FT			RA		
Variables	**Estimator Effect [a]**	**Outcome Effect [b]**	**Selection Effect [c]**	**Estimator effect**	**Outcome Effect**	**Selection Effect**
Primary school enrolment (all)	1.81%	0.982	1.075	0.70%	0.017	1.050
primary school enrolment (girls)	0.54%	1.089	0.982	0.41%	1.089	1.055
Primary school enrolment (boys)	0.70%	1.071	1.033	0.40%	1.112	1.004
Secondary school enrolment (all)	0.05%	1.040	1.067	1.83%	1.034	1.117
Secondary school enrolment (girls)	0.82%	1.144	1.094	1.44%	0.955	1.193
Secondary school enrolment (boys)	0.0001%	1.211	1.022	2.14%	1.179	1.137
Primary schooling efficiency (all)	0.26%	0.983	1.017	0.24%	1.027	1.016
Primary schooling efficiency (girls)	0.16%	1.032	1.063	0.72%	1.013	1.057
Primary schooling efficiency (boys)	0.19%	1.060	0.988	0.28%	1.079	1.024
Secondary schooling efficiency (all)	0.32%	0.951	1.082	2.15%	1.046	1.166
Secondary schooling efficiency (girls)	0.30%	1.162	1.149	1.24%	1.123	1.236
Secondary schooling efficiency (boys)	0.07%	1.202	1.036	1.38%	1.126	1.084

Source: Authors' estimation based on survey and interview data; *Notes:* [a] The estimator effect indicates the extent of change in the treatment effect under the presence of a binary confounder compared to the baseline estimate. [b] The outcome effect measures the effect of the binary confounder on the untreated outcome. [c] The selection effect measures the effect of the binary confounder on the relative probability of selection into treatment.

Table A7: First stage PSM results explaining the probability of participating in a certification scheme (Uganda data)

Variable	FT		RA	
Head sex	0.872	***	0.049	
	(0.231)		*(0.314)*	
Head age	0.007		-0.006	
	(0.005)		*(0.006)*	
Head education	-0.029	**	-0.046	***
	(0.012)		*(0.014)*	
Girls below school age	0.165		-0.036	
	(0.086)	*	*(0.101)*	
Boys below school age	0.166	*	0.009	
	(0.092)		*(0.107)*	
Girls primary school age	-0.076		-0.017	
	(0.055)		*(0.061)*	
Boys primary school age	-0.055		0.008	
	(0.055)		*(0.057)*	
Girls secondary school age	0.031		-0.124	*
	(0.070)		*(0.072)*	
Boys secondary school age	0.013		-0.036	
	(0.062)		*(0.070)*	
Wife education	0.009		0.021	
	(0.017)		*(0.013)*	
Muslim	-0.392		-0.884	**
	(0.289)		*(0.405)*	
Adult older than 18	0.015		0.011	
	(0.035)		*(0.038)*	
Total area	0.043		0.121	**
	(0.059)		*(0.061)*	
Livestock (TLU)	-0.010		-0.031	
	(0.032)		*(0.035)*	
Asset deprived	-0.218		-0.195	
	(0.160)		*(0.171)*	
Distance to district town (km)	0.018	**	0.021	
	(0.008)		*(0.008)*	
Secondary school dummy	0.159		-0.071	
	(0.171)		*(0.197)*	
Constant	-1.236		-0.370	
	(0.396)		*(0.455)*	
Number of observations	509			
Wald Chi^2	67.57			
Probability Chi^2	0.00			
Log Likelihood	-487.6			

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A8: Balancing properties in the matched sample (Uganda data)

		FT				RA			
Variable		**Treated**	**Control**	**%bias**		**Treated**	**Control**	**%bias**	
Head sex	Unmatched	0.211	0.066	42.9	***	0.064	0.066	-0.7	
	Matched	0.206	0.165	12.0		0.065	0.066	-0.3	
Head age	Unmatched	52.30	48.78	23.8	**	47.45	48.78	-9.6	
	Matched	51.98	51.08	6.1		47.40	47.31	0.6	
Head education	Unmatched	7.394	9.066	-26.8	**	7.239	9.066	-30.5	**
	Matched	7.404	7.276	2.1		7.204	7.250	-0.8	
Girls below school age	Unmatched	0.669	0.616	5.9		0.661	0.616	5.5	
	Matched	0.667	0.728	-6.9		0.657	0.620	4.7	
Boys below school age	Unmatched	0.613	0.516	12.4		0.550	0.516	4.9	
	Matched	0.603	0.599	0.5		0.556	0.547	1.2	
Girls primary school age	Unmatched	1.458	1.620	-11.8		1.596	1.620	-1.8	
	Matched	1.447	1.506	-4.3		1.602	1.645	-3.3	
Boys primary school age	Unmatched	1.352	1.496	-10.9		1.569	1.496	5.4	
	Matched	1.340	1.379	-2.9		1.583	1.550	2.5	
Girls secondary school age	Unmatched	1.225	1.128	9.1		0.972	1.128	-14.7	
	Matched	1.213	1.272	-5.6		0.963	1.000	-3.5	
Boys secondary school age	Unmatched	1.331	1.271	5.0		1.248	1.271	-2.1	
	Matched	1.305	1.449	-12.1		1.250	1.289	-3.4	
Wife education	Unmatched	4.697	5.302	-12.6		6.257	5.302	12.1	
	Matched	4.731	4.901	-3.5		5.398	5.517	-1.5	
Muslim	Unmatched	0.049	0.081	-13.0		0.018	0.081	-29.2	**
	Matched	0.050	0.045	1.9		0.019	0.010	3.7	
Adult older than 18	Unmatched	4.739	4.531	9.0		4.385	4.531	-6.0	
	Matched	4.723	4.868	-6.3		4.389	4.422	-1.3	
Total area	Unmatched	1.091	1.029	5.5		1.281	1.029	20.7	*
	Matched	1.087	1.125	-3.3		1.278	1.155	10.1	
Livestock (TLU)	Unmatched	2.244	2.131	4.8		2.037	2.131	-4.2	
	Matched	2.243	2.201	1.8		2.030	2.101	-3.2	
Asset deprived	Unmatched	0.317	0.329	-2.7		0.312	0.329	-3.7	
	Matched	0.319	0.290	6.2		0.315	0.319	-0.9	
Distance to district town (km)	Unmatched	27.59	26.18	15.5		28.06	26.18	21.6	*
	Matched	27.62	27.78	-1.7		28.14	28.42	-3.2	
Secondary school dummy	Unmatched	0.232	0.198	8.4		0.165	0.198	-8.4	
	Matched	0.227	0.247	-4.8		0.167	0.164	0.7	
Number of observations		142.0	258.0			109.0			
Pseudo R^2 matched sample		0.009	0.011			0.004			
P-value LR test		1.00	0.00			1.00			
Mean bias		4.70	4.40			2.70			
Median bias		3.90	4.20			2.80			

Source: Authors' estimation based on survey and interview data; *Notes:* The two-sided *t*-tests compare the matched samples of FT and RA households, against non-certified households. Significant differences are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A9: Simulation-based sensitivity analysis of PSM estimates to violation of the conditional independence assumption for total primary, and total secondary school children enrolment and schooling efficiency by certification categories (Uganda data)

	FT			RA		
Variables	**Estimator Effect [a]**	**Outcome Effect [b]**	**Selection Effect [c]**	**Estimator effect**	**Outcome Effect**	**Selection Effect**
Primary school enrolment (all)	0.05%	1.071	0.993	0.03%	1.026	1.024
primary school enrolment (girls)	0.18%	1.044	0.989	0.64%	0.973	1.067
Primary school enrolment (boys)	0.06%	1.026	0.938	0.81%	1.092	0.993
Secondary school enrolment (all)	0.06%	0.984	1.046	0.67%	1.032	1.063
Secondary school enrolment (girls)	0.17%	1.165	1.146	1.69%	1.051	1.150
Secondary school enrolment (boys)	0.07%	1.036	1.117	1.37%	1.204	1.128
Primary schooling efficiency (all)	0.19%	0.978	0.977	4.10%	1.016	1.007
Primary schooling efficiency (girls)	3.26%	1.021	1.035	1.45%	1.074	1.021
Primary schooling efficiency (boys)	0.79%	1.017	1.011	1.60%	1.030	1.001
Secondary schooling efficiency (all)	0.06%	1.092	0.975	2.13%	1.040	1.022
Secondary schooling efficiency (girls)	0.14%	1.114	1.034	0.92%	1.075	1.108
Secondary schooling efficiency (boys)	1.42%	1.041	1.082	10.3%	1.091	1.130

Source: Authors' estimation based on survey and interview data; *Notes:* [a] The estimator effect indicates the extent of change in the treatment effect under the presence of a binary confounder compared to the baseline estimate; [b] The outcome effect measures the effect of the binary confounder on the untreated outcome; [c] The selection effect measures the effect of the binary confounder on the relative probability of selection into treatment.

Table A10: Results of probit estimations of FT and RA impact on school enrolment (pooled data)

	Primary schooling						Secondary schooling					
Variables	**All**		**Girls**		**Boys**		**All**		**Girls**		**Boys**	
FT	0.012		-0.019		0.044	*	0.172	***	0.172	***	0.193	***
	(0.018)		*(0.022)*		*(0.026)*		*(0.035)*		*(0.047)*		*(0.053)*	
RA	-0.002		-0.024		0.028		-0.016		-0.071		0.021	
	(0.024)		*(0.028)*		*(0.032)*		*(0.041)*		*(0.055)*		*(0.057)*	
Child sex	-0.011						0.006					
	(0.015)						*(0.033)*					
Child age	0.015	***	0.012	***	0.019	***	0.028	***	-0.006		0.063	***
	(0.004)		*(0.005)*		*(0.005)*		*(0.010)*		*(0.014)*		*(0.014)*	
Average intelligence	-0.001		-0.001		-0.009		0.068		0.097		0.034	
	(0.027)		*(0.034)*		*(0.036)*		*(0.057)*		*(0.084)*		*(0.065)*	
Above average intelligence	-0.004		-0.014		0.004		0.153	**	0.207	**	0.111	
	(0.033)		*(0.039)*		*(0.043)*		*(0.062)*		*(0.089)*		*(0.074)*	
Girls below school age	0.004		0.003		0.006		-0.002		-0.005		-0.006	
	(0.010)		*(0.011)*		*(0.018)*		*(0.022)*		*(0.026)*		*(0.032)*	
Boys below school age	-0.008		-0.008		-0.006		0.002		-0.045		0.076	**
	(0.011)		*(0.014)*		*(0.014)*		*(0.021)*		*(0.028)*		*(0.037)*	
Girls primary school age	-0.002		-0.005		0.008		0.007		0.003		0.012	
	(0.007)		*(0.007)*		*(0.008)*		*(0.011)*		*(0.015)*		*(0.016)*	
Boys primary school age	-0.009		-0.008		-0.007		-0.006		-0.005		-0.0002	
	(0.006)		*(0.007)*		*(0.008)*		*(0.012)*		*(0.016)*		*(0.016)*	
Girls secondary school age	0.0003		0.010		-0.015		0.0004		0.052	**	-0.048	**
	(0.008)		*(0.010)*		*(0.010)*		*(0.015)*		*(0.023)*		*(0.020)*	
Boys secondary school age	-0.002		-0.004		-0.003		0.008		0.016		0.013	
	(0.007)		*(0.009)*		*(0.009)*		*(0.014)*		*(0.018)*		*(0.020)*	
Head sex	-0.007		0.005		-0.014		-0.025		-0.110		0.117	*
	(0.031)		*(0.036)*		*(0.042)*		*(0.052)*		*(0.070)*		*(0.069)*	
Head age	-0.001		0.001		-0.002	**	.00004		-0.000		0.001	
	(0.001)		*(0.001)*		*(0.001)*		*(0.001)*		*(0.002)*		*(0.002)*	
Head education	-0.0005		-0.0002		-0.002		0.003		-0.0003		0.006	
	(0.002)		*(0.002)*		*(0.002)*		*(0.003)*		*(0.004)*		*(0.004)*	
Wife education	0.001		0.002		0.001		0.006	*	0.002		0.013	*
	(0.002)		*(0.003)*		*(0.003)*		*(0.004)*		*(0.002)*		*(0.007)*	
Muslim	-0.034	*	-0.018		-0.057	**	-0.077		-0.064		-0.089	
	(0.020)		*(0.024)*		*(0.029)*		*(0.049)*		*(0.064)*		*(0.064)*	
Adult older than 18	0.006		-0.002		0.017	**	0.004		0.001		0.004	
	(0.005)		*(0.006)*		*(0.007)*		*(0.009)*		*(0.012)*		*(0.011)*	
Total area	-0.001		0.008		-0.011	**	-0.019	*	-0.028	**	-0.014	*
	(0.003)		*(0.005)*		*(0.005)*		*(0.010)*		*(0.014)*		*(0.008)*	
Livestock (TLU)	0.001		-0.003		0.007	**	0.002		-0.005		0.008	
	(0.003)		*(0.003)*		*(0.003)*		*(0.006)*		*(0.008)*		*(0.006)*	
Asset deprived	-0.010		-0.006		-0.014		-0.053	*	-0.065		-0.039	
	(0.016)		*(0.020)*		*(0.022)*		*(0.032)*		*(0.045)*		*(0.042)*	
Distance to district town (km)	-0.002		-0.001		-0.002		-0.0003		-0.001		0.001	
	(0.001)		*(0.001)*		*(0.001)*		*(0.002)*		*(0.002)*		*(0.003)*	
Secondary school dummy	-0.052	***	-0.035		-0.065	***	-0.026		-0.091	**	0.015	
	(0.019)		*(0.025)*		*(0.025)*		*(0.033)*		*(0.045)*		*(0.049)*	
Ethiopia	-0.124	***	-0.113	***	-0.135	***	-0.189	**	-0.079		-0.253	**
	(0.030)		*(0.039)*		*(0.041)*		*(0.075)*		*(0.092)*		*(0.099)*	
Number of observations	1786		911.0		875.0		1123		530.0		593.0	
Wald Chi^2	88.5		41.5		92.5		125.9		66.3		102.6	
Probability Chi^2	0.000		0.010		0.000		0.000		0.000		0.000	
Pseudo R^2	0.079		0.081		0.117		0.119		0.104		0.205	
Log Likelihood	-547.4		-253.4		-279.8		-576.7		-270.5		-280.0	

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A11: Results of tobit estimations of FT and RA impact on schooling efficiency (pooled data)

	Primary schooling						Secondary schooling					
Variables	**All**		**Girls**		**Boys**		**All**		**Girls**		**Boys**	
FT	0.159	***	0.097	**	0.224	***	0.121	***	0.131	***	0.129	***
	(0.036)		*(0.042)*		*(0.047)*		*(0.022)*		*(0.033)*		*(0.029)*	
RA	0.020		-0.029		0.073	*	-0.018		-0.096	*	0.031	
	(0.035)		*(0.052)*		*(0.042)*		*(0.034)*		*(0.054)*		*(0.038)*	
Child sex	-0.027						0.055	**				
	(0.025)						*(0.024)*					
Child age	-0.036	***	-0.041	***	-0.030	***	-0.022	***	-0.048	***	0.001	
	(0.007)		*(0.009)*		*(0.010)*		*(0.007)*		*(0.012)*		*(0.008)*	
Average intelligence	-0.009		-0.044		0.019		0.027		0.074		-0.013	
	(0.038)		*(0.058)*		*(0.048)*		*(0.037)*		*(0.071)*		*(0.032)*	
Above average intelligence	0.109	*	0.096		0.105		0.101	**	0.173	**	0.049	
	(0.056)		*(0.073)*		*(0.071)*		*(0.042)*		*(0.078)*		*(0.039)*	
Girls below school age	-0.002		0.005		-0.002		0.005		0.018		-0.011	
	(0.016)		*(0.020)*		*(0.026)*		*(0.015)*		*(0.019)*		*(0.019)*	
Boys below school age	0.021		0.046	*	-0.010		-0.014		-0.051	*	0.019	
	(0.020)		*(0.026)*		*(0.022)*		*(0.016)*		*(0.026)*		*(0.016)*	
Girls primary school age	-0.006		-0.004		-0.010		0.006		-0.0004		0.012	
	(0.011)		*(0.014)*		*(0.015)*		*(0.008)*		*(0.011)*		*(0.009)*	
Boys primary school age	-0.029	***	-0.032	**	-0.018		0.003		-0.006		0.019	*
	(0.011)		*(0.014)*		*(0.014)*		*(0.009)*		*(0.013)*		*(0.010)*	
Girls secondary school age	-0.001		0.017		-0.021		0.004		0.036	**	-0.026	*
	(0.015)		*(0.019)*		*(0.019)*		*(0.011)*		*(0.018)*		*(0.014)*	
Boys secondary school age	0.015		0.026		0.003		-0.001		0.005		-0.006	
	(0.011)		*(0.017)*		*(0.014)*		*(0.010)*		*(0.015)*		*(0.013)*	
Head sex	-0.034		-0.019		-0.077		-0.001		-0.043		0.069	
	(0.062)		*(0.072)*		*(0.085)*		*(0.041)*		*(0.066)*		*(0.048)*	
Head age	-0.0003		0.001		-0.001		0.001		0.001		0.002	*
	(0.001)		*(0.001)*		*(0.001)*		*(0.001)*		*(0.001)*		*(0.001)*	
Head education	0.002		-0.003		0.006		0.004	**	0.001		0.006	***
	(0.003)		*(0.003)*		*(0.004)*		*(0.002)*		*(0.003)*		*(0.002)*	
Wife education	0.003		0.005		0.001		0.002	*	0.0005		0.005	**
	(0.003)		*(0.004)*		*(0.004)*		*(0.001)*		*(0.002)*		*(0.002)*	
Muslim	-0.063		-0.042		-0.065		-0.101	**	-0.086		-0.095	**
	(0.047)		*(0.059)*		*(0.066)*		*(0.041)*		*(0.056)*		*(0.048)*	
Adult older than 18	0.011		0.003		0.020	**	0.005		-0.003		0.010	
	(0.007)		*(0.011)*		*(0.010)*		*(0.006)*		*(0.010)*		*(0.006)*	
Total area	-0.002		-0.008		0.006		-0.007	*	-0.004		-0.007	**
	(0.007)		*(0.006)*		*(0.013)*		*(0.004)*		*(0.011)*		*(0.003)*	
Livestock (TLU)	-0.004		-0.013	*	0.004		-0.001		-0.006		0.005	
	(0.006)		*(0.008)*		*(0.007)*		*(0.004)*		*(0.005)*		*(0.004)*	
Asset deprived	-0.019		-0.103	**	0.073		-0.047	*	-0.094	**	-0.005	
	(0.037)		*(0.043)*		*(0.052)*		*(0.025)*		*(0.039)*		*(0.030)*	
Distance to district town (km)	-0.004	***	-0.004	**	-0.004	*	-0.0001		-0.001		0.001	
	(0.002)		*(0.002)*		*(0.002)*		*(0.001)*		*(0.002)*		*(0.002)*	
Secondary school dummy	-0.034		-0.061		-0.012		-0.027		-0.046		-0.017	
	(0.036)		*(0.050)*		*(0.045)*		*(0.027)*		*(0.037)*		*(0.032)*	
Ethiopia	0.098	*	0.180	**	0.004		-0.245	***	-0.200	***	-0.286	***
	(0.057)		*(0.075)*		*(0.072)*		*(0.049)*		*(0.066)*		*(0.061)*	
Constant	1.251	***	1.341	***	1.086	***	1.102	***	1.579	***	0.683	***
	(0.114)		*(0.163)*		*(0.129)*		*(0.126)*		*(0.203)*		*(0.140)*	
Number of observations	1786		911.0		875.0		1123		530.0		593.0	
Wald Chi^2	4.010		2.824		3.283		16.84		10.43		13.02	
Probability Chi^2	0.000		0.000		0.000		0.000		0.000		0.000	
Pseudo R^2	0.045		0.053		0.057		0.254		0.202		0.446	
Log Likelihood	-1314		-687.4		-608.1		-440.7		-252.0		-150.8	

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A12: Results of probit estimations of FT and RA impact on school enrolment in Ethiopia

	Primary schooling			Secondary schooling		
Variables	**All**	**Girls**	**Boys**	**All**	**Girls**	**Boys**
FT	-0.055	-0.121 ***	0.025	0.079	0.055	0.120
	(0.038)	*(0.045)*	*(0.046)*	*(0.085)*	*(0.132)*	*(0.115)*
RA	-0.022	-0.105 *	0.104	-0.078	-0.470 *	0.078
	(0.059)	*(0.064)*	*(0.063)*	*(0.123)*	*(0.250)*	*(0.141)*
Child sex	-0.003			-0.183 **		
	(0.027)			*(0.076)*		
Child age	0.017 ***	0.015 **	0.022 ***	0.022	0.003	0.048
	(0.006)	*(0.008)*	*(0.008)*	*(0.024)*	*(0.040)*	*(0.032)*
Average intelligence	0.025	-0.104 ***	0.128	-0.032	-0.112	0.135
	(0.065)	*(0.031)*	*(0.090)*	*(0.150)*	*(0.288)*	*(0.173)*
Above average intelligence	0.081	-0.037	0.181 *	0.045	-0.024	0.222
	(0.067)	*(0.036)*	*(0.096)*	*(0.159)*	*(0.266)*	*(0.196)*
Girls below school age	0.029	0.012	0.053	0.021	0.009	0.052
	(0.023)	*(0.027)*	*(0.033)*	*(0.066)*	*(0.090)*	*(0.089)*
Boys below school age	0.013	0.0005	0.025	-0.003	-0.029	-0.030
	(0.023)	*(0.028)*	*(0.028)*	*(0.066)*	*(0.085)*	*(0.102)*
Girls primary school age	0.002	-0.009	0.029 **	-0.004	-0.036	0.010
	(0.013)	*(0.011)*	*(0.014)*	*(0.023)*	*(0.029)*	*(0.031)*
Boys primary school age	-0.016 *	-0.021 *	-0.010	0.013	0.021	0.007
	(0.009)	*(0.011)*	*(0.012)*	*(0.024)*	*(0.030)*	*(0.033)*
Girls secondary school age	-0.009	0.021	-0.052 ***	-0.020	0.096	-0.092 *
	(0.013)	*(0.017)*	*(0.016)*	*(0.038)*	*(0.064)*	*(0.048)*
Boys secondary school age	-0.002	-0.012	0.005	0.064 *	0.062	0.050
	(0.014)	*(0.017)*	*(0.016)*	*(0.038)*	*(0.056)*	*(0.050)*
Head sex	-0.031	-0.020	-0.019	-0.053	-0.159	0.051
	(0.055)	*(0.062)*	*(0.077)*	*(0.138)*	*(0.214)*	*(0.173)*
Head age	0.001	0.003 *	-0.001	-0.005 *	-0.009 **	0.001
	(0.001)	*(0.002)*	*(0.001)*	*(0.003)*	*(0.004)*	*(0.004)*
Head education	-0.005	0.004	-0.015 ***	0.001	-0.021	0.027 **
	(0.004)	*(0.005)*	*(0.005)*	*(0.010)*	*(0.016)*	*(0.013)*
Wife education	0.002	0.005	0.005	0.011	-0.034	0.038 **
	(0.007)	*(0.007)*	*(0.006)*	*(0.014)*	*(0.022)*	*(0.018)*
Muslim	-0.066 *	-0.013	-0.125 ***	-0.034	-0.051	0.029
	(0.038)	*(0.046)*	*(0.043)*	*(0.077)*	*(0.139)*	*(0.097)*
Adult older than 18	-0.008	-0.017	0.004	-0.023	-0.072 **	-0.027
	(0.014)	*(0.015)*	*(0.015)*	*(0.028)*	*(0.033)*	*(0.039)*
Total area	-0.003	0.011	-0.019 ***	-0.027	-0.080 ***	-0.013
	(0.004)	*(0.007)*	*(0.007)*	*(0.019)*	*(0.029)*	*(0.009)*
Livestock (TLU)	0.002	-0.006	0.014 ***	0.007	-0.009	0.029 **
	(0.004)	*(0.005)*	*(0.005)*	*(0.010)*	*(0.012)*	*(0.013)*
Asset deprived	-0.015	0.010	-0.018	-0.065	-0.065	-0.055
	(0.026)	*(0.032)*	*(0.037)*	*(0.071)*	*(0.116)*	*(0.089)*
Distance to district town (km)	-0.005 **	-0.005 **	-0.003	-0.008	-0.023 ***	0.005
	(0.002)	*(0.002)*	*(0.003)*	*(0.006)*	*(0.008)*	*(0.007)*
Secondary school dummy	-0.127 ***	-0.099 **	-0.110 **	-0.166 *	-0.277	-0.144
	(0.040)	*(0.049)*	*(0.048)*	*(0.100)*	*(0.175)*	*(0.127)*
Constant	-0.055	-0.121 ***	0.025	0.079	0.055	0.120
	(0.038)	*(0.045)*	*(0.046)*	*(0.085)*	*(0.132)*	*(0.115)*
Number of observations	883.0	435.0	448.0	332.0	135.0	197.0
Wald Chi^2	37.15	38.78	73.74	26.21	40.23	39.17
Probability Chi^2	0.031	0.015	0.000	0.291	0.010	0.014
Pseudo R^2	0.064	0.109	0.159	0.082	0.221	0.143
Log Likelihood	-350.2	-152.2	-170.1	-209.5	-69.3	-117.0

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A13: Results of tobit estimations of FT and RA impact on schooling efficiency in Ethiopia

	Primary schooling						Secondary schooling					
Variables	**All**		**Girls**		**Boys**		**All**		**Girls**		**Boys**	
FT	0.153	**	0.023		0.281	***	0.104	**	0.033		0.146	**
	(0.068)		*(0.084)*		*(0.088)*		*(0.047)*		*(0.066)*		*(0.057)*	
RA	-0.018		-0.156		0.117		0.022		-0.298	**	0.115	
	(0.075)		*(0.122)*		*(0.090)*		*(0.080)*		*(0.133)*		*(0.089)*	
Child sex	-0.023						-0.037					
	(0.046)						*(0.043)*					
Child age	-0.074	***	-0.081	***	-0.061	***	-0.025	*	-0.028		-0.024	
	(0.012)		*(0.016)*		*(0.016)*		*(0.014)*		*(0.020)*		*(0.018)*	
Average intelligence	-0.065		-0.256	**	0.051		0.008		0.054		0.020	
	(0.073)		*(0.110)*		*(0.086)*		*(0.061)*		*(0.139)*		*(0.082)*	
Above average intelligence	0.194	*	0.058		0.252	*	0.050		0.174		0.015	
	(0.103)		*(0.140)*		*(0.130)*		*(0.073)*		*(0.130)*		*(0.106)*	
Girls below school age	0.029		0.048		0.023		0.009		-0.004		-0.009	
	(0.043)		*(0.060)*		*(0.059)*		*(0.046)*		*(0.051)*		*(0.053)*	
Boys below school age	0.093	**	0.123	**	0.037		-0.038		-0.088		-0.015	
	(0.041)		*(0.056)*		*(0.048)*		*(0.049)*		*(0.055)*		*(0.058)*	
Girls primary school age	0.004		0.001		-0.001		0.006		-0.011		0.012	
	(0.017)		*(0.023)*		*(0.024)*		*(0.012)*		*(0.017)*		*(0.016)*	
Boys primary school age	-0.043	**	-0.071	***	-0.020		0.011		0.015		0.009	
	(0.018)		*(0.024)*		*(0.023)*		*(0.015)*		*(0.019)*		*(0.018)*	
Girls secondary school age	-0.014		0.028		-0.057		-0.013		0.043		-0.056	**
	(0.028)		*(0.035)*		*(0.037)*		*(0.020)*		*(0.031)*		*(0.026)*	
Boys secondary school age	0.038		0.065		0.033		-0.001		-0.003		-0.012	
	(0.028)		*(0.043)*		*(0.031)*		*(0.024)*		*(0.032)*		*(0.029)*	
Head sex	-0.011		0.021		-0.117		0.020		-0.080		0.100	
	(0.109)		*(0.127)*		*(0.175)*		*(0.065)*		*(0.101)*		*(0.102)*	
Head age	0.003		0.004		0.002		0.001		-0.001		0.004	**
	(0.002)		*(0.003)*		*(0.003)*		*(0.002)*		*(0.002)*		*(0.002)*	
Head education	.00008		-0.011		0.009		0.004		-0.007		0.013	*
	(0.008)		*(0.010)*		*(0.012)*		*(0.006)*		*(0.007)*		*(0.007)*	
Wife education	0.025	***	0.034	**	0.014		0.013	*	-0.015		0.028	***
	(0.010)		*(0.014)*		*(0.010)*		*(0.008)*		*(0.011)*		*(0.008)*	
Muslim	-0.071		-0.024		-0.083		-0.063		-0.039		-0.014	
	(0.070)		*(0.079)*		*(0.104)*		*(0.046)*		*(0.060)*		*(0.056)*	
Adult older than 18	-0.003		-0.009		0.003		-0.019		-0.057	***	-0.008	
	(0.021)		*(0.032)*		*(0.023)*		*(0.018)*		*(0.019)*		*(0.022)*	
Total area	-0.003		-0.007		0.004		-0.006		-0.021		-0.005	
	(0.008)		*(0.008)*		*(0.017)*		*(0.004)*		*(0.015)*		*(0.004)*	
Livestock (TLU)	-0.002		-0.014		0.008		0.004		-0.005		0.014	*
	(0.008)		*(0.010)*		*(0.009)*		*(0.006)*		*(0.006)*		*(0.007)*	
Asset deprived	-0.002		-0.100		0.127		-0.057		-0.130	**	-0.032	
	(0.060)		*(0.071)*		*(0.086)*		*(0.046)*		*(0.053)*		*(0.053)*	
Distance to district town (km)	-0.010	**	-0.016	***	-0.005		-0.0004		-0.006		0.004	
	(0.004)		*(0.005)*		*(0.005)*		*(0.003)*		*(0.004)*		*(0.004)*	
Secondary school dummy	-0.027		-0.116		0.029		-0.044		-0.078		-0.038	
	(0.078)		*(0.112)*		*(0.088)*		*(0.064)*		*(0.088)*		*(0.076)*	
Constant	1.656	***	2.087	***	1.176	***	1.020	***	1.515	***	0.636	*
	(0.213)		*(0.340)*		*(0.240)*		*(0.275)*		*(0.368)*		*(0.344)*	
Number of observations	883.0		435.0		448.0		332.0		135.0		197.0	
Wald Chi^2	4.075		3.387		2.388		2.155		3.320		3.499	
Probability Chi^2	0.000		0.000		0.000		0.002		0.000		0.000	
Pseudo R^2	0.076		0.096		0.079		0.159		0.499		0.285	
Log Likelihood	-806.7		-409.5		-381.1		-94.10		-20.15		-50.43	

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A14: Results of probit estimations of FT and RA impact on school enrolment in Uganda

	Primary schooling						Secondary schooling					
Variables	**All**		**Girls**		**Boys**		**All**		**Girls**		**Boys**	
FT	0.053	***	0.034	*	0.070	***	0.171	***	0.195	***	0.166	***
	(0.018)		(0.019)		(0.025)		(0.035)		(0.050)		(0.047)	
RA	0.002		-0.009		0.004		-0.023		-0.047		-0.026	
	(0.016)		*(0.016)*		*(0.024)*		*(0.036)*		*(0.054)*		*(0.042)*	
Child sex	-0.014						0.059	*				
	(0.013)						*(0.034)*					
Child age	0.011	***	0.009	***	0.014	***	0.027	***	-0.002		0.046	***
	(0.003)		*(0.003)*		*(0.005)*		*(0.009)*		*(0.013)*		*(0.011)*	
Average intelligence	-0.003		0.047				0.075		0.126		0.016	
	(0.018)		*(0.034)*				*(0.058)*		*(0.089)*		*(0.056)*	
Above average intelligence	-0.047		-0.022				0.141	**	0.228	**	0.051	
	(0.031)		*(0.045)*				*(0.064)*		*(0.093)*		*(0.066)*	
Girls below school age	-0.004	*	-0.001		-0.012		-0.006		0.008		-0.017	
	(0.008)		*(0.007)*		*(0.015)*		*(0.020)*		*(0.028)*		*(0.024)*	
Boys below school age	-0.015		-0.012		-0.011		0.012		-0.039		0.083	***
	(0.008)		*(0.010)*		*(0.010)*		*(0.020)*		*(0.028)*		*(0.027)*	
Girls primary school age	-0.005		-0.003		-0.004		0.009		0.002		0.021	
	(0.006)		*(0.005)*		*(0.008)*		*(0.011)*		*(0.016)*		*(0.016)*	
Boys primary school age	-0.002		0.001		-0.006		-0.012		-0.012		-0.008	
	(0.006)		*(0.006)*		*(0.009)*		*(0.012)*		*(0.015)*		*(0.014)*	
Girls secondary school age	0.003		0.001		0.007		0.004		0.039	*	-0.032	*
	(0.008)		*(0.008)*		*(0.012)*		*(0.015)*		*(0.023)*		*(0.019)*	
Boys secondary school age	-0.001		0.003		-0.006		-0.004		0.004		-0.003	
	(0.006)		*(0.006)*		*(0.010)*		*(0.013)*		*(0.017)*		*(0.017)*	
Head sex	0.013		0.017		-0.025		-0.044		-0.140	**	0.098	
	(0.026)		*(0.025)*		*(0.034)*		*(0.052)*		*(0.069)*		*(0.067)*	
Head age	-0.001	**	-0.001		-0.002	**	0.001		0.002		0.001	
	(0.001)		*(0.001)*		*(0.001)*		*(0.001)*		*(0.002)*		*(0.001)*	
Head education	0.0003		-0.001		0.003	*	0.003		0.001		0.003	
	(0.001)		*(0.001)*		*(0.002)*		*(0.003)*		*(0.004)*		*(0.003)*	
Wife education	-0.0002		0.0001		-0.0004		0.005	*	0.001		0.008	
	(0.001)		*(0.001)*		*(0.002)*		*(0.003)*		*(0.002)*		*(0.005)*	
Muslim	0.019		0.019		0.013		-0.104		-0.016		-0.179	**
	(0.029)		*(0.029)*		*(0.045)*		*(0.068)*		*(0.088)*		*(0.076)*	
Adult older than 18	0.007		0.002		0.013	*	0.003		0.001		0.005	
	(0.005)		*(0.004)*		*(0.007)*		*(0.008)*		*(0.013)*		*(0.009)*	
Total area	0.003		0.011	*	-0.009		-0.001		0.003		-0.004	
	(0.006)		*(0.007)*		*(0.010)*		*(0.013)*		*(0.018)*		*(0.018)*	
Livestock (TLU)	-0.001		2.10^{-7}		-0.003		-0.001		0.010		-0.004	
	(0.003)		*(0.003)*		*(0.004)*		*(0.006)*		*(0.012)*		*(0.007)*	
Asset deprived	-0.004		-0.017		0.011		-0.034		-0.064		-0.008	
	(0.016)		*(0.016)*		*(0.024)*		*(0.032)*		*(0.045)*		*(0.043)*	
Distance to district town (km)	-0.001		-0.0004		-0.001		0.0003		0.001		-0.0002	
	(0.001)		*(0.001)*		*(0.001)*		*(0.002)*		*(0.002)*		*(0.002)*	
Secondary school dummy	-0.019		-0.007		-0.029		-0.018		-0.130	***	0.084	
	(0.018)		*(0.015)*		*(0.024)*		*(0.034)*		*(0.044)*		*(0.051)*	
Number of observations	903.0		476.0		380.0		791.0		395.0		396.0	
Wald Chi^2	45.63		54.34		45.57		64.99		50.08		56.71	
Probability Chi^2	0.003		0.000		0.001		0.000		0.001		0.000	
Pseudo R^2	0.105		0.149		0.146		0.096		0.123		0.189	
Log Likelihood	-178.1		-80.96		-85.40		-353.9		-181.61		-148.5	

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A15: Results of tobit estimations of FT and RA impact on schooling efficiency in Uganda

	Primary schooling						Secondary schooling					
Variables	**All**		**Girls**		**Boys**		**All**		**Girls**		**Boys**	
FT	0.131	***	0.097	***	0.162	***	0.111	***	0.148	***	0.103	***
	(0.027)		*(0.036)*		*(0.034)*		*(0.027)*		*(0.043)*		*(0.033)*	
RA	0.036		0.006		0.058		-0.041		-0.080		-0.023	
	(0.035)		*(0.044)*		*(0.046)*		*(0.039)*		*(0.063)*		*(0.039)*	
Child sex	-0.016						0.091	***				
	(0.022)						*(0.030)*					
Child age	0.011	*	0.010		0.013		-0.023	***	-0.053	***	0.004	
	(0.006)		*(0.008)*		*(0.009)*		*(0.008)*		*(0.014)*		*(0.009)*	
Average intelligence	0.053		0.108	*	-0.013		0.025		0.094		-0.041	
	(0.034)		*(0.056)*		*(0.046)*		*(0.044)*		*(0.083)*		*(0.035)*	
Above average intelligence	0.059		0.104	*	-0.0002		0.101	**	0.173	*	0.039	
	(0.045)		*(0.063)*		*(0.057)*		*(0.051)*		*(0.092)*		*(0.046)*	
Girls below school age	0.022		0.034	**	.00008		0.007		0.028		-0.012	
	(0.014)		*(0.015)*		*(0.025)*		*(0.015)*		*(0.023)*		*(0.019)*	
Boys below school age	0.001		0.003		0.003		-0.004		-0.044		0.024	*
	(0.017)		*(0.024)*		*(0.019)*		*(0.017)*		*(0.030)*		*(0.015)*	
Girls primary school age	-0.015		-0.020		-0.009		0.006		-0.002		0.011	
	(0.010)		*(0.013)*		*(0.014)*		*(0.010)*		*(0.015)*		*(0.011)*	
Boys primary school age	-0.004		-0.006		-0.005		-0.002		-0.019		0.024	**
	(0.010)		*(0.014)*		*(0.014)*		*(0.011)*		*(0.016)*		*(0.010)*	
Girls secondary school age	0.004		0.009		-0.0005		0.006		0.030		-0.022	
	(0.012)		*(0.016)*		*(0.016)*		*(0.014)*		*(0.022)*		*(0.017)*	
Boys secondary school age	-0.001		0.009		-0.015		-0.005		0.004		-0.011	
	(0.011)		*(0.015)*		*(0.013)*		*(0.012)*		*(0.017)*		*(0.014)*	
Head sex	-0.016		-0.002		-0.043		-0.011		-0.059		0.071	
	(0.048)		*(0.050)*		*(0.064)*		*(0.051)*		*(0.079)*		*(0.057)*	
Head age	-0.001		-0.0002		-0.002		0.001		0.001		0.001	
	(0.001)		*(0.001)*		*(0.001)*		*(0.001)*		*(0.002)*		*(0.001)*	
Head education	0.002		0.001		0.004	*	0.004	*	0.002		0.004	**
	(0.002)		*(0.002)*		*(0.002)*		*(0.002)*		*(0.004)*		*(0.002)*	
Wife education	-0.002		-0.003		-0.001		0.002		-0.0002		0.003	**
	(0.002)		*(0.003)*		*(0.003)*		*(0.001)*		*(0.002)*		*(0.001)*	
Muslim	0.033		0.051		0.010		-0.158	*	-0.069		-0.225	**
	(0.053)		*(0.064)*		*(0.067)*		*(0.081)*		*(0.109)*		*(0.091)*	
Adult older than 18	0.015	**	0.009		0.025	***	0.008		0.003		0.011	*
	(0.007)		*(0.009)*		*(0.008)*		*(0.007)*		*(0.012)*		*(0.006)*	
Total area	0.002		0.010		-0.011		0.0003		0.008		-0.003	
	(0.010)		*(0.011)*		*(0.015)*		*(0.011)*		*(0.014)*		*(0.013)*	
Livestock (TLU)	-0.003		-0.002		-0.003		-0.003		-0.004		0.003	
	(0.004)		*(0.006)*		*(0.006)*		*(0.004)*		*(0.007)*		*(0.005)*	
Asset deprived	-0.026		-0.078	**	0.029		-0.034		-0.092	*	0.024	
	(0.029)		*(0.037)*		*(0.036)*		*(0.033)*		*(0.050)*		*(0.039)*	
Distance to district town (km)	-0.001		-2.10^{-6}		-0.003		.00002		-0.001		0.001	
	(0.001)		*(0.002)*		*(0.002)*		*(0.002)*		*(0.003)*		*(0.002)*	
Secondary school dummy	-0.065	*	-0.093	**	-0.047		-0.013		-0.072		0.030	
	(0.034)		*(0.043)*		*(0.042)*		*(0.031)*		*(0.046)*		*(0.036)*	
Constant	*0.726*	***	*0.671*	***	*0.787*	***	*1.094*	***	*1.562*	***	*0.747*	***
	(0.107)		*(0.139)*		*(0.136)*		*(0.145)*		*(0.232)*		*(0.163)*	
Number of observations	903.0		476.0		427.0		791.0		395.0		396.0	
Wald Chi^2	2.617		1.827		2.365		2.509		2.327		2.262	
Probability Chi^2	0.000		0.013		0.001		0.000		0.001		0.001	
Pseudo R^2	0.095		0.139		0.110		0.101		0.129		0.208	
Log Likelihood	-286.9		-133.9		-143.4		-334.8		-212.4		-84.01	

Notes: Robust standard errors in parentheses. Significant effects are indicated with * p<0.1, ** p<0.05, *** p<0.01.

Table A16: Summary of estimated effects of coffee certification on school enrolment and schooling efficiency for primary and secondary school-aged children, estimated from probit and tobit regression models and using total household income as additional control variable

	Pooled data				Ethiopia				Uganda		
	FT		**RA**		**FT**		**RA**		**FT**		**RA**
Primary school enrolment (all)	0.011		-0.005		-0.050		-0.004		0.051	***	-0.003
	(0.018)		*(0.023)*		*(0.037)*		*(0.053)*		*(0.017)*		*(0.016)*
primary school enrolment (girls)	-0.021		-0.030		-0.115	***	-0.089		0.033	*	-0.013
	(0.021)		*(0.027)*		*(0.045)*		*(0.060)*		*(0.019)*		*(0.015)*
primary school enrolment (boys)	0.044	*	0.026		0.026		0.113		0.068	***	-0.002
	(0.026)		*(0.032)*		*(0.046)*		*(0.073)*		*(0.025)*		*(0.024)*
Secondary school enrolment (all)	0.172	***	-0.025		0.056		-0.182		0.171	***	-0.023
	(0.035)		*(0.042)*		*(0.086)*		*(0.136)*		*(0.035)*		*(0.037)*
Secondary school enrolment (girls)	0.176	***	-0.104	*	0.024		-0.577	**	0.199	***	-0.067
	(0.048)		*(0.056)*		*(0.131)*		*(0.248)*		*(0.050)*		*(0.056)*
Secondary school enrolment (boys)	0.193	***	0.035		0.097		-0.012		0.165	***	-0.011
	(0.053)		*(0.060)*		*(0.115)*		*(0.160)*		*(0.046)*		*(0.044)*
Primary schooling efficiency (all)	0.154	***	0.004		0.153	**	-0.015		0.126	***	0.021
	(0.036)		*(0.036)*		*(0.069)*		*(0.081)*		*(0.027)*		*(0.035)*
Primary schooling efficiency (girls)	0.089	**	-0.054		0.019		-0.166		0.095	***	-0.008
	(0.042)		*(0.052)*		*(0.085)*		*(0.125)*		*(0.035)*		*(0.043)*
Primary schooling efficiency (boys)	0.222	***	0.066		0.290	***	0.158	*	0.155	***	0.043
	(0.048)		*(0.044)*		*(0.090)*		*(0.093)*		*(0.034)*		*(0.045)*
Secondary schooling efficiency (all)	0.121	***	-0.029		0.083	*	-0.084		0.111	***	-0.044
	(0.022)		*(0.035)*		*(0.048)*		*(0.089)*		*(0.026)*		*(0.040)*
Secondary schooling efficiency (girls)	0.134	***	-0.114	**	0.014		-0.385	***	0.150	***	-0.094
	(0.034)		*(0.055)*		*(0.065)*		*(0.139)*		*(0.043)*		*(0.064)*
Secondary schooling efficiency (boys)	0.129	***	0.024		0.124	**	0.017		0.102	***	-0.018
	(0.029)		*(0.042)*		*(0.058)*		*(0.102)*		*(0.033)*		*(0.044)*

Source: Authors' estimation based on survey data; *Notes:* Robust Standard errors are reported in parentheses. Estimates significantly different from zero are indicated with * $p < 0.1$, ** $p < 0.05$, *** $p < .0.01$. Average marginal effects are reported for probit regressions.

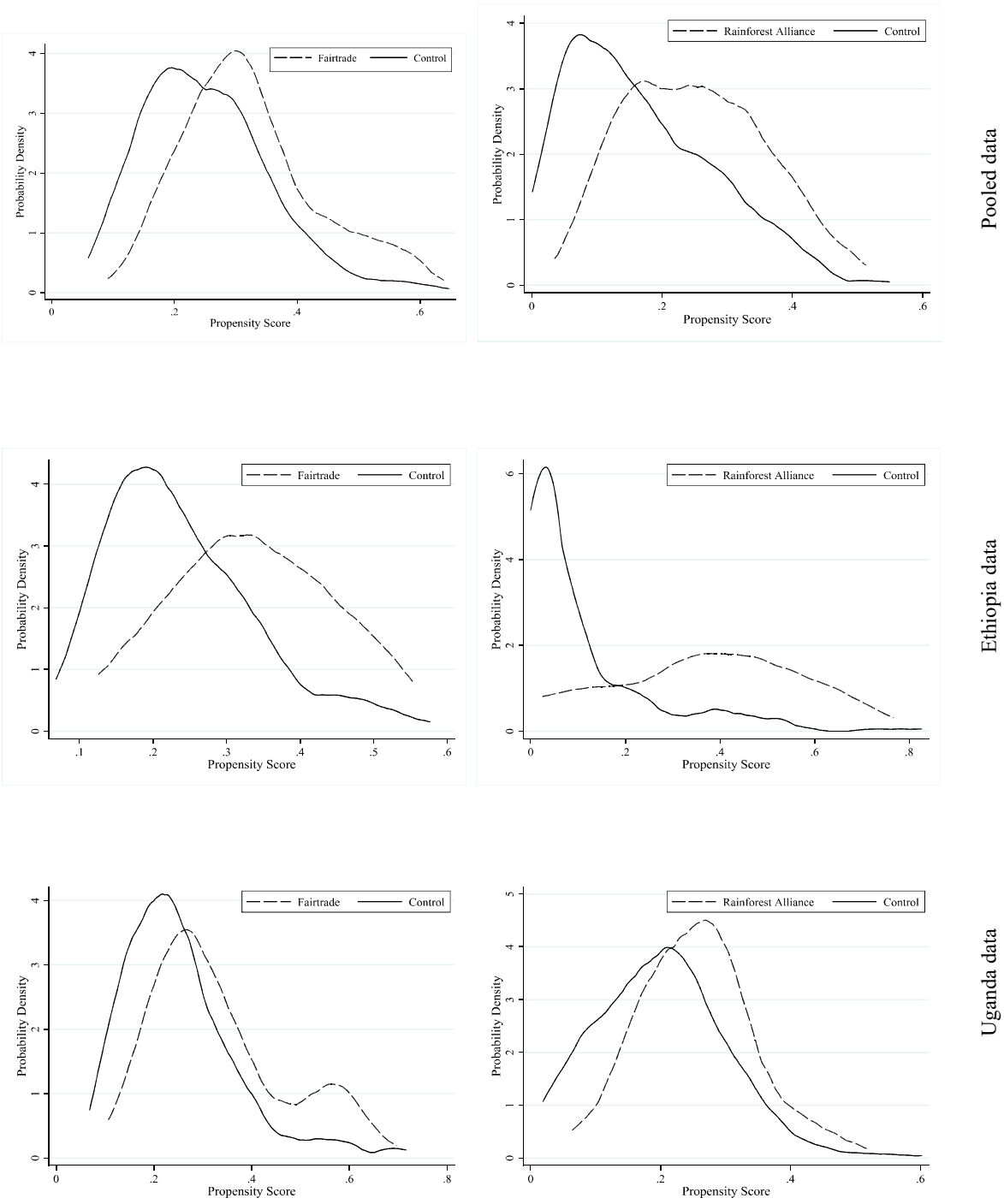

Figure A1. Propensity score distribution by FT and RA certification schemes
Source: Authors' estimation based on survey and interview data.

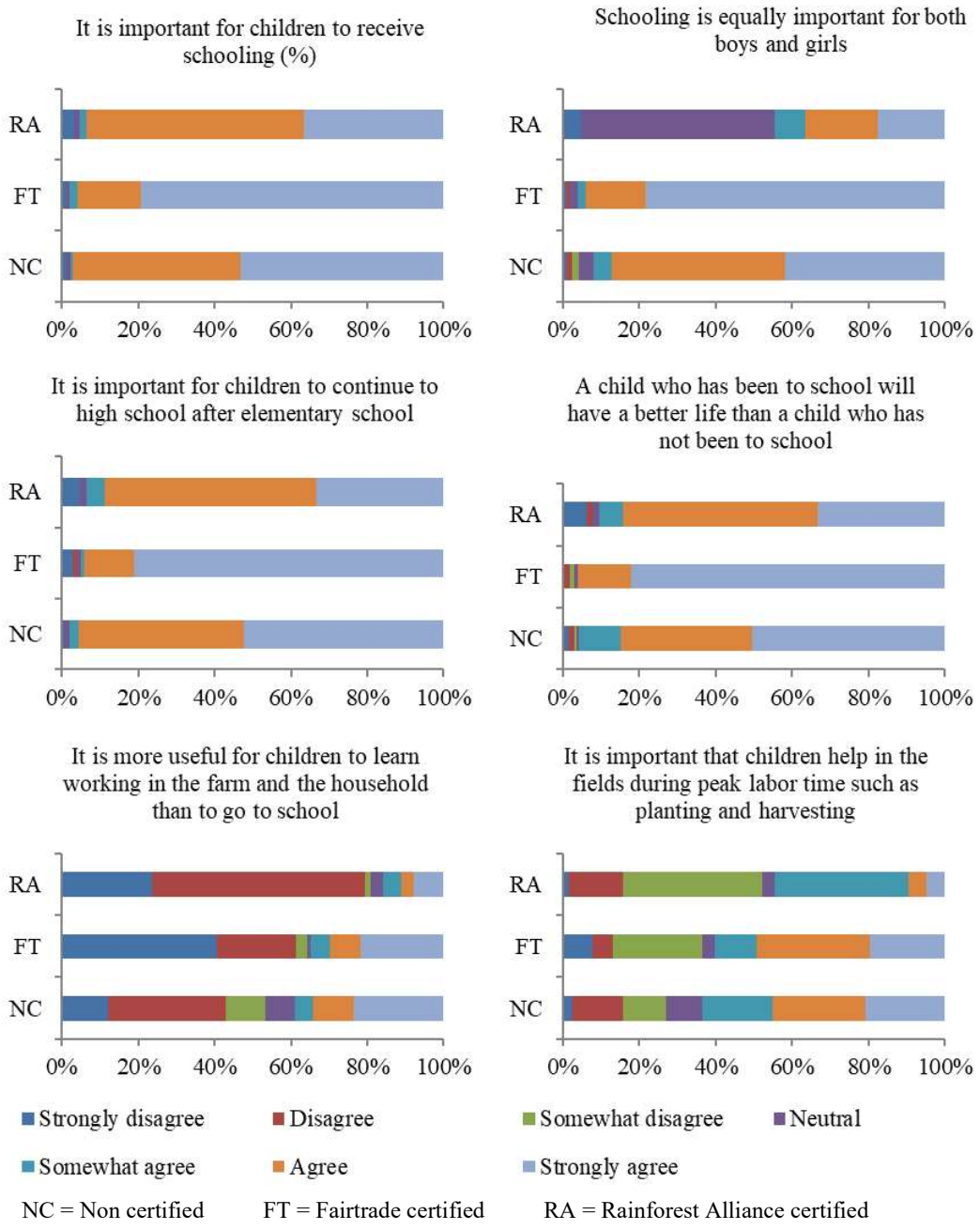

Figure A2: Household perception on child schooling and child labour by certification categories in Ethiopia
Source: Authors' calculation from survey data.