The Effects of Fair Trade Certification: Evidence From Coffee Producers in Costa Rica*

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Abstract: We examine the effects of Fair Trade (FT) certification of coffee on producers and households in Costa Rica. Examining the production dynamics of the universe of Costa Rican coffee mills from 1999–2014, we find that FT certification is associated with a higher sales price, greater sales, and more revenues. As expected, these effects are greater when global coffee prices are lower and the FT guaranteed minimum price is binding. Looking at households, we find evidence that FT is associated with higher incomes for all families, but especially for those working in the coffee sector. However, we also find that, within this sector, the benefits are not evenly distributed. Farm owners and skilled workers benefit from FT, intermediaries are hurt, and hired unskilled workers are unaffected. Thus, although FT creates sizable benefits (on average), it also results in a redistribution from intermediaries to farmers. Lastly, we also find evidence of positive effects of FT certification on the education of high-school-aged children, which is most likely due to the presence of scholarship programs that are funded by FT premiums.

Keywords: Fair Trade, poverty, education.

JEL Classification: F14, F63, O13, O54.

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1. Introduction

Fair Trade (FT) certification aims to offer ethically-minded consumers the opportunity to help lift producers in developing countries out of poverty. The appeal of Fair Trade is reflected in the impressive growth of Fair Trade certified imports over the past two decades. Since its inception in 1997, sales of Fair Trade certified products (under Fair Trade Labelling Organization (FLO) International / Fairtrade International) have grown exponentially. Today, there are over 1,200 FT-certified producer organizations worldwide representing over 1.4 million FT-certified farmers and workers, located in 74 different countries (Fairtrade International, 2014). Despite the rapid growth and pervasiveness of FT products, well-identified evidence of the effects of FT certification remains scarce (Dragusanu, Giovannucci and Nunn, 2014). The question remains: does Fair Trade really work? This study attempts to help answer this question by estimating the effects of FT certification within the coffee sector in Costa Rica.

Fair Trade uses two primary mechanisms in an attempt to achieve its goal of improving the lives of farmers in developing countries. The first is a *minimum price* that is guaranteed to be paid if the product is sold as FT. This is meant to cover the average costs of sustainable production and to provide a guarantee that reduces the risk faced by coffee growers. The second is a *price premium* paid to producers. This premium is in addition to the sales price and must be set aside and invested in projects that improve the quality of life of producers and their communities. The specifics of how the premium is used must be reached in a democratic manner by the producers themselves.

The primary issue one faces when attempting to convincingly identify a causal effect is the fact that certification is endogenous. The primary concern is that mills may become certified when they also obtain a lucrative long-term contract from a large buyer like Starbucks. To gain a better understanding of the nature of selection into certification, in August of 2012, we visited farmers from four FT-certified coffee mills to collect information on the factors that cause mills to become FT certified. We found four common determinants of certification in our setting. First, many mills in Costa Rica also operate stores that sell agricultural products, including certain pesticides that could not be sold if FT certified. Thus, mills that obtain greater revenue from selling banned chemicals are less likely to certify. Second, mills that forecast lower prices in the future perceived a greater benefit from Fair Trade's price floor, and thus were more likely to

join. Third, individual farmers who believed in environmental or socially responsible farming practices were more likely to join. Finally, access to information about the logistics of becoming certified and managerial ability were also important.

An important insight from our interviews is that all but the last of the determinants of certification appear to be primarily time-invariant. Admittedly, knowledge about the logistics of becoming certified could change very quickly. However, the other factors, like a farmer's ideology, the nature of his forecasts about the future, or the costs of certification, potentially change more slowly and may be captured to a large extent by producer fixed effects. This highlights the importance of estimates, like ours, that do not rely on cross-sectional variation only. An additional insight is that the nature of selection appears ambiguous. While positive selection likely arises from the last determinant (being informed), the nature of selection from the other three is ambiguous. The existing evidence, although scarce, appears to suggest that selection may, in fact, be negative (Saenz-Segura and Zuniga-Arias, 2009, Ruben and Fort, 2009, 2012).

Our analysis begins with an examination of the universe of coffee mills in Costa Rica, observed annually over a sixteen year period (1999–2014). We start by examining the determinants of selection into certification, using specifications that include mill fixed effects and year fixed effects. We find no evidence that changes (or levels) of observable characteristics – namely, prices, exports, domestic sales, total sales, or the share of exports in total sales – predict the adoption of FT certification. This is consistent with the impression from our interviews that time-invariant producer characteristics might be the primary determinant of selection into certification.

Our analysis then turns to an examination of the effects of FT certification. For part of our period of analysis, 1999-2014, the guarantee minimum price was binding and for part it was not. Therefore, we allow the effect of FT to differ depending on the extent to which price floor was binding. Examining variation across coffee mills and years and using an estimating equation that includes mill fixed effects and year fixed effects, we find that when the price floor is binding, FT-certified producers sell their products at higher prices. Although this is found for both domestic sales and exports, the effect is more precisely estimated for exports. We also find that when the price floor is binding, the quantity of coffee sold by FT-certified mills is higher, as are their total

revenues.[1]

We then turn to the broader effects of FT certification, using household-level survey data. We link the certification of cooperatives to households by constructing a measure of the share of exports in a canton (an administrative region in Costa Rica) and a year that is from FT-certified producers. This allows us to examine the relationship between this measure and household incomes. Since one of the explicit goals of FT is to set aside funds for community projects, it is likely that households not directly involved in coffee production, but living in the same canton, may also benefit from an increase in Fair Trade certification. Thus, our regressions also allow for the presence of spatial spillovers by estimating the effects of FT certification on all households in a region, including those not employed in the coffee sector. All empirical specifications examine household-level data collected annually from 2001–2009. The regressions, which are at the household level, include canton fixed effects, year fixed effects, and the following controls for characteristics of the household head: occupation, industry of employment, age, gender, and education.

We find evidence of sizable positive spillovers. Those not employed in the coffee sector, but living in cantons during years with more FT certification, have higher incomes. Although the spillover effects are smaller in magnitude than the direct effects, they are still sizable. For example, a one-standard-deviation increase in FT-certification intensity is associated with a 3.5% increase in the average income of all individuals in the canton. We also find additional benefits for those who work in the coffee sector, although there is significant heterogeneity. On average, greater FT certification leads to an increase in income to those in the coffee industry (beyond the spillover benefits described above). This increase is concentrated among skilled coffee growers, who account for 43.5% of those employed in the coffee sector. For this group, a one-standard-deviation increase in FT-certification intensity is associated with a 7.7% increase in average incomes (in addition to the 3.5% felt by all). The unskilled workers, who comprise 49.8% of those in the coffee sector, do not receive any additional benefits (beyond the benefits felt by all). Those working in non-farm occupations in the coffee sector (e.g., intermediaries and others who are responsible for transportation, storage, and sales), and who account for 6.7% of those in coffee, are hurt significantly by FT. For this group, a one-standard-deviation increase in FT intensity is

[1] As we explain in detail, the greater quantity is most likely due to the price floor inducing FT-certified farmers to sell more of their coffee as FT through the FT-certified mill, rather than as conventional through a conventional mill.

associated with a 3.9% decrease in average incomes (net of the positive spillover effects). Since non-farm workers have incomes that are approximately 50% higher than the skilled farmers, a result of FT is that it decreases income inequality within the coffee sector by transferring rents from intermediaries to farmers. This is one of the stated goals of Fair Trade in general.

Motivated by the fact that within Costa Rica, cooperatives commonly use FT premiums for the building of schools, the purchase of materials, and the provision of scholarships, we also examine the effect of FT certification on education as measured by the enrollment of school-aged children. Our estimates show that FT certification has no effect on the enrollment of elementary-school children (aged 7–12), a result that is not surprising given that elementary-school enrollment rates in Costa Rica are close to 99%. However, we find that FT certification is associated with higher school enrollment for high-school students (aged 13–17). This is true both for children whose parents work within coffee and whose parents do not. According to the estimates, a one-standard-deviation increase in FT-certification intensity is associated with a 2 to 5 percentage-point increase in the probability of school enrollment. Consistent with the estimated effects of FT on the incomes of non-farm workers (e.g., intermediaries, etc) in the coffee sector, we find that the enrollment of their children is adversely affected by FT.

Our findings complement a small number of existing studies that attempt to identify the causal effects of FT. Most existing studies rely on cross-sectional comparisons from moderately sized surveys. For example, Mendez, Bacon, Olson, Petchers, Herrador, Carranza, Trujillo, Guadarrama-Zugasti, Cordon and Mendoza (2011) compare 469 households from 18 different cooperatives in four Latin American countries, Bacon (2005) compares 228 coffee farmers from Nicaragua, and Weber (2011) surveys 845 farmers from Southern Mexico. All three studies observe one cross-section. A number of studies have used matching techniques to obtain more credible causal estimates from cross-sectional data. These include Beuchelt and Zeller (2011), who examine 327 farmers in Nicaragua, and Ruben and Fort (2009) and Ruben and Fort (2012), who study 360 farmers from six coffee cooperatives in Peru.

Our estimates complement and improve upon the existing evidence in a number of ways. First, rather than relying on cross-sectional comparisons, we provide estimates based on changes over time. For example, our mill-level analysis is based on an estimating equation that include mill fixed effects (as well as time period fixed effects). The mill fixed effects absorb average differences between the mills in our sample. Therefore, unlike existing studies, our estimates are not derived

from cross-sectional differences. We also complement the existing evidence by testing for spillover benefits of FT. Given that an intended goal of FT is to improve the economic conditions of local communities, these benefits are potentially important. Not accounting for them may significantly understate the benefits of Fair Trade. It not only leads one to ignore the potentially important spillover benefits of Fair Trade, but it also causes a downward bias in the estimated effect of FT certification on producers because the control group also benefits.[2]

The findings here also complement the recent qualitative analysis of Ronchi (2002) that explores the effects of FT in Costa Rica. In 1999, Ronchi (2002) conducted interviews of farmers in FT-certified cooperatives in Costa Rica in an attempt to assess the impacts of FT on the farmers. She found that while most farmers reported having higher standards of living and being able to provide more education for their children since the introduction of FT certification ten years earlier, none of the respondents identified Fair Trade as the source of this improvement. It is possible that these improvements reflected more general trends among all farmers in the coffee sector. However, it is also possible that they were due to FT, but that this was not recognized by the farmers. One does not need to be aware of effects for them to work. Our empirical approach complements this descriptive analysis by providing quantitative estimates of the effects of FT certification within the coffee sector in Costa Rica in the period immediately following Ronchi's (2002) study.

Lastly, our findings contribute a better understanding of how international trade can affect income and education in developing countries. Our findings complement previous studies showing the effects that conventional exports can have in developing countries (e.g., Topalova, 2007, Edmonds, Pavcnik and Topalova, 2010, McCaig, 2011, Brambilla, Porto and Tarozzi, 2012). Our findings highlight the benefit to producers of labels that provide greater information to consumers about the nature of the production process. As has been shown by a number of experiments, consumers are willing to pay significantly more for coffee that was produced in a manner consistent with FT certification (e.g., Arnot, Boxall and Cash, 2006, Hiscox, Broukhim and Litwin, 2011, Hainmueller, Hiscox and Sequeira, 2015).

The paper is organized as follows. In the following section, we provide background information about Fair Trade certification and coffee production in Costa Rica. In section 3, we examine

[2]See Miguel and Kremer (2004) for a well-known example of this, although looking at the effect of a large-scale health intervention on educational outcomes.

effects at the mill-level and test for selection into certification. In section 4, we then examine the effects of FT certification at the household level, examining effects on adult incomes and school enrollment of children. Section 5 concludes.

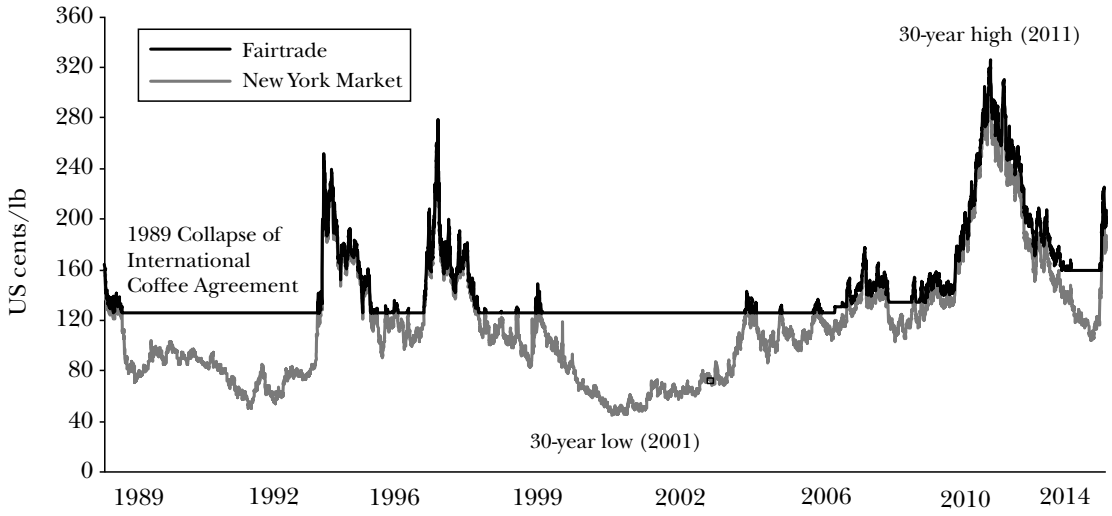
2. Background

A. *Fair Trade Certification*

Fair Trade has its origins in an initiative started in the Netherlands by a church-based NGO in 1988 in response to low coffee prices. The stated aim of the initiative was to ensure growers were provided "sufficient wages". The NGO created a fair trade label for their products called Max Havelaar, named after a fictional Dutch character who opposed the exploitation of coffee pickers in Dutch colonies. Over the next half decade, Max Havelaar was replicated in other European countries and in North America. As well, similar organizations, such as TransFair, emerged. In 1997, various labeling initiatives formed an umbrella association called the Fair Trade Labelling Organization International (FLO), and in 2002, the FT Certification mark was launched.

The stated goal of Fair Trade is to improve the living conditions of farmers in developing countries. In practice, this is accomplished through two primary mechanisms. The first is a guaranteed *minimum price* for all coffee that is sold as Fair Trade, which is set by the Fair Trade Labelling Organization (FLO). The minimum price is meant to cover the average costs of sustainable production and to provide a guarantee that reduces the risk faced by coffee growers. FT buyers must always pay producers at least the minimum price regardless of what the market price is at the time. Currently, the minimum price (for conventional Arabica washed coffee) is set at \$1.40 per pound. For organic coffee, it is \$0.30 more, and for unwashed coffee it is \$0.05 less. The relationship between the minimum FT price and market prices between 1989 and 2014 is shown in Figure 1, which is taken from Dragusanu et al. (2014). As shown, for a significant portion of the past 25 years the price floor has been binding. In addition, for much of our sample period, which starts in 1999, the price floor has been binding.

The second component of FT is a *price premium* that is paid to producers. The premium, which is currently set at \$0.20 per pound, is in addition to the sales price and must be set aside and invested in projects that improve the quality of life of producers and their communities. The specifics of how the premium is to be allocated is supposed to be determined in a democratic man-



Source: © Fairtrade Foundation, adapted and used with permission.
Notes: NB Fairtrade Price = Fairtrade Minimum Price* of 140 cents/lb + 20 cents/lb Fairtrade Premium.** When the New York prices is 140 cents or above, the Fairtrade Price = New York price + 20 cents. The New York Price is the daily settlement price of the 2nd position Coffee C Futures contract at ICE Futures US.
* Fairtrade Minimum Price was increased on June 1, 2008, and April 1, 2011.
** Fairtrade Premium was increased on June 1, 2007, and April 1, 2011.

Figure 1: The Fair Trade minimum coffee price, 1989–2014

ner by the producers themselves. Potential projects that could be funded with the FT premium include the building of schools and health clinics, offering instruction courses to members of the community, provision of educational scholarships, investments in community infrastructure, improvements in water treatment systems, improved production practices, including conversion to organic production and the implementation of environmentally responsible production. For example, Ronchi (2002, pp. 19–20) documents an example of the Costa Rican cooperative Coope Llano Bonito using the premiums to hire a full time agricultural technician to help with such objectives. As of 2011, FLO explicitly mandates that five cents of the premium must be invested towards improving the quality and/or productivity of coffee.

For coffee to be sold under the FT mark, all actors in the supply chain, including importers and exporters, must obtain FT certification. On the production side, the certification is open to small farmer organizations and cooperatives that have a democratic structure, as well as commercial farms and other companies that employ hired labor (Fair Trade Foundation, 2012). The certification entails meeting specific standards that are set and maintained by FLO. An independent certification company FLO-CERT (which became independent from FLO International in 2004) is

in charge of inspecting and certifying producers (Fair Trade Foundation, 2012).

For coffee, the FT compliance criteria focus on the social, economic, and environmental development of the community. In terms of social development, the producer organization must have a democratic structure, transparent administration, and must not discriminate against its members. To satisfy the economic development criteria, organizations need to be able to effectively export their product and administer the premium in a transparent and democratic manner. The environmental development criteria are meant to ensure that the members work towards including environmental practices as an integral part of farm management, by minimizing or eliminating the use of certain fertilizers and pesticides and replacing them with more natural biological methods that help ensure the health and safety of the cooperative members and their communities (Fair Trade Foundation, 2012). In the case of commercial plantations that employ a large number of workers, the FT standards entail that hired workers are not children or forced workers, and are free to bargain collectively. Hired workers must be paid at least the minimum wage in their region, and they must also be given a safe, healthy, and equitable environment (Fair Trade Foundation, 2012).

To obtain FT certification, producer organizations need to submit an application with FLO-CERT. If the application is accepted, the organization goes through an initial inspection process carried out by one of the FLO-CERT representatives in the region. If the minimum requirements are met, the organization is issued a certificate that is usually valid for a year. The certificate can be renewed following re-inspection. Initially, inspection and certification were free of charge until 2004. Since then, producer organizations have had to pay fees associated with applications, initial certifications, and certification renewals.

B. *Coffee Production in Costa Rica*

Costa Rica is the world's 14th largest producer of coffee, with production totaling 1.49 million 60-kilogram bags of coffee in 2016-2017 (International Coffee Organization, 2017). The agro-climatic conditions in this area, and to a large extent in the rest of the country are characterized by volcanic soils, high elevation, warm temperatures that stay relatively constant throughout the year, and climates with distinct wet/dry seasons, which have been very favorable for coffee cultivation (Instituto del Café de Costa Rica, 2017b). Coffee cultivation started to develop after independence from Spain in 1821 and the first coffee plantations were situated in the Central Valley, which is

the area surrounding the capital San Jose. Today, coffee tends to be cultivated on small plots in family farms: 92 percent of coffee farmers have plots that are less than 5 hectares and 6 percent have plots that are between 5 and 20 hectares (Instituto del Café de Costa Rica, 2017a).

During the harvest season, which generally lasts from December to April, coffee farmers deliver the cherries to a collection center belonging to a local mill (called *beneficio*) for processing.[3] The pulp of the cherries is removed and the beans are washed. The resulting product is called parchment coffee. The mills then sell the parchment coffee to exporters and domestic roasters. Exporters are specialized domestic firms who aggregate purchases from multiple mills and sell them to foreign buyers. In many cases, mills and coops have their own export arm. In addition to coffee processing services, cooperatives also provide a range of services to their members such as the provision of agricultural supplies, technical assistance, marketing assistance, and credit.

Coffee processing and sales in Costa Rica are regulated through Law no. 2762, which was adopted in 1961, and is more commonly referred to simply as the 'Coffee Law'. The purpose of the law was "to establish an equitable regime to regulate the relations between coffee producers, mills, and exporters that guarantees a rational and truthful participation of each sector in the coffee business" (Instituto del Café de Costa Rica, 2017c). The Costa Rican government established a non-governmental agency called Instituto del Café de Costa Rica (ICAFE) to implement and enforce the provisions of the Coffee Law.

The process of the sale of coffee is as follows. Farmers deliver their harvested coffee cherries to the mill. At this point, they receive an advance payment which is determined using the world coffee prices that are prevailing at the time. Historically, the advance payment has been approximately two thirds of the total payment that the producer eventually receives. Every 15 days, mills must report the amount of coffee received to ICAFE.

Mills then sell the parchment coffee to exporters and domestic buyers. All coffee sales are registered and must be approved by ICAFE. The contract price must be equal to or above the world coffee price, plus a differential which is set in advance by ICAFE based on four different coffee attributes (five categories, eight types, seven qualities, and six preparations). From January to October, mills make trimestrial payments to producers. These payments are defined by ICAFE according to each mill's sales.

[3]Cooperative members generally take the cherries to be processed at their cooperative mill, although they are free to sell their cherries to others mills.

At the end of the harvest year, after all coffee has been sold, mills pay producers a final liquidation payment. The ICAFE Liquidation Board calculates a liquidation price for each mill which is equal to total mill sales minus each mill's expenses and profits divided by the amount of green coffee received. The total payment to a producer is equal to the mill liquidation price times the amount of coffee received from that producer. Each mill needs to submit detailed expenses to ICAFE for approval. Historically, mill profits have been approximately 9% of total mill sales. The final liquidation prices for each mill must be published in Costa Rica's main newspapers in November, and the mill must pay producers the balance of their payment within eight days. Historically, producers have received approximately 80% of the final coffee price.

There are a number of ways that FT could affect the incomes of farmers in this setting. First, coffee that is sold as FT will have a higher sales price, particularly during periods in which the price floor is binding. In addition, farmers who belong to an FT-certified cooperative that also owns its own mill will also obtain a share of the mill's profits. Furthermore, if the cooperative also registers as an exporter, then the export mark-up (which is about 2.5% of the coffee price) will also go to the cooperatives (and its members). Thus, we expect FT to potentially have two primary effects. It provides a higher final sales price and it helps farmers to capture a larger share of the final price.

C. *Anecdotal Evidence on Selection into Fair Trade Certification*

The central issue for the empirical analysis is the nature of selection into certification. Specifically, a natural question to ask is: if FT has benefits, why aren't all mills FT certified? To better understand the source of variation underlying FT certification, we undertook interviews with four FT-certified cooperatives in August of 2012. The interviews revealed a number of factors that underlie variation in certification status for Costa Rican coffee producers.[4]

While FT has benefits it also has costs and mills vary in the effective costs that FT imposes on them. Several cooperatives mentioned an important cost of FT being the potential loss that they would suffer due to FT requirements that prevent them from selling certain products – primarily pesticides – in their stores. Many mills operate a store where they sell various agricultural supplies to the community. The extent to which a mill earns revenue from the sale of agricultural chemicals banned by FT affects its costs of certification. If this characteristic is

[4]For an earlier case study of FT-certified coffee cooperatives in Costa Rica, see Sick (2008) and Ronchi (2002).

historically determined and varies little over time, it will be captured by the mill fixed effects in our empirical analysis.

In addition, the perceived benefits of FT certification also vary by mill. One of the primary benefits of FT sales is the existence of a guaranteed minimum price. The expected future benefit of this depends on the farmer's belief about future prices. Those farmers that expect the future price of coffee to be above the minimum price perceive lower benefits to FT certification than farmers who believe future coffee prices may drop below the minimum. We also learned that the values and beliefs of farmers play an important role. Farmers who a priori believe in the importance of environmentally sustainable or socially responsible farming practices will be more willing to undertake the changes in production dictated by FT certification. Both of these factors, although important determinants of the timing of certification, are most likely time-invariant and can be accounted for by mill fixed effects in our panel setting.

The final factors that were mentioned were access to information about the certification requirements and the managerial ability that is needed to satisfy the requirements. These factors potentially vary over time and may be correlated with other factors that also affect our outcomes of interest. For example, improvements in management or in international sales connections may affect FT certification, but may also be independently affect the economic outcomes of interest.

A final insight that we gained from our interviews is that the nature of selection appears ambiguous. While positive selection likely arises from the last determinant (being informed), the nature of selection from the last three is ambiguous. In addition, participants of the interviews typically described FT as a strategy that is often pursued by producers who would have difficulty selling their coffee otherwise. This suggests, that selection might be negative. The existing evidence, although scarce, appears to suggest that, on net, selection may be negative. Saenz-Segura and Zuniga-Arias (2009) examine a sample of 103 coffee producers in Costa Rica and find a very strong negative relationship between Fair Trade certification and experience, education, and income. Negative selection was also found by Ruben and Fort (2012) in their study of 360 Peruvian coffee farmers (also see Ruben and Fort, 2009). In their sample, farmers that are less educated and own smaller farms are more likely to become certified.

The fact that many of the important determinants of certification are likely time invariant highlights the importance (and benefit) of estimates that do not rely on cross-sectional variation only. Thus, it is important that our analysis examines a panel of producers and is able to account

for producer fixed effects.

3. Producer-level analysis

To construct the data necessary to examine the effects of FT certification on coffee producers we combine two types of data. The first is information on coffee prices and quantities sold by mills and cooperatives. These are provided by ICAFE by aggregating the individual transaction-level data from the sale contracts between mills and buyers (exporters and domestic roasters). The data contains information on total production (total coffee received for wet-milling from coffee growers in that year's harvest), disaggregated by the quantity sold to exporters and the quantity sold to domestic buyers. The data also include average prices obtained for the coffee sold to exporters and domestic buyers.[5]

Since ICAFE does not collect information on the sales of coffee disaggregated by FT/conventional status, we are only able to identify which cooperatives are FT certified. This information is obtained from multiple sources. The main source comes from FLO certification rosters which are available to us from 2003 until 2011 and which contain the name and date of certification for all producer-organizations. From these we extract the names of certified coffee producers in Costa Rica and create an FT-certification indicator variable that equals one in the years in which a mill is FT certified and zero otherwise. Since official certification rosters from FLO are not available to us prior to 2003 or after 2011, we have supplemented this with records from the mills listed by FLO-CERT as being FT certified to determine their initial date of certification. We link the information on a mill's certification status with the ICAFE data using the name of the producer organization, which is reported in both sources of data. The matched data results in an unbalanced panel of 332 coffee mills that are observed annually from 1999 until 2014.

A. *Checking for evidence of selection into certification*

Before turning to an examination of the effects of FT certification on producers, we first consider the issue of selection into certification. To assess the importance and nature of selection, we check whether, when conditioning on time-invariant producer characteristics, time-varying producer

[5]The ICAFE data are recorded by harvest years (rather than calendar years), which range from October to October. In our data, an observation in year t corresponds to the harvest which is from October in year $t-1$ to October in year t.

characteristics predict the onset of Fair Trade certification. That is, we check whether there is a significant increase in production, exports, or sales prices just prior to the onset of certification. If so, then this is evidence that an omitted time-varying factor, like a new contract to supply an overseas buyer, is causing the producer to become certified. We examine this by estimating the following equation where the dependent variable is an indicator variable for the onset of FT certification:

$$I_{i,t}^{Onset} = \alpha_i + \alpha_t + \beta_1 X_{i,t} + \varepsilon_{i,t}, \tag{1}$$

where i indexes a coffee mill and t years (1999–2014). $I_{i,t}^{Onset}$ is an indicator variable that equals one if period t is the first year that producer i is FT certified. α_i denotes mill fixed effects and α_t denotes year fixed effects. Mill fixed effects control for time-invariant characteristics, like those discussed in section 2C, that may affect the timing of FT certification.

The variable $X_{i,t}$ denotes an observable characteristic that may predict the onset of certification, either domestic sales, exports, total sales, exports as a share of total sales, domestic prices, or export prices. We measure each in two ways. The first is with a one year lag (e.g., in period $t-1$), which tests whether the value of the variable in the previous year predicts the onset of FT certification. The second measure is the growth rate of each variable during the previous two years (e.g., between periods $t-2$ and t). This checks whether the onset of certification is preceded by exceptionally high rates of growth in sales, exports, or prices.

The estimates are reported in Table 1. Panel A reports the coefficients for the variables measured as a one-year lag of their levels and panel B reports the coefficients for the variables measured by their two-year growth rates. For both sets of variables, we are interested in whether we observe a positive relationship between the independent variables and the onset of certification. We find no evidence of such an effect. All twelve reported coefficients are not statistically different from zero, and all twelve have very small point estimates. In addition, the coefficients are as frequently negative as they are positive. Thus, we find no evidence for positive selection of producers into FT certification.

B. *Effects of FT certification on producers*

We now turn to an examination of the estimated effects of FT certification on coffee producers. Our analysis examines a range outcomes. Since the primary mandate of FT is to ensure higher and more stable prices to certified farmers (through the premium and price floor), our primary

Table 1: Determinants of FT Certification

	Dependent variable: Indicator for the onset of FT certification					
	Characteristic for independent variable:					
	ln domestic sales	ln exports	ln total sales	Exports as a share of total sales	ln domestic price	ln export price
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Certification onset and lagged characteristics					
One year lagged characteristic	0.00023	-0.00118	-0.00114	0.00025	0.00687	-0.00848
	(0.00105)	(0.00151)	(0.00144)	(0.00501)	(0.00759)	(0.00806)
Year FE, Mill FE	Y	Y	Y	Y	Y	Y
Observations	1,765	1,742	1,825	1,825	1,765	1,742
R-squared	0.082	0.083	0.082	0.082	0.082	0.083
	Panel B: Certification onset and 2-year growth of characteristics					
Prior 2-year growth (t -2 to t)	-0.00078	0.00089	-0.00073	0.00527	0.00130	0.00741
	(0.00080)	(0.00132)	(0.00132)	(0.00455)	(0.00643)	(0.01070)
Year FE, Mill FE	Y	Y	Y	Y	Y	Y
Observations	1,410	1,412	1,484	1,484	1,440	1,445
R-squared	0.089	0.088	0.088	0.088	0.088	0.089

Notes : Coefficients are reported with standard errors clustered at the mill level in parantheses. All regressions include year fixed effects and mill fixed effects. The dependent variable is an indicator variable that equals one in the first year of Fair Trade certification. The independent variable reported in Panel A is the lag of the characteristic reported in the column heading. The independent variable in panel B is the growth of the characteristic from period t-2 to period t. ***, **, and * indicate significance ath the 1, 5, and 10 percent levels.

outcome of interest is the sales price of coffee. In addition, we examine the quantity of coffee purchased and sold by mills, as well as total revenues.

Although we examine a range of different outcomes, throughout our analysis we place particular importance on price as an outcome. This is because the interpretation of the effects on quantities (and therefore revenues) is complicated by the fact that farmers belonging to an FT-certified cooperative are not obligated to only bring the coffee cherries for processing to the FT-certified cooperative to which they are a member. They can, and often do, sell to other nearby mills. (As we explain in more detail below, because coffee cherries spoil very quickly and must be processed within days, the primary consideration is that the mill must be very close by.) Thus, it is difficult to interpret estimated effects of FT on the quantity of coffee sold by the mill. By contrast, sales prices tell us the effect of FT certification on the price of coffee sold by that mill.

We begin with the following equation:

$$y_{i,t} = \alpha_i + \alpha_t + \beta\, I_{i,t}^{FT} + \varepsilon_{i,t}, \tag{2}$$

where i indexes a coffee mill and t years (1999–2014); $y_{i,t}$ denotes an outcome of interest; $I_{i,t}^{FT}$ is an indicator variable that equals one if mill i is FT certified in year t; and α_i and α_t denote

mill fixed effects and year fixed effects, respectively. Mill fixed effects control for time-invariant characteristics, like those discussed in section 2C, that may be correlated with the timing of FT certification. The coefficient β captures the average effect of FT certification on the outcomes of interest.

Given the nature of FT certification, we do not expect certification to have the same effect in all years. Through its guarantee minimum price, FT should have a greater effect in periods when the coffee price is lower than the price floor and the FT minimum price is binding. To capture this, we also estimate a second specification:

$$y_{i,t} = \mu_i + \mu_t + \gamma_1 I_{i,t}^{FT} + \gamma_2 I_{i,t}^{FT} \cdot I_t^{p<\underline{p}} + \epsilon_{i,t}, \tag{3}$$

where $I_t^{p<\underline{p}}$ is an indicator variable that equals one if the world coffee price is below the minimum FT price at any point during the year. During our sample period, 1999–2014, the world price of coffee was below the FT minimum price for nine years, and thus $I_t^{p<\underline{p}}$ equals one during these periods.

We also estimate a third specification, where we replace the indicator variable $I_t^{p<\underline{p}}$ with a continuous measure of the size of the price gap, P_t^{Gap}. The variable is equal to the FT minimum price minus the world price in years in which the price floor is binding. In years when it is not binding, the variable takes on the value of zero i.e., $P_t^{Gap} = \min\{0, \underline{p} - p\}$. Thus, the variable measures the increase in price that the FT minimum price provides if coffee is sold as FT. The revised estimating equation is:

$$y_{i,t} = \zeta_i + \zeta_t + \phi_1 I_{i,t}^{FT} + \phi_2 I_{i,t}^{FT} \cdot P_t^{Gap} + \nu_{i,t}. \tag{4}$$

In equations (3) and (4), the coefficients γ_2 and ϕ_2 capture the insurance benefits of FT certification that are obtained when the world price of coffee falls below the FT floor. The coefficients γ_1 and ϕ_1 capture the average effect that FT provides, even when the world price is above the price floor. These should capture the benefits of the FT price premium, which producers receive whether or not the price floor is binding.

Our primary outcome of interest is the average price that producers receive for their coffee. Given that the stated intention of FT certification is to provide insurance and higher prices to certified producers, we expect a positive effect of FT certification on prices. We measure prices in two ways. The first is to use actual prices but winsorized at the 99th percentile. Due to mea-

Table 2: The Effect of FT Certification on Sales Prices

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Dependent variable:											
	Domestic Price (USD/lb)			ln Domestic Price			Export Price (USD/lb)			ln Export Price		
Fair Trade Certified, FTC	-0.0244	-0.0393	-0.0310	0.0008	-0.0161	-0.0104	-0.0197	-0.0401	-0.0274	0.0204	0.0095	0.0153
	(0.0241)	(0.0266)	(0.0251)	(0.0379)	(0.0400)	(0.0393)	(0.0288)	(0.0313)	(0.0294)	(0.0246)	(0.0252)	(0.0251)
FTC x Price Gap Indicator		0.0535			0.0609			0.0738***			0.0397**	
		(0.0346)			(0.0383)			(0.0220)			(0.0195)	
FTC x Price Gap (USD/lb)			0.1030			0.1750			0.1210*			0.0809
			(0.0795)			(0.1270)			(0.0618)			(0.1010)
16 Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mill FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,038	2,038	2,038	2,038	2,038	2,038	2,000	2,000	2,000	2,000	2,000	2,000
Number of clusters/mills	307	307	307	307	307	307	307	307	307	307	307	307
Mean of dep. variable	1.14	1.14	1.14	-0.03	-0.03	-0.03	1.48	1.48	1.48	0.30	0.30	0.30
Std. dev. of dep. variable	0.63	0.63	0.63	0.61	0.61	0.61	0.63	0.63	0.63	0.43	0.43	0.43

Notes : The table reports OLS estimates of equations (1)-(3). An observation is a mill-year. Each specification contains mill and year fixed effects. The dependent variable in columns 1-3 is the domestic price calculated as the average price obtained by a mill in a given year for the domestic coffee sales transactions and expressed in USD/lb. The domestic price was winsorized at the 99th percentile. The dependent variable in columns 4-6 is the natural logarithm of the non-winsorized domestic price. The dependent variable in columns 7-9 is the export price calculated as the average price obtained by a mill in a given year in export coffee sales transactions and expressed in USD/lb. The export price was winsorised at at the 99th percentile. The dependent variable in columns 10-12 is the natural logarithm of the non-winsorized export price. The Price Gap Indicator equals 1 in years in which the world price for Arabica coffee is below the FairTrade minimum price. The FairTrade minimum price was equal to $1.25/lb from 1999 to 2010 and $1.35/lb starting in 2011. The Price Gap variable equals zero when the Price Gap Indicator is zero and the difference between the FairTrade minimum price and the world price for Arabica coffee in years when the Price Gap Indicator is equal to 1. The Price Gap variable ranges from 0 to 0.66 USD/lb. Coefficients are reported with standard errors clustered at the mill-level in parantheses. ***, **, and * indicate significance ath the 1, 5, and 10 percent levels.

surement error, a small number of observations have high prices and are thus highly influential. The second is to use the natural log of prices. This facilitates a convenient interpretation of the coefficients and reduces the effect of extreme observations.

Estimates of equations (2)–(4) are reported in Table 2, where we separately examine the price of coffee sold domestically and internationally. In columns 1–6, the dependent variable is the average price of domestic coffee sales and in columns 7–12 it is the average price of coffee exports. Columns 1–3 and 7–9 report estimates using winsorized prices, while columns 4–6 and 10–12 report estimates using the natural log of prices. Estimates of equation (2), which does not allow for a differential effect of FT when the price floor is binding, are reported in columns 1, 4, 7, and 10. In each of the specifications, the estimated coefficient β_1 is small in magnitude and is not statistically different from zero. As is reported in the subsequent columns, this zero effect masks important heterogeneity. Estimates of equation (3) are reported in columns 2, 5, 8, and 11. Examining the price of domestic sales (columns 2 and 5), we find no significant additional benefit to FT certification when the price floor is binding. Although the estimates of γ_1 are positive, they are not statistically different from zero. When we estimate the effect on export prices (columns 8 and 11), we find a positive (and significant) effect of FT certification on prices in years when the price floor was binding. These findings are consistent with the fact that coffee that is sold domestically by FT-certified producers are less likely to be sold as FT certified (and receive the

benefits of its price support). On the other hand, exported coffee that is sold by FT-certified producers is more likely to be sold as FT-certified.

We further investigate the price-support effects of FT by estimating equation (4). The estimates are reported in columns 3, 6, 9, and 12. We find that when the dependent variable is the average price of domestic sales, the coefficient of the FT interaction, ϕ_2, is positive, sizable in magnitude, but insignificant (columns 3 and 6). Thus, for domestically sold coffee, there are additional effects of FT certification when the price floor is binding, but these effects are imprecisely estimated and not statistically different from zero. The estimated effects of FT on the average price of exports are similar in magnitude as the estimates for domestic sales, but are more precisely estimated (columns 9 and 12). The estimate from column 9 is particularly informative. If FT worked perfectly, and all exported coffee sold by a FT-certified producer could be sold as FT, then we would expect the estimate of ϕ_2 to be close to one. That is, a one cent increase in the price gap should result in a one-cent benefit to being FT certified. In reality, it is difficult for FT-certified producers to sell all of their product as FT, and this becomes even more difficult when FT coffee is being sold at significantly higher prices than conventional coffee.[6] The estimate of ϕ_2 in column 9 suggests that each 1 cent of benefit due to the difference between the FT price floor and world price of coffee results in 0.12 cents of benefit to FT-certified exporters. That is, if the FT price insurance mechanism could deliver up to 1 cent of benefit, our estimates indicate that in reality the benefit is 0.12 cents. However, one caveat is that classical measurement error in the independent variables will cause this estimate to be biased towards zero. Thus, this estimate is potentially a worst-case-scenario assessment of the effectiveness of FT price support for producers.

We now turn to an examination of how FT certification affects quantities sold by estimating equations (2)–(4) with various quantity measures as dependent variables. The estimates are reported in Table 3. In columns 1–3, we examine the total quantity received by FT-certified mills from farmers. After receiving the coffee, the mills process the coffee and it is then sold on domestic or international markets. The estimates show evidence that FT-certified mills receive more coffee from farmers in years when the price floor is binding (columns 1–3). Because only FT-certified farmers who are members of a FT cooperative are able to sell to the cooperative, this likely arises because members find it more attractive to sell their coffee to the cooperative

[6]For a discussion on over-certification and free entry into Fair Trade and its effects, see de Janvry, McIntosh and Sadoulet (2015).

Table 3: The Effect of FT Certification on Quantities Received and Sold by Mills

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable:								
	ln Total Quantity Received			ln Total Quantity Sold			Share of Quantity Received that is Sold		
Fair Trade Certified, FTC	0.039	-0.052	-0.007	-0.059	-0.163	-0.099	-0.0012	0.0025	-0.0025
	(0.124)	(0.140)	(0.130)	(0.140)	(0.158)	(0.144)	(0.0073)	(0.0083)	(0.0084)
FTC x Price Gap Indicator		0.398**			0.380*			-0.016**	
		(0.161)			(0.199)			(0.007)	
FTC x Price Gap (USD/lb)			0.888*			0.636			0.027
			(0.460)			(0.449)			(0.097)
16 Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mill FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,740	1,740	1,740	2,108	2,108	2,108	1,740	1,740	1,740
Number of clusters/mills	307	307	307	307	307	307	307	307	307
Mean of dep. variable	7.93	7.93	7.93	12.85	12.85	12.85	0.97	0.97	0.97
Std. dev. of dep. variable	2.18	2.18	2.18	2.19	2.19	2.19	0.09	0.09	0.09

Notes: The table reports OLS estimates of equations (1)-(3). An observation is a mill-year. Each specification contains mill and year fixed effects. The dependent variable in columns 1-3 is the natural logarithm of the total quantity received by the mill from coffee farmers. This variable is only reported in the sample years 2003 to 2014. The dependent variable in columns 4-6 is the natural logarithm of the total quantity (expressed in lbs) sold by a mill on the export market. The dependent variable in columns 7-9 is equal to the ratio of total quantity sold and total quantity received. Note that this variable is only reported in the sample years 2003 to 2014. The Price Gap Indicator equals one in years in which the world price for Arabica coffee is below the FairTrade minimum price. The FairTrade minimum price was equal to \$1.25/lb from 1999 to 2010 and \$1.35/lb starting in 2011. The Price Gap variable equals zero when the Price Gap Indicator is zero and the difference between the FairTrade minimum price and the world price for Arabica coffee in years when the Price Gap Indicator is equal to one. The Price Gap variable ranges from 0 to 0.66 USD/lb. Coefficients are reported with standard errors clustered at the mill-level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

rather than a conventional mill. (While FT certified member farmers generally sell to their coop, they often also sell their coffee to other third parties.)[7] When world prices are low and the FT minimum price becomes binding, then FT-certified mills have the potential to pay higher prices relative to non-FT mills (if the coffee is sold as FT). According to the estimates from column 2, FT-certified mills receive $0.40 - 0.05 = 35\%$ more coffee relative to non-certified mills in years when the price floor is binding. When it is not binding, similar quantities are received.

Columns 4–6 show that the total quantities sold by the mill (both domestically and internationally) follow the same pattern as the total quantities received by the mill. Thus, we see that when the price floor is binding FT-certified mills both receive more coffee (columns 1–3) and sell more coffee (columns 4–6). Comparing the two sets of coefficients, we see that the interaction coefficients for the quantity sold regressions are lower than the interaction coefficients for the quantity received regressions: 0.40 versus 0.38 (column 2 versus column 5); and 0.89 versus 0.64 (column 3 versus column 6). This raises the question of whether FT-certified mills are less able to sell all coffee received when the price floor is binding. Thus, in columns 7–9, we reported

[7] Although the policy of FT cooperatives is that members should not sell their products to other mills or third-party intermediaries, in reality farmers typically do (Ronchi, 2002, p. 16).

Table 4: The Effect of FT Certification on Quantity Sold Domestically and Internationally

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable:								
	ln Domestic Quantity Sold			ln Export Quantity Sold			Export Quantity as a Share of Total Quantity Sold		
Fair Trade Certified, FTC	-0.125	-0.327	-0.222	-0.0108	-0.0905	-0.0342	0.0356	0.0517	0.0433
	(0.210)	(0.235)	(0.219)	(0.164)	(0.182)	(0.169)	(0.0320)	(0.0355)	(0.0334)
FTC x Price Gap Indicator		0.730***			0.289			-0.058	
		(0.205)			(0.198)			(0.044)	
FTC x Price Gap (USD/lb)			1.518***			0.370			-0.121
			(0.445)			(0.441)			(0.078)
16 Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mill FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	2,038	2,038	2,038	2,000	2,000	2,000	2,108	2,108	2,108
Number of clusters/mills	307	307	307	307	307	307	307	307	307
Mean of dep. variable	10.9	10.9	10.9	12.8	12.8	12.8	0.79	0.79	0.79
Std. dev. of dep. variable	2.3	2.3	2.3	2.1	2.1	2.1	0.25	0.25	0.25

Notes: The table reports OLS estimates of equations (1)-(3). An observation is a mill-year. Each specification contains mill and year fixed effects. The dependent variable in columns 1-3 is the natural logarithm of the total quantity (expressed in lbs) sold by a mill on the domestic market. The dependent variable in columns 4-6 is the natural logarithm of the total quantity (expressed in lbs) sold by a mill on the export market. The dependent variable in columns 7-9 is equal to the ratio of export quantity sold over total quantity sold. The Price Gap Indicator equals one in years in which the world price for Arabica coffee is below the FairTrade minimum price. The FairTrade minimum price was equal to $1.25/lb from 1999 to 2010 and $1.35/lb starting in 2011. The Price Gap variable equals zero when the Price Gap Indicator is zero and the difference between the FairTrade minimum price and the world price for Arabica coffee in years when the Price Gap Indicator is equal to one. The Price Gap variable ranges from 0 to 0.66 USD/lb. Coefficients are reported with standard errors clustered at the mill-level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

estimate of equations (2)–(4) with the share of the quantity received that is sold as the dependent variable. We find mixed evidence of more coffee being unsold by certified mills when the price floor is binding. In column 8, the coefficient on the interaction term is negative and significant, but in column 9 it is positive and insignificant. The negative coefficient, although significant, is small in magnitude and very close to zero. The coefficient suggests that 1.6% less of the coffee received can be sold by FT-certified mills when the price floor is binding.

We next turn to a closer examination of the quantity of coffee sold and estimate effects separately for domestic and international sales. The estimates are reported in Table 4. Columns 1–3 report estimates of equations (2)–(4) with the quantity of domestic coffee sales as the dependent variable, while columns 4–6 report estimates with the quantity of coffee exports as the dependent variable. We see that the effects on total sales appear to be mainly due to domestic sales. The coefficients on the interaction terms for domestic sales are larger in magnitude and more precisely estimated than for foreign sales. This suggests that at times when the price floor is binding, although some of the additional coffee received by FT-certified mills is exported, most appears to be sold domestically. In columns 7–9, we test for a differential effect on domestic sales versus exports for certified mills when the price floor binds. As reported, while in general FT-certified

Table 5: The Effect of FT Certification on Revenues

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Dependent variable:								
	ln Total Revenue			ln Domestic Revenue:			ln Export Revenue:		
Fair Trade Certified, FTC	-0.080	-0.191	-0.124	-0.124	-0.344	-0.233	0.0097	-0.081	-0.019
	(0.137)	(0.155)	(0.141)	(0.228)	(0.251)	(0.236)	(0.158)	(0.176)	(0.163)
FTC x Price Gap Indicator		0.400**			0.791***			0.329*	
		(0.181)			(0.217)			(0.198)	
FTC x Price Gap (USD/lb)			0.676*			1.693***			0.451
			(0.408)			(0.481)			(0.450)
16 Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mill FE	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1,928	1,928	1,928	2,038	2,038	2,038	2,000	2,000	2,000
Number of clusters/mills	307	307	307	307	307	307	307	307	307
Mean of dep. variable	13.36	13.36	13.36	10.83	10.83	10.83	13.10	13.10	13.10
Std. dev. of dep. variable	1.86	1.86	1.86	2.17	2.17	2.17	1.95	1.95	1.95

Notes: The table reports OLS estimates of equations (1)-(3). An observation is a mill-year. Each specification contains mill and year fixed effects. The dependent variable in columns 1-3 is the total revenue (expressed in USD) obtained by a mill in a given year and equals the sum of domestic and export revenue. The dependent variable in columns 4-6 is the natural logarithm of domestic revenue (expressed in USD) obtained by a mill in a given year. The dependent variable in columns 7-9 is the natural logarithm of export revenue (expressed in USD) obtained by a mill in a given year. The Price Gap Indicator equals one in years in which the world price for Arabica coffee is below the FairTrade minimum price. The FairTrade minimum price was equal to \$1.25/lb from 1999-2010 and \$1.35/lb starting in 2011. The Price Gap variable equals zero when the Price Gap Indicator is zero and the difference between the FairTrade minimum price and the world price for Arabica coffee in years when the Price Gap Indicator is equal to one. The Price Gap variable ranges from 0 to 0.66 USD/lb. Coefficients are reported with standard errors clustered at the mill level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

mills export more, when the price floor binds, the export share of FT-certified mills tends to decrease, although this estimated effect is not statistically different from zero.

The final outcome that we examine is the total revenue received by mills. Estimates of equations (2)–(4) with the natural log of total revenues as the dependent variable are reported in columns 1–3 of Table 5. The estimates show large and significant effects of FT certification on the revenues of FT-certified mills when the price floor is binding. Disaggregating revenues between domestic revenues (columns 4–6) and export revenues (columns 7–9), we find that similar effects are found for both, but that the magnitude of the estimated effect is noticeably larger for domestic revenues.

A clear picture emerges from the estimates reported in Tables 2–5. When the price floor binds, FT-certified farmers have potential access to a market that offers significantly higher prices than the conventional market. We observe the higher prices in the estimates of Table 2. The FT-certified farmers recognize the benefit of selling their coffee as FT-certified through their local FT-certified cooperative to which they are a member rather than through other conventional mills. Thus, the amount of coffee that is sold by farmers to FT-certified cooperatives increases (columns 1–3 of Table 3). The FT cooperative then attempts to sell more coffee on the domestic and export

markets. While we see that nearly all of the extra coffee is sold (columns 4–9 of Table 3), more of the extra coffee ends up being sold on the domestic market than the export market (Table 4). Because FT-certified mills receive a higher price when the price floor is binding, and they sell greater quantities, their total revenues are also greater; this is true for both domestic and export revenues (Table 5).

We conclude by reminding the reader of an important caveat. Because we are unable to observe whether or not coffee sold is FT-certified, our interpretation of the estimates in Tables 2–5 is with indirect evidence. Unfortunately, we are not able to observe directly the prices or sales of coffee that is sold as conventional nor sold as FT.

4. Effects of FT Certification on Households

A. *Data and Estimating Equations*

Having examined the effects of FT certification on producers, we now turn to an examination of the effect of FT certification on households. We do this by linking our matched ICAFE-FLO data (used in the previous section) with household survey data from *Encuesta Hogares de Propositos Multiples* (EHPM). The EHPM survey, which has been carried out in July of each year since 1981, contains information on household members' age, gender, occupation, industry of employment, income, and education. Although the mill-level data start in 1999, we begin our individual-level analysis in 2001 because the survey data does not record the canton of the household prior to then. Because sufficiently detailed occupation and industry data stop being available after 2009, our analysis ends in 2009. Thus, the full sample period is 2001–2009.

Looking at the relationship between world prices and the FT price floor shown in Figure 1, we see that for nearly all of the 2001–2009 period, the price floor was binding.[8] Thus, our household-level estimates should be interpreted as the effects of FT certification on households during a period in which the price floor is binding. Before turning to the household-level analysis, we first estimate the average effect of FT certification on producers during this more restricted time period. Estimates of equation (2) are reported in Table 6. During this period, we estimate large positive effects of FT certification on the price of coffee sold for export (columns 3–4), and insignificant effects on the price of coffee sold domestically (columns 1–2). The findings are

[8]More specifically, the price floor was binding from 1999 until February of 2008.

Table 6: Price of Coffee Sold by Mills, 2001–2009

	(1)	(2)	(3)	(4)
	Dependent variable:			
	Domestic Price (USD/lb)	ln Domestic Price	Export Price (USD/lb)	ln Export Price
Fair Trade Certified, FTC	-0.0066	0.0080	0.0623***	0.0870***
	(0.0266)	(0.0687)	(0.0235)	(0.0321)
9 Year FE	Y	Y	Y	Y
Mill FE	Y	Y	Y	Y
Observations	977	977	972	972
Number of clusters/mills	307	307	307	307
Mean of dep. variable	0.80	-0.36	1.08	0.02
Std. dev. of dep. variable	0.37	0.56	0.34	0.34

Notes : The table reports OLS estimates of equation (1). An observation is a mill-year. Each specification contains mill and year fixed effects. The dependent variable in column 1 is the domestic price calculated as the average price obtained by a mill in a given year for the domestic coffee sales transactions and expressed in USD/lb. The domestic price was winsorized at the 99th percentile. The dependent variable in column 2 is the natural logarithm of the non-winsorized domestic price. The dependent variable in column 3 is the export price calculated as the average price obtained by a mill in a given year in export coffee sales transactions and expressed in USD/lb. The export price was winsorised at at the 99th percentile. The dependent variable in column 4 is the natural logarithm of the non-winsorized export price. Coefficients are reported with standard errors clustered at the mill-level in parantheses. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

consistent with the estimates reported in Table 2, which examine a longer time period and allow for differential effects depending on the extent to which the price floor was binding. The period from 2001–2009 was a period for which the price floor was binding almost continuously, and so estimating the average effect for this period yields sizable effects, particularly on export prices.

We link the matched ICAFE-FLO mill-level data to the EHPM household survey data using the canton of the mill and the canton of the household.[9] The canton is the secondary administrative level in Costa Rica, and there are 81 cantons in total. Because harvested coffee cherries immediately begin to decompose and ferment, compromising the quality of the coffee, processing must occur within 24 hours after the cherries have been harvested. Given this, the locations of farms and the mills will generally be within the same canton.

Our treatment variable is a measure of FT certification intensity in a canton c in year t, which we denote with $FTI_{c,t}$. The measure we construct is the fraction of total exports from a canton that are sold by Fair Trade certified mills.[10] More precisely, let $X_{k,c,t}$ denote total coffee exports in

[9]We obtain information of the canton of each mill from the address recorded by ICAFE. In the few cases where the address of the mill is not available from ICAFE, we obtained the information by contacting the mill directly. We are able to identify the canton of mills for 90% of all exports between 2001-2009.

[10]It is important to emphasize that our measure is not a measure of the share of exports that are sold as FT certified. Because we do not know sales of FT certified coffee and non-FT certified coffee by mill, we are unable to construct this measure. Among the four cooperatives we interviewed in 2012, the share of their total sales in the previous year that was sold as FT was 80, 53, 40, and 10%.

year t by mill k located in canton c, and let $I^{FT}_{k,c,t}$ be an indicator variable that equals one if mill k is FT certified in year t. Then, our measure of FT intensity of canton c in year t, $FTI_{c,t}$, is given by:

$$FTI_{c,t} = \sum_k \frac{X_{k,c,t} \cdot I^{FT}_{k,c,t}}{X_{k,c,t}}. \tag{5}$$

When there is no coffee production in a county and year, i.e., $\sum_k X_{k,c,t} = 0$, we assign $FTI_{c,t}$ the value of zero. That is, we assume the populations in the canton experience no treatment. As we show, our estimates are nearly identical if we restrict our sample to include only cantons that produce coffee. The benefit of examining a larger sample of households, including those that live in cantons that do not produce coffee, is that the coefficients for the covariates in the regression, including industry and occupation fixed effects, are more precisely estimated.

A map showing broad categories of the average Fair Trade intensity of cantons in 2001 and 2009 is provided in Figure 2. Cantons with no coffee production are shown in the lightest shade. Of the 81 cantons in Costa Rica, 45 did not produce coffee during our sample period.[11] For the 36 cantons with coffee production, the value of $FTI_{c,t}$ is represented by shading from light/yellow (low FT intensity) to dark/brown (high FT intensity).

The first estimating equation that we consider is one where we simply estimate the impact of FT certification on income. The equation is:

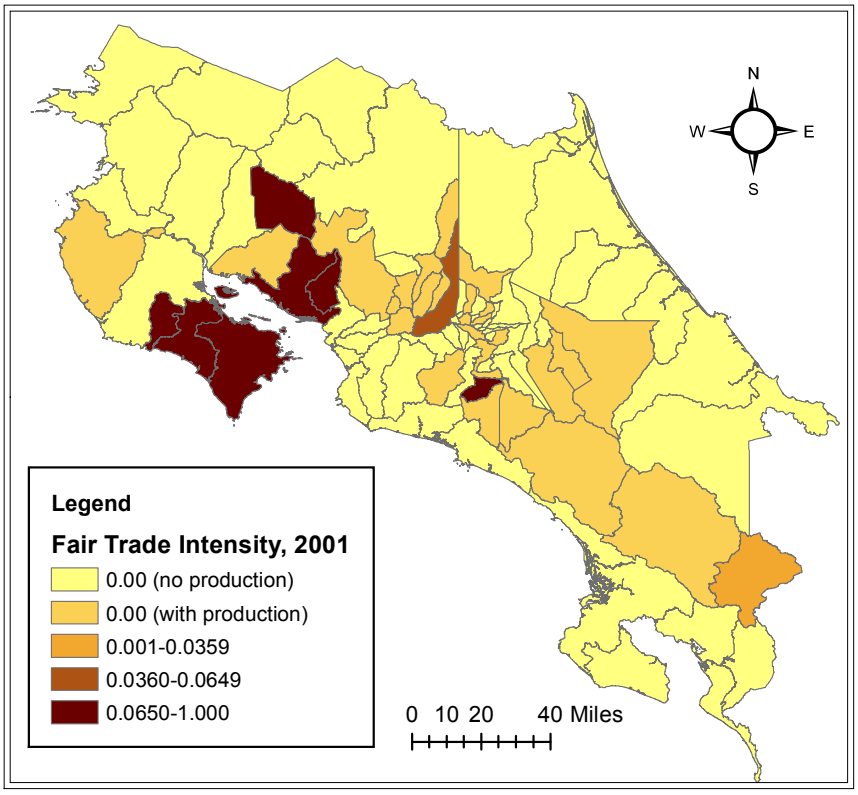
$$y_{j,i,c,t} = \alpha_i + \alpha_c + \alpha_t + \theta FTI_{c,t} + \mathbf{X}'_{j,t}\mathbf{\Gamma} + \varepsilon_{j,i,c,t}, \tag{6}$$

where j denotes individuals, i industries (480), c cantons, and t years (2001–2009). The sample includes all employed individuals over the age of twelve.[12] The dependent variable, $y_{j,i,c,t}$, denotes income in the past month, measured in the current local currency (colones). $FTI_{c,t}$ is our measure of the extent of Fair Trade certification in canton c in year t. $\mathbf{X}'_{j,t}$ is a vector of individual-level covariates: educational-attainment fixed effects,[13] age, age^2, gender, gender $\times$ age, and gender $\times$ age^2. The equation also includes canton fixed effects α_c, survey year fixed effects α_t, and industry-of-employment fixed effects α_i. The canton fixed effects control for time-invariant regional characteristics that affect the outcomes; survey-year fixed effects control

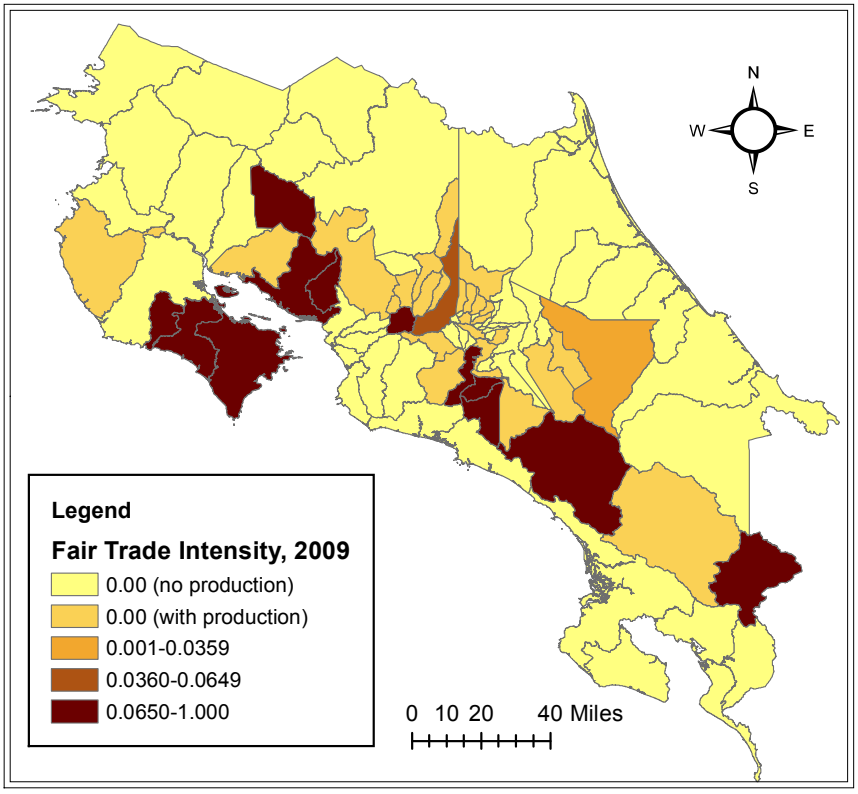
[11] As we explain below, all empirical results are robust to restricting the analysis to only include the 36 coffee producing cantons. In addition, results are robust to only examining the rural areas within these cantons.

[12] To be included in the sample an individual must be employed, and report an income, an occupation, and an industry of employment. As we show, our estimates are similar if we vary this criterion.

[13] The categories are: No education, Preparatory, Special Education, Primary Education, High-school (academic), High-school (technical), Parauniversity, University



(a) Fair Trade certification in 2001



(b) Fair Trade certification in 2009

Figure 2: Share of coffee producers that are Fair Trade certified (weighted by total exports) in the first (2001) and last (2009) periods of our panel.

for macroeconomic shocks that are common to all industries and cantons; and industry fixed effects control for time-invariant industry characteristics.

The coefficient θ is an estimate of the effect of FT-certification on all individuals living within a canton. Although it is possible that some effects of FT are felt by all individuals within a canton, it is likely that the effects are greatest for individuals working directly within the coffee industry. We allow for this by estimating the following equation, which allows for a differential effect of FT certification on those who work in the coffee industry:

$$y_{j,i,c,t} = \alpha_i + \alpha_c + \alpha_t + \mu_1 FTI_{c,t} + \mu_2 FTI_{c,t} \cdot I_j^{i=\text{coffee}} + \mathbf{X}_{j,t}\mathbf{\Gamma} + \varepsilon_{j,i,c,t} \tag{7}$$

where $I_j^{i=\text{coffee}}$ is an indicator variable that equals one if individual j's reported primary industry-of-employment is the "cultivation of coffee".[14] The inclusion of $FTI_{c,t} \cdot I_j^{i=\text{coffee}}$ in equation (7) allows for a differential effect of FT certification for those who work in the coffee sector. The coefficient μ_2 measures the additional effect that FT certification has on these individuals. The total effect of FT certification for these individuals is given by $\mu_1 + \mu_2$. The coefficient μ_1 measures the effect of increasing FT intensity within a region on individuals not working in the coffee industry. Thus, it can be interpreted as the average spillover effect of FT certification for all individuals within the region.

It is possible that, even within the coffee industry, workers benefit differentially from FT certification. For example, farm owners may benefit more than unskilled coffee pickers who are hired seasonally. In addition, one of the implicit goals of FT is to transfer rents from large intermediaries to small-scale farmers. Motivated by this, we examine the distribution of benefits of FT certification with an estimating equation that distinguishes between three different occupations within the coffee industry: skilled agricultural workers, unskilled agricultural workers, and other non-farm occupations. The latter are likely to be those involved in the sales, storage, transport and/or processing of coffee (e.g., intermediaries, mills, and their employees). We do this by augmenting equation (7) with an occupation dimension and allowing for a differential effect of FT certification on those in the coffee industry depending on their occupation.

The augmented estimating equation is:

$$\begin{aligned} \ln y_{j,i,o,c,t} &= \alpha_{i,o} + \alpha_c + \alpha_t \\ &\quad + \gamma_1 FTI_{c,t} + \gamma_2 FTI_{c,t} \cdot I_j^{i=\text{coffee},o=\text{skilled}} \end{aligned}$$

[14] Specifically, the indicator equals one if the observation's primary employment is in industry 01140.

$$+\gamma_3 FTI_{c,t} \cdot I_j^{i=\text{coffee},o=\text{unskilled}} + \gamma_4 FTI_{c,t} \cdot I_j^{i=\text{coffee},o=\text{nonfarm}}$$
$$+\mathbf{X}_{j,t}\mathbf{\Gamma} + \varepsilon_{j,i,o,c,t}, \tag{8}$$

where o indexes a worker's self-reported occupation (413 in total), and $\alpha_{i,o}$ indicate occupation-industry fixed effects. The variable $I_j^{i=\text{coffee},o=\text{skilled}}$ is an indicator variable that equals one if individual j works in the coffee sector and has a "skilled" occupation (which includes categories such as "farmers", "growers", and "skilled workers"); $I_j^{i=\text{coffee},o=\text{unskilled}}$ is an indicator that equals one if individual j works in the coffee sector and has an unskilled occupation (which primarily consists of "agricultural laborers" and "coffee pickers");[15] and $I_j^{i=\text{coffee},o=\text{nonfarm}}$ is an indicator variable that equals one if individual j works in the coffee sector, but is in other non-farm occupations. The residual category primarily consists of individuals involved in the management, sales, storage, transport and/or processing of coffee. The three interaction terms allow the effects of FT certification in a canton to be different for those working in coffee in each of the three different occupation groups. Thus, the coefficients γ_2, γ_3, and γ_4 measure the additional effect of FT on those working in the coffee industry and in each of the occupational groups.

In equation (8), the spillover effect of FT to those in a canton, which is given by γ_1, is assumed to be the same for all individuals independent of their occupation. An alternative strategy is to allow these effects to vary depending on an individual's occupation. This can be done by including the following double interactions in the estimating equation: $FTI_{d,t} \cdot I_j^{i=\text{skilled}}$, $FTI_{d,t} \cdot I_j^{o=\text{unskilled}}$, and $FTI_{d,t} \cdot I_j^{o=\text{nonfarm}}$. Doing this results in the following equation:

$$\begin{aligned}
\ln y_{j,i,o,c,t} \;=\; & \alpha_{i,o} + \alpha_c + \alpha_t \\
& + \beta_1 FTI_{c,t} \cdot I_j^{o=\text{skilled}} + \beta_2 FTI_{c,t} \cdot I_j^{o=\text{unskilled}} + \beta_3 FTI_{c,t} \cdot I_j^{o=\text{nonfarm}} \\
& + \beta_4 FTI_{c,t} \cdot I_j^{i=\text{coffee},o=\text{skilled}} + \beta_5 FTI_{c,t} \cdot I_j^{i=\text{coffee},o=\text{unskilled}} \\
& + \beta_6 FTI_{c,t} \cdot I_j^{i=\text{coffee},o=\text{nonfarm}} + \mathbf{X}_{j,t}\mathbf{\Gamma} + \varepsilon_{j,i,o,c,t}.
\end{aligned} \tag{9}$$

The coefficient β_1 measures the spillover effect of FT certification on skilled individuals within a canton, while β_4 measures the additional effect of FT certification on skilled individuals who work in the coffee industry. Thus, the total effect of FT certification for skilled workers in the coffee industry is given by $\beta_1 + \beta_4$. Similarly, the total effect of FT certification for unskilled workers

[15] Skilled agricultural occupations is category 61 of 'primary occupational group' variable in the household survey. The categories are based on the *Classification de Ocupaciones de Costa Rica*, which was published by the Costa Rica Statistical Institute. Unskilled agricultural occupations are category 92. Non-farm occupations are all other categories.

who are not in the coffee industry is given by β_2, while the total effect for unskilled workers in the coffee industry is given by $\beta_2 + \beta_5$. Analogously, for nonfarm workers, the spillover effect is given by β_3 and the total effect for nonfarm workers in the coffee industry is given by $\beta_3 + \beta_6$.

B. ***Estimated Effects of FT on Incomes***

Estimates of equations (6)–(9) are reported in Table 7. Column 1 reports an estimate of equation (6), which allows for an average effect of FT certification for all individuals within a canton in a year. The estimates show a positive and significant average effect of FT intensity on household incomes. According to the estimated coefficient, a one-standard-deviation increase in FT intensity (0.28) is associated with a 3.1% ($0.269 \times 0.114 = 0.031$) increase in incomes.[16] In column 2, we report our estimate of equation (7), which allows the effect of FT to differ for those that work in the coffee sector. We continue to find a sizable general effect, and also estimate an additional positive effect of FT intensity within the coffee sector. The additional effect, although sizable and close to the same magnitude as the general effect, is imprecisely estimated and not statistically different from zero.

The estimated positive general effects of FT, θ and μ_1, likely arise for a number of potential reasons. First, the FT premiums received by the cooperatives are typically used on local public goods that benefit the whole community, not just the members of the cooperative or those within the coffee sector. For example, the cooperative COOPELDOS sets aside a specific amount per unit of coffee for the maintenance of roads in the area, which increases the productivity of many within the region, not just coffee producers (Ronchi, 2002, pp. 20–21). Another example is from the cooperative COOPE CERRO AZUL, which sets a minimum wage for any laborers hired by its members. Given the integrated market for unskilled labor, this, in turn, has had spillover benefits for all unskilled workers in the region. Other nearby organizations that also hired laborers – and not necessarily in coffee – have had to match the wages paid by the cooperative (Ronchi, 2002, p. 21).

We next turn to estimates of equation (8), which allow for heterogeneous effects within the coffee sector. The estimates, which are reported in column 3, show that the average effect for those within the coffee sector masks significant heterogeneity. The baseline effect for those not

[16]The mean of the FT intensity measure is 0.090 and the standard deviation is 0.268. Summary statistics for the household-level analysis are reported Appendix Table A2.

in the coffee industry remains statistically significant and similar in magnitude to column 2. The estimate of γ_2 shows that there is an additional benefit to skilled coffee growers. The total benefit of FT certification for this group ($\hat{\gamma}_1 + \hat{\gamma}_2$) is: $0.128 + 0.285 = 0.413$. The estimate of γ_3 shows that unskilled workers in the coffee sector receive no additional benefit from FT certification. For this group, the combined effect ($\hat{\gamma}_1 + \hat{\gamma}_3$) is: $0.127 - 0.093 = 0.034$. Those in non-farm occupations working in the coffee sector – who are primarily intermediaries and their employees – appear to lose from FT certification. The additional effect to this group is negative and highly significant. The total effect of FT certification for this group ($\hat{\gamma}_1 + \hat{\gamma}_4$) is negative and significant: $0.128 - 0.272 = -0.144$.

The finding of a large benefit from FT certification for skilled coffee growers (who are mainly the farm owners), but not for unskilled workers is confirmed by the estimates of equation (9), which are reported in column 4. Overall, the estimates of equation (9), which allows the spillover effects of FT certification to differ depending on an individual's occupation, confirm the findings from equation (8). According to the estimates, there are statistically significant positive spillover effects for those in unskilled occupations ($\hat{\beta}_2 = 0.124$) and for those in non-farm occupations ($\hat{\beta}_3 = 0.135$). For those working in skilled occupations, the spillovers are also positive, although they are smaller in magnitude and not statistically significant ($\hat{\beta}_1 = 0.053$). These findings are not surprising given that the public goods and community projects that result from FT premiums are typically developed to help rural and lower-income populations.

Overall, the estimates show that while FT significantly increases the incomes of those working in skilled occupations in the coffee sector (e.g., farm owners), it has a large negative effect on the incomes of those working in non-farm occupations within the coffee sector.[17] Thus, it appears as if FT redistributes money from intermediaries to the farm owners. Given that this redistribution is a goal of FT, this result is not surprising.[18] In practice, this likely occurs because when cooperatives obtain the FT certification and are offering higher prices, coffee growers are more likely to take their coffee cherries for processing at the cooperative mill. Stand-alone mills and exporters (i.e. intermediaries) will tend to lose as a result. Part of the FT initiative is aimed at helping farmers

[17] Although we do not know with certainty that intermediaries comprise the majority of workers in the non-farm category, as we report below in Table 8, we do observe that their average income is approximately 42% higher than for skilled coffee workers and 100% higher than non-skilled workers. In addition, the number of individuals in this sector is very small. While there are 1,388 individuals in skilled occupations in the coffee sector, there are only 214 individuals working in non-farm occupations in the coffee sector.

[18] For a theoretical examination of this consequence of FT see Podhorsky (2015).

Table 7: The Effect of FT on Incomes by Industry and Occupation.

	Sample: All individuals 12 or older Dependent variable: ln monthly income			
	(1)	(2)	(3)	(4)
Fair Trade Intensity, FTI	0.114*** (0.027)	0.106*** (0.028)	0.128*** (0.030)	
FTI x Coffee		0.092 (0.089)		
FTI x Skilled				0.053 (0.061)
FTI x Unskilled				0.124*** (0.047)
FTI x Nonfarm				0.135*** (0.030)
FTI x Coffee x Skilled			0.285* (0.151)	0.358** (0.150)
FTI x Coffee x Unskilled			-0.093 (0.084)	-0.093 (0.093)
FTI x Coffee x Nonfarm			-0.272*** (0.102)	-0.280*** (0.099)
Age, age^2, gender & interactions	Y	Y	Y	Y
Education FE	Y	Y	Y	Y
79 Canton FE	Y	Y	Y	Y
9 Year FE	Y	Y	Y	Y
9,793 Industry x Occupation FE	N	N	Y	Y
461 Industry FE	Y	Y	N	N
Observations	143,364	143,364	143,364	143,364
Clusters	79	79	79	79
R-squared	0.521	0.521	0.611	0.611

Notes: The unit of observation is an individual. The sample includes all individuals over the age of 12 who report an income and an industry and occupation of employment. The dependent variable is the natural log of monthly income. The variable *Coffee* is equal to 1 if the individual's primary industry of employment is coffee cultivation. The variables *Skilled*, *Unskilled* and *Nonfarm* equal 1 if an individual's primary occupation is skilled agricultural worker, unskilled agricultural worker or other nonfarm occupation, respectively. All regressions include education FE, canton FE, year FE, and controls for age, age-squared, gender, gender x age, and gender x age-squared. Coefficients are reported with standard errors clustered at the canton level. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

market and sell their own coffee, thus removing the need to use external intermediaries. This is done by not only requiring that farmers form cooperatives that process and sell the coffee, but the FT organization also tries to connect farmers to FT certified purchasers of coffee. In addition, knowledge and technical training is also provided to farmers to help them better understand the market.

Our findings also show that there is no additional benefit (beyond the general spillover benefit to all) to unskilled workers in the coffee sector. This is not surprising once one considers the structure of FT. Unless the members of the cooperative, who will tend to be the 'skilled workers' in our sample, decide to allocate some of the premium to increasing the wages of coffee pickers and other hired workers (unskilled workers in the sample), then we should not expect to see any income effects for this group of workers from increasing FT production. These findings are consistent with descriptive evidence from Valkila and Nygren (2009), which shows that Guatemalan coffee workers do not appear to benefit from Fair Trade.

Given the uneven benefits of FT within the coffee sector, it is important to understand the relative sizes of the different groups, as well as their relative levels of prosperity. Table 8 provides this information. It reports average monthly incomes over the sample period (2001–2009), measured in Costa Rican colones. (The average exchange rate from 2001–2009 was approximately 440 Costa Rican colones per US dollar.) The first panel of the table looks across all households in the sample and, for each industry and occupation category, reports the number of households in our sample and average monthly income. For the full sample, the average monthly income is 185,689 colones or $422 dollars. For individuals working in the coffee industry, the average is significantly lower at about 95,061 colones. Within this industry, incomes are higher than average for skilled coffee workers (107,166), lower than average for unskilled workers (76,831) and significantly higher than average for non-farm occupations (151,660). In the sample, other occupations account for about 6.7% of all workers in the coffee industry, unskilled occupations account for 49.7%, and skilled occupations account for 43.5%. The lower panels in 8 show that similar patterns are observed if we restrict the sample to households that are in coffee-producing cantons or households in the rural regions of coffee-producing cantons.

These statistics suggest that for the vast majority of workers in the coffee industry (93.3%) FT either has positive or non-existent effects on incomes (beyond the positive spillover effects felt by all). The group that is hurt (those in non-farm occupations) comprises a very small proportion

Table 8: Average Incomes by Industry and Occupation.

	All occupations	Skilled agriculture only	Unskilled agriculture only	Nonfarm occupations
		All of Costa Rica		
All industries	185,689 n = 143,364	125,372 n = 11,217	95,708 n = 15,659	210,330 n = 102,756
Coffee industry only	95,061 n = 3,188	107,166 n = 1,388	76,831 n = 1,586	151,660 n = 214
		Coffee Producing Cantons Only		
All industries	185,406 n = 71,747	115,319 n = 5,636	85,926 n = 6,425	208,491 n = 52,702
Coffee industry only	95,318 n = 2,909	107,220 n = 1,294	76,951 n = 1,435	156,181 n=180
		Rural Parts of Coffee Producing Cantons Only		
All industries	161,851 n=42,627	113,040 n = 5,085	84,841 n = 5,978	190,986 n = 27,724
Coffee industry only	92,097 n = 2,760	104,502 n = 1,231	75,763 n = 1,376	139,182 n = 153

Notes: The table reports average monthly income (in colones) and the number of observations. 500 Costa Rican colones is equal to approximately one U.S. dollar.

of all workers in the coffee sector and they have incomes that are almost 100% higher than the incomes of those in unskilled occupations and 42% higher than the incomes of those in skilled occupations. Although the group that benefits significantly from FT has higher incomes than those in unskilled occupations, their incomes are still much lower than the average for all of Costa Rica. While the average income in the full sample is 185,689 colones, the average income for those in skilled occupations in the coffee sector is 107,166 colones. Thus, the primary beneficiaries of FT are economically disadvantaged, even if they are not the very poorest group.

a. Robustness and Sensitivity Checks

We now turn to an examination of the robustness of the estimates of Table 7. In our baseline specification, the sample includes all individuals 12 or older who are employed and report a positive income. One potential concern with this is that it omits individuals who are unemployed and earn zero wages. To check the sensitivity of our estimates to this characteristic of the sample,

we include individuals even if they report no income. Given the minimum age of 12, if we include all individuals who report zero income, we will likely include a large number of children who are in school and not in the workforce. Therefore, we also restrict the sample to individuals 18 or older. Thus, the sample includes all individuals 18 or older, even if they report no income.[19] Estimates of equations (6)–(9) with the alternative sample are reported in Table 9. Comparing these estimates with those from Table 7, we see that the results are qualitatively identical and quantitatively very similar.

We next check the robustness of our results to a number of sample restrictions. We first restrict the sample to only include: (*i*) cantons that produce coffee (36 in total), and (*ii*) the rural areas of these coffee-producing cantons. The argument for including observations that are not in coffee-producing cantons is that they help to estimate the control variables and fixed effects that are important for the analysis. On the other hand, one could also argue that the cantons in the restricted samples are more comparable. Estimates of equation (9) for these two subsamples are reported in columns 3 and 5 of Table 10. (Column 1 reproduces the baseline estimates for comparison.) The estimates remain very similar when we use the restricted samples.

We also check the robustness of our estimates to restricting the sample to only include individuals who are the head of a household. We do this separately for each of the three samples: all cantons, coffee producing cantons, and rural parts of coffee cantons. The estimates are reported in columns 2, 4, and 6 of Table 10. Again, we find that the estimates remain very similar, although the negative impact on non-farm occupations in the coffee industry is smaller in magnitude and no longer statistically significant.

Lastly, we check the robustness of our estimates to the use of different FT intensity measures. The estimates are reported in Table 11. Column 1 reproduces the baseline estimate that uses exports to create an export weighted measure of FT intensity. In column 2, we report estimates that use production weights. As shown, the estimates are nearly identical. Next, we use time-invariant export weights. That is, in equation (5), we use $\overline{X}_{kc}$ rather than X_{kct}, where $\overline{X}_{kc}$ is average exports of mill k in canton c from 2001–2009. One may be concerned with the variation in FT intensity that is due to the year-to-year change in exports across mills. This measure, by using a time-invariant measure of exports, is purged of this variation. As shown in column 4, the

[19] Recall that our estimation strategy still requires information on an individual's occupation and sector of employment. Thus, individuals for which this is unknown still are not in the sample.

Table 9: The Effect of FT on Incomes by Industry and Occupation.

	Sample: All individuals 18 or older Dependent variable: ln monthly income			
	(1)	(2)	(3)	(4)
Fair Trade Intensity, FTI	0.172* (0.098)	0.126 (0.093)	0.160 (0.124)	
FTI x Coffee		0.506 (0.695)		
FTI x Skilled				0.051 (0.204)
FTI x Unskilled				0.258 (0.223)
FTI x Nonfarm				0.156 (0.126)
FTI x Coffee x Skilled			1.453*** (0.394)	1.561*** (0.385)
FTI x Coffee x Unskilled			-0.203 (1.108)	-0.299 (1.109)
FTI x Coffee x Nonfarm			-0.789 (1.076)	-0.785 (1.076)
Age, age^2, gender & interactions	Y	Y	Y	Y
Education controls	Y	Y	Y	Y
79 Canton FE	Y	Y	Y	Y
9 Year FE	Y	Y	Y	Y
9,813 Industry x Occupation FE	N	N	Y	Y
461 Industry FE	Y	Y	N	N
Observations	163,466	163,466	163,466	163,466
Clusters	79	79	79	79
R-squared	0.175	0.175	0.254	0.254

Notes: The unit of observation is an individual. The sample includes all individuals over the age of 12 who report an income and an industry and occupation of employment. The dependent variable is the natural log of monthly income. The variable Coffee is equal to 1 if the individual's primary industry of employment is coffee cultivation. The variables *Skilled*, *Unskilled* and *Nonfarm* equal 1 if an individual's primary occupation is skilled agricultural worker, unskilled agricultural worker or other nonfarm occupation, respectively. All regressions include education FE, canton FE, year FE, and controls for age, age-squared, gender, gender x age, and gender x age-squared. Coefficients are reported with standard errors clustered at the canton level. ***, **, and * indicate significance at the 1, 5 and 10 percent levels.

Table 10: The Effect of FT on Incomes: Robustness to Subsamples

	All Cantons		Coffee producing Cantons only		Rural parts of coffee producing Cantons	
	All individuals	Household heads only	All individuals	Household heads only	All individuals	Household heads only
	(1)	(2)	(3)	(4)	(5)	(6)
FTI x Skilled	0.053	0.028	0.058	0.070	0.017	0.023
	(0.061)	(0.072)	(0.070)	(0.082)	(0.084)	(0.094)
FTI x Unskilled	0.124***	0.116**	0.165**	0.162**	0.166**	0.166**
	(0.047)	(0.055)	(0.064)	(0.075)	(0.068)	(0.078)
FTI x Nonfarm	0.135***	0.106***	0.141***	0.106**	0.116**	0.086
	(0.030)	(0.039)	(0.033)	(0.041)	(0.045)	(0.053)
FTI x Coffee x Skilled	0.358**	0.380**	0.342**	0.328**	0.356**	0.362**
	(0.150)	(0.152)	(0.157)	(0.159)	(0.159)	(0.163)
FTI x Coffee x Unskilled	-0.093	-0.118	-0.119	-0.159	-0.134	-0.157
	(0.093)	(0.090)	(0.107)	(0.099)	(0.104)	(0.097)
FTI x Coffee x Nonfarm	-0.280***	-0.178	-0.266**	-0.106	-0.283**	-0.185
	(0.099)	(0.109)	(0.118)	(0.124)	(0.118)	(0.127)
Age, age^2, gender & interactions	Y	Y	Y	Y	Y	Y
Education controls	Y	Y	Y	Y	Y	Y
79 Canton FE	Y	Y	Y	Y	Y	Y
9 Year FE	Y	Y	Y	Y	Y	Y
9,793 Industry x Occupation FE	Y	Y	Y	Y	Y	Y
Observations	143,364	74,590	71,747	36,914	42,627	22,903
Clusters	79	79	36	36	36	36
R-squared	0.611	0.620	0.633	0.646	0.627	0.635

Notes: The unit of observation is an individual. Coefficients are reported with standard errors clustered at the canton level. The variable *Coffee* is equal to 1 if the individual's primary industry of employment is coffee cultivation. The variables *Skilled*, *Unskilled* and *Nonfarm* equal 1 if an individual's primary occupation is skilled agricultural worker, unskilled agricultural worker or other nonfarm occupation, respectively. All regressions include canton FE, industry-occupation fixed effects, year fixed effects, and controls for age, age-squared, gender, gender x age, and gender x age-squared. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

Table 11: The Effect of FT on Incomes: Robustness to Using Alternative FTI Measures

	Fair Trade Intensity Measure Used:				
	Baseline: export weighted	Production weighted	Time invariant export weights	Initial (2001) export weights	Indicator if at least one mill is FT certified
	(1)	(2)	(3)	(4)	(5)
FTI x Skilled	0.053	0.060	0.037	0.038	0.070
	(0.061)	(0.064)	(0.058)	(0.058)	(0.077)
FTI x Unskilled	0.124***	0.131**	0.098**	0.097**	0.109**
	(0.047)	(0.050)	(0.038)	(0.037)	(0.050)
FTI x Nonfarm	0.135***	0.143***	0.105***	0.105***	0.092***
	(0.030)	(0.035)	(0.021)	(0.021)	(0.035)
FTI x Coffee x Skilled	0.358**	0.354**	0.310**	0.293**	0.142
	(0.150)	(0.155)	(0.121)	(0.118)	(0.102)
FTI x Coffee x Unskilled	-0.093	-0.089	-0.074	-0.068	-0.058
	(0.093)	(0.096)	(0.088)	(0.088)	(0.049)
FTI x Coffee x Nonfarm	-0.280***	-0.283***	-0.210***	-0.199**	-0.142**
	(0.099)	(0.101)	(0.077)	(0.076)	(0.061)
Age, age^2, gender & interactions	Y	Y	Y	Y	Y
Education controls	Y	Y	Y	Y	Y
79 Canton FE	Y	Y	Y	Y	Y
9 Year FE	Y	Y	Y	Y	Y
9,793 Industry x Occupation FE	Y	Y	Y	Y	Y
Observations	143,364	143,364	143,364	143,364	143,364
Clusters	79	79	79	79	79
R-squared	0.611	0.611	0.611	0.611	0.611

Notes: The unit of observation is an individual. Coefficients are reported with standard errors clustered at the canton level. The variable *Coffee* equal to 1 if the individual's primary industry of employment is coffee cultivation. The variables *Skilled, Unskilled and Nonfarm* equal 1 if an individual's primary occupation is skilled agricultural worker, unskilled agricultural worker or other nonfarm occupation, respectively. All regressions include canton fixed effects, industry-occupation fixed effects, year fixed effects, and controls for age, age-squared, gender, gender x age, and gender x age-squared and education. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

estimates remain robust. In column 5, we report similar estimates, but using exports in the initial period, 2001, rather than average exports as weights. Again, the estimates remain robust. In the last robustness check, we construct an extremely coarse measure of FT intensity that is completely independent of any variation in production or exports. We use an indicator variable that equals one if there is at least one FT-certified mill in the canton in that year. As shown, the results are robust to the use of this coarse measure of FT intensity.

Overall, our sensitivity checks confirm the robustness of the findings from Table 7. The estimates continue to show the presence of spillover effects to individuals working outside of the coffee sector. In addition, within the coffee sector, skilled workers (e.g., farm owners) benefit significantly, while those in non-farm occupations (e.g., intermediaries) are hurt. In

all specifications, the estimated magnitudes and statistical significance are very similar to the baseline estimates.

C. *Estimated Effects of FT on School Enrollment*

We next turn to an investigation of the effects of FT certification on the education of children. There are three main channels through which FT production could affect education. First, by increasing household incomes, FT certification could increase educational attainment. As we have seen, FT certification is associated with higher payments to skilled occupations in the coffee industry, as well as positive spillover effects to those residing in the same canton. Second, FT certification, by making coffee production a more profitable endeavor, may increase the opportunity costs of going to school.[20] Third, FT could affect educational attainment through enhanced provision of public goods in a region. As we have discussed, in Costa Rica, part of the FT premium is directed towards the building of schools and roads, the provision of books, equipment and other materials, as well as the provision of scholarships for students to attend school. For example, since COOCAFE's creation of the Children of the Field Foundation (*Fundación Hijos del Campo*) in 1996, they have provided scholarships to 2,598 students and financial support to 240 schools. COOCAFE estimates that over 5,800 students have been helped by their foundation.[21]

To examine the effects of FT certification on education, we estimate a version of equation (9) where the unit of observation is a child and the dependent variable is an indicator variable that equals one if the child is enrolled in school at the time of the survey. We examine three different samples: children aged 7–12 years old (potential elementary school students); children aged 13–17 (secondary school students); and children aged 18–25 (university students). Since children do not have an identified industry and occupation, in these specifications we instead use the industry and occupation of the household head. Thus, the estimates report how school enrollment of children varies with FT certification for households in different occupations within and outside of the coffee sector.

Estimates are reported in Table 12. Column 1 reports estimates for elementary-aged children, column 2 for secondary-school-aged children, and column 3 for university-aged children. FT

[20] This is an effect that has been found in Mexico (Atkin, 2016).

[21] For an examination of the impacts of the Foundation in the years immediately following its inception (see Ronchi, 2002). From 1997–1999 alone, the foundation provided funding to 71 elementary schools, donating approximately US$ 360 per school, benefiting 5,061 students.

Table 12: FT Certification and School Attendance

	Dependent variable: Indicator for school enrollment		
	Ages 7-12	Ages 13-17	Ages 18-25
	(1)	(2)	(3)
FTI x Skilled	0.001	0.171***	0.022
	(0.011)	(0.037)	(0.047)
FTI x Unskilled	0.004	0.116**	-0.050
	(0.017)	(0.048)	(0.039)
FTI x Nonfarm	0.006	0.082***	0.004
	(0.007)	(0.029)	(0.030)
FTI x Coffee x Skilled	-0.008	0.019	-0.059
	(0.020)	(0.069)	(0.117)
FTI x Coffee x Unskilled	0.028	-0.120	-0.085
	(0.035)	(0.106)	(0.066)
FTI x Coffee x Nonfarm	-0.014	-0.789***	0.063
	(0.009)	(0.188)	(0.119)
Age, age^2, gender & interactions	Y	Y	Y
Canton FE	Y	Y	Y
Year FE	Y	Y	Y
Industry x Occupation FE (of hh head)	Y	Y	Y
Observations	45,038	38,663	50,973
Clusters	79	79	79
R-squared	0.107	0.262	0.307

Notes: The unit of observation is an individual. Coefficients are reported with standard errors clustered at the canton level. The dependent variable is an indicator variable if a child attends school. The variable *Coffee* is equal to 1 if an individual belongs to a household where the household head reports coffee production as the main industry of employment. The variables *Skilled*, *Unskilled* and *Nonfarm* equal 1 if an individual belongs to a household where the household head reports the main occupation as skilled agricultural worker, unskilled agricultural worker or an other nonfarm occupation, respectively. All regressions include canton fixed effects, year fixed effects, fixed effects for the household head's industry x occupation, and controls for age, age-squared, gender, gender x age, and gender x age-squared. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

certification appears to have no effect on enrollment in elementary schools. This is consistent with the fact that elementary school enrollment rates are very high in Costa Rica and thus there is little scope for improvement. For example, in our sample 98.9% of children who are aged 8 report being enrolled in school. By contrast, we do find evidence of a positive association between FT certification in a canton and the level of secondary school enrollment. These effects are present irrespective of the occupation category of the household head, although the effects are greatest for children with a household head who is in a skilled occupation. A one-standard-deviation increase in FT intensity (0.27) is associated with a 5% ($0.27 \times 0.171 = 0.05$) increase in the probability of school enrollment for the children of those in skilled agricultural occupations, a 3% ($0.27 \times 0.116 = 0.03$) increase for children of those in unskilled occupations, and a 2% ($0.27 \times 0.091 = 0.02$) increase for children of those in non-farm occupations.

The estimates of the additional effects for those working within the coffee sector are very close to zero for skilled occupations (0.019), negative, sizable, but insignificant for those in unskilled occupations (-0.120), and negative, large in magnitude, and highly significant for those in other occupations (-0.789). For unskilled and non-farm occupation parents, the negative additional effect within the coffee sector is greater than the positive general effects of FT intensity. For unskilled workers within the coffee sector the net effect is close to zero: $0.116 - 0.120 = -0.004$. However, for non-farm occupations within the coffee sector, the net effect is large and negative: $0.082 - 0.789 = -0.707$. This effect is potentially explained by the large negative effects of FT on the incomes of this group. Evidence from similar developing-country contexts find that low incomes can prevent parents from being able to send their children to school, resulting in lower enrollment rates (Edmonds et al., 2010).

The estimates for school enrollment for those of university age (18–25) suggest that FT intensity has no effect on university enrollment. All coefficients are small in magnitude and not statistically different from zero. These findings are consistent with a relatively small proportion of the premiums being allocated to post-secondary education. In addition, the funds that are allocated to this tend to be focused on adult education and skills upgrading, which primarily affect those older than 25.

In an attempt to better understand the reason for the estimated relationship between FT intensity and enrollment of high-school-aged students, we also examine the relationship between FT certification and the following alternative activities: being in the labor force, being employed,

Table 13: FT Certification, Education, and Employment: Children from Ages 13–17

	Sample: Individuals 13-17 years old			
	Attend School	In labor force	Employed	Unemployed
	(1)	(2)	(3)	(4)
FTI x Skilled	0.171***	-0.055***	-0.054***	-0.001
	(0.037)	(0.020)	(0.016)	(0.009)
FTI x Unskilled	0.116**	-0.042*	-0.039*	-0.003
	(0.048)	(0.021)	(0.022)	(0.011)
FTI x Nonfarm	0.082***	-0.052***	-0.044***	-0.008
	(0.029)	(0.012)	(0.010)	(0.009)
FTI x Coffee x Skilled	0.019	-0.036	-0.036	0.001
	(0.069)	(0.039)	(0.037)	(0.007)
FTI x Coffee x Unskilled	-0.120	-0.012	-0.008	-0.004
	(0.106)	(0.027)	(0.031)	(0.011)
FTI x Coffee x Nonfarm	-0.789***	-0.386	-0.403	0.017
	(0.188)	(0.341)	(0.353)	(0.014)
Age, age^2, gender & interactions	Y	Y	Y	Y
36 Canton FE	Y	Y	Y	Y
10 Year FE	Y	Y	Y	Y
7,171 Industry x Occupation FE	Y	Y	Y	Y
Observations	38,663	38,670	38,670	38,670
R-squared	0.262	0.296	0.263	0.149

Notes : The unit of observation is an individual. Coefficients are reported with standard errors clustered at the canton level. The variable *Coffee* is equal to 1 if an individual belongs to a household where the household head reports coffee production as the main industry of employment. The variables *Skilled, Unskilled* and *Nonfarm* equal 1 if an individual belongs to a household where the household head reports the main occupation as skilled agricultural worker, unskilled agricultural worker or a nonfarm occupation, respectively. All regressions include canton fixed effects, industry-occupation fixed effects, year fixed effects, and controls for age, age-squared, gender, gender x age, and gender x age-squared. ***, **, and * indicate significance at the 1, 5, and 10 percent levels.

and being unemployed. Estimates are reported in Table 13 for children aged 13–17. Column 1 reproduces the enrollment estimates from column 2 of Table 12, while columns 2–4 report estimates of equation (9) where the dependent variables are indicators for each of the following three categories: in labor force, employed and unemployed.

The estimates show that the increase in school enrollment for children of parents who are in skilled occupations coincides with a removal of the children from the labor force (column 2) and in particular from employment (column 3). There is no statistically significant association with unemployment (column 4). The patterns are also similar for children of parents in unskilled and other occupations, although the coefficients are less precisely estimated. Overall, the estimates suggest that FT certification results in children being drawn out of employment and into school. Given that this effect is felt outside of the coffee sector, a potential explanation is that the scholarship and bursaries funded through Fair Trade have reduced the costs of schooling and, therefore, increased enrollment rates. For children of those employed in coffee and in non-farm occupations, we see no evidence of the decrease in school enrollment coinciding with entry into the labor force or employment. Thus, it appears as if these children simply become inactive.

5. Conclusions

We have examined the effect of Fair Trade certification on coffee producers in Costa Rica. We began the analysis by examining the impact of FT certification on the universe of coffee mills from 1999–2014. We found that FT certification is associated with higher prices and more revenues when the minimum sales price that is guaranteed by FT is higher than the world price of coffee. The positive effect on prices is more precisely estimated for exports, but is apparent for domestic sales as well.

Turning to the impact of FT on households, we found evidence of income benefits to those living within cantons where there was FT certification, including households outside of the coffee sector. We also found additional effects of FT for those working within the coffee sector. FT increases the incomes of skilled coffee growers who are primarily farm owners. We find no evidence that the hired unskilled workers receive benefits (beyond those that accrue to the community in general). In addition, non-farm occupations, which are primarily intermediaries, in the coffee sector are hurt by FT. Since those working in coffee in non-farm occupations have average incomes that are close to 42% higher than the skilled coffee growers, FT certification

results in a decrease in inequality within the coffee sector, as rents are transferred from the intermediaries to the farm owners. In addition, the skilled coffee farmers who benefit comprise a much larger proportion of those in the coffee sector (43.5%) than the intermediaries that are hurt by FT (6.7%).

Motivated by the fact that within Costa Rica, cooperatives commonly use FT premiums to build schools, purchase school supplies, and provide scholarships, we also examined the effects of FT certification on education as measured by the enrollment of school-aged children. We found that FT certification is associated with higher school enrollment for high-school students. This is true both for children whose parents work within coffee and for those whose parents do not. Consistent with the estimated effects of FT on the incomes of non-farm occupations in the coffee sector, we found that the enrollment of their children is adversely affected by FT.

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Appendix Tables

Table A1: Summary statistics for mill-level analysis

Variable	Observations	Mean	Standard Deviation
Fair Trade Certified (1/0)	2,197	0.10	0.30
Price Gap Indicator (1/0)	2,197	0.41	0.49
Price Gap (USD/lb)	2,197	0.14	0.22
Share of Quantity Received that is Sold (%)	1,740	98.66	9.56
Domestic Price (USD/lb)	2,038	1.13	0.58
Export Price (USD/lb)	2,000	1.47	0.61
Domestic Quantity (lbs)	2,195	278,515	541,605
Export Quantity (lbs)	2,196	1,588,493	2,874,386
Total Quantity Sold (lbs)	1,821	15,216	29,747
Total Quantity Received (lbs)	2,194	1,868,326	3,295,827
Total Revenue (USD)	1,928	2,456,420	4,301,392
Domestic Revenue (USD)	2,038	287,257	603,411
Export Revenue (USD)	2,000	2,095,297	3,810,584

Table A2: Summary statistics for individual-level analysis

Variable	Observations	Mean	Standard Deviation
Individual montly income (Colones)	143,364	185,689	257,087
Fair Trade Intensity (FTI) Measures:			
Export weighted (baseline)	143,364	0.09	0.27
Production weighted	143,364	0.09	0.27
Time invariant export weights	143,364	0.10	0.29
Initial (2001) export weights	143,364	0.10	0.29
Indicator if at least one mill is FT certified	143,364	0.16	0.37
Industry of primary occupation is Coffee (1/0)	143,364	0.02	0.14
Primary occupation is skilled agriculture (1/0)	143,364	0.06	0.24
Primary occupation is unskilled agriculture (1/0)	143,364	0.12	0.32
Primary occupation is nonfarm agriculture(1/0)	143,364	0.82	0.38