ELSEVIER
www.elsevier.com/locate/worlddev

World Development Vol. xx, pp. xxx–xxx, 2013

0305-750X/$ - see front matter

http://dx.doi.org/10.1016/j.worlddev.2012.12.005

Disentangling the Effects of Fair Trade on the Quality of Malian Cotton

Q5 GAËLLE BALINEAU *

CERDI (Centre for Studies and Research on International Development), Clermont-Ferrand, France

Summary. — The increasing importance of premium segments and private labels raise skepticism about the ability of Fair Trade to help smallholders compete in high value-added markets. Using panel data collected in Mali, this paper contributes to the debate by estimating the impact of Fairtrade certification on the quality of Malian cotton. Controlling for the nonrandom certification of producers, results show a significant impact on the quality of cotton produced by both certified and geographically close noncertified growers *via* spillover effects. The analysis suggests that contract farming enforced by third-parties and demonstration effects foster the adoption of innovative agricultural practices.

Key words — fair trade, impact, innovation adoption, cotton, Africa, Mali

1. INTRODUCTION

Over the last decade, skepticism about the ability of Fair Trade to generate sustainable benefits to producers in developing countries has increased hand in hand with its notoriety. On the empirical side, as underlined by Ruben and Fort (2012), recent impact evaluations that take into account the selection bias inherent to the participation in Fair Trade markets tend to relativize previous results of many enthusiastic case studies. First, they challenge the ability of Fair Trade to deliver on its core principle—guarantee higher prices and incomes to producers than in the conventional sector. Indeed, net of inflation (Bacon, 2010; Jaffee, 2008) or of certification costs (Weber, 2011), Fair Trade prices are often lower than expected. And even when they are shown to be higher than those obtained on conventional markets (Arnould, Plastina, & Ball, 2009; Bacon, 2005) or to be more satisfactory to producers (Becchetti & Costantino, 2008), their impact on net income could be small due to higher production costs (mainly due the intensification of labor efforts—see for example Barham, Callenes, Gitter, Lewis, & Weber, 2011; Beuchelt & Zeller, 2011; Valkila, 2009). As regards the second pillar of Fair Trade—the technical assistance provided to producers' organizations (POs) in order to strengthen their capacities, some impact evaluations confirm the positive effect of Fair Trade found in previous case studies on the POs' governance and management (Ruben & Fort, 2012), and on their bargaining power (Becchetti, Costantino, & Portale, 2008; Ronchi, 2006). However, it remains very difficult to ascertain if these improvements would subsist without the support of Fair Trade organizations, and if they have an impact on the ability of producers to get higher prices and incomes on nonFair Trade markets—which is crucial given that Fair Trade is still confined to a niche market.

The efficiency of Fair Trade schemes and their sustainability are also questioned from a theoretical point of view. Focusing on the Fairtrade (FT) certification system managed by Fairtrade International (or FLO),[1] De Janvry, McIntosh, and Sadoulet (2012) show both theoretically and empirically how the design of the current system cannot guarantee premiums to producers. Indeed, the prices set by FLO for FT-labeled products do not vary with quality, and the number of certifications is not limited. Therefore FT premiums are dissipated through over-certification (that prevents producers to sell all production on FT markets) and unrewarded quality (FT does not pay for better quality). Although the (in)efficiency of Fair Trade in general is much debated,[2] the literature actually suggests that the cost–benefit analysis of Fair Trade does not argue in its favor. Many authors therefore suggest restructuring current Fair Trade schemes to create greater producer benefits. Some argue that Fair Trade should, as its founding principles state, be redesigned as a support to the development of commercial capacities. For example, Mendoza and Bastiaensen (2003) think that the networks and capacities built by the different Fair Trade organizations could help small-scale farmers get larger shares of the high-value export markets that Fair Trade tries to compete in ("specialty coffees" for example, see Kaplinsky, 2006). However, until now, we do not know if, and how, Fair Trade could support producers in developing countries in keeping up with high quality requirements and gaining market shares on high value-added segments that already suffer from saturation (World Bank, 2007).

This paper gives evidence that Fair Trade contributes to raising the quality of cotton production in Mali where the implementation of the "Fairtrade cotton project" was to im-

* Field research for this study has been funded with a contribution from the French Ministry of Foreign Affairs, the Regional Council of Auvergne (France), and the Centre for Studies and Research on International Development (CERDI, Clermont-Ferrand, France). I would like to thank the *Compagnie Malienne pour le Développement des Textiles* (CMDT, Mali) for outstanding assistance in conducting the surveys, as well as the survey team. I gratefully acknowledge the collaboration of surveyed cooperatives and farmers of the Kita region. I am indebted to Catherine Araujo-Bonjean, Jean-Louis Arcand, Pascal Babin, Delphine Babin-Pelliard, Philippe Dulbecco, Alain de Janvry, François Giraudy, and Elisabeth Sadoulet for their help in designing the impact evaluation. I wish to thank Jenny C. Aker, Tanguy Bernard, Sylvain Chabé-Ferret, Jaime de Melo, CERDI seminar and 2009 AfrEA-NONIE-3IE International Conference on Impact Evaluation participants for comments on earlier versions of this paper. I would also like to thank the three anonymous reviewers for their constructive comments and suggestions to improve the quality of the paper. Finally, I thank the Foundation for Studies and Research on International Development (Ferdi, Clermont-Ferrand, France) for financial support to publication. All remaining errors are mine. Final revision accepted: December 4, 2012.

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

prove and promote the quality of, and hence the demand for, Malian cotton. On the empirical side, its contribution is to use panel data and a variety of econometric methods that explicitly address the problem of nonrandom selection into Fairtrade (FT). This entails dealing with two possibilities. The first is that observed (positive) differences in quality performances between certified and noncertified cooperatives might reflect differences in their inherent characteristics, rather than the impact of certification itself (which is a classic selection bias problem). The second is that observed (negative) difference between certified and noncertified cooperatives might reflect a "mean reversion process" if FT certification is based on previous quality performance (a phenomenon known as the "Ashenfelter's dip effect" in the impact evaluation literature). Besides, the empirical strategy is also designed to carefully estimate spillover effects, considered as an explicit objective of the FT cotton project and which, if not taken into account, would lead to underestimate the impact of FT on certified cooperatives.

The empirical analysis uses a panel data set collected in Mali in 2008 that covers both certified cooperatives and a control group of noncertified cooperatives split into two sub-groups (according to their distance to certified cooperatives) to estimate spillovers. The econometric approach relies on fixed-effects regressions that deal with the classic selection bias problem. Moreover, as preliminary findings confirm the possibility of a mean reversion process, the empirical strategy is refined to take into account the effect of past (exceptional) quality performance. To get round the difficulty of controlling simultaneously for both fixed-effects and the past values of the dependent variable (that, if not taken into account, would have led to respectively over- and underestimate the impact of FT), I provide two sets of estimations aimed at bounding the treatment effects.

Results show that, at the minimum, FT increases the share of top quality cotton in certified cooperatives by seven percentage points (pp), and that it has large spillover effects as the impact of FT on neighboring nonFT cooperatives is a 5 pp rise in the top quality cotton. In other words, FT at least accounts for more than half of the quality improvement observed in the region (where the proportion of top quality cotton increased from 3% to 16% over the period studied). Having tested for the possibility of other explanatory factors, I conclude that one can be confident that the impact of FT certification is accounted for by the enhanced producers' incentives implied by the FT contract. Indeed, in addition to the price differentiation according to quality, it introduces clearer quality criteria, a more credible grading of cotton, as well as collective cooperation incentives. As to spillovers, the analysis suggests that they can be explained by a "demonstration effect" (Bassett, 2010, p. 52). Indeed, as initially skeptical noncertified cotton growers observe the effects of more efficient pest management practices, adoption expands. On the policy side, this paper thus suggests other paths that sustainable certification schemes can offer to producers to help them achieve better outcomes. Credible commitments about future benefits enforced by a third party and demonstration effects, in particular, could be used to foster the adoption of new agricultural practices by smallholders.

The remainder of the paper proceeds as follows: Section 2 provides an overview of the cotton sector in Mali and details the objectives of the Fairtrade cotton project. Section 3 presents the data and the identification strategy. Section 4 contains the empirical findings. Section 5 draws the implications of the results and concludes.

2. FAIRTRADE COTTON IN MALI: CONTEXT AND OBJECTIVES

(a) Overview of the cotton sector in Mali

Cotton production in Mali first increased under the impulse of the French state-owned *Compagnie Française pour le Développement des Fibres Textiles* (CFDT) created in 1949. The *Compagnie Malienne pour le Développement des Textiles* (CMDT) has continued to support the development of cotton production since 1974.[3] CMDT controls the cotton supply chain. At the production level, it supplies POs (mainly cooperatives) with inputs (seeds, fertilizers, pesticides) on credit, facilitates their access to equipment, and provides them with technical assistance to improve yields and cotton quality. CMDT purchases farmers' entire production at a fixed national price, which producers know before planting. Input credits provided are reimbursed by POs through deduction from the purchase price of cotton. Downstream, CMDT collects seed cotton at the village-level, transports, and gins it in its factories, and finally grades and exports cotton lint. It should be noted that Malian cotton cooperatives do not have the same role as coffee cooperatives in Latin and Central America. Indeed, they do not actually sell inputs to or buy cotton from producers, but are rather used as platforms through which CMDT carries out these commercial activities. The main role of POs is to repay credit for their defaulting members, which is a frequent source of conflict among farmers (Bassett, 2008, p. 46).

Since 1974, this vertically-integrated structure has been associated with higher cotton production in Mali. Over the past thirty years, areas planted and volumes produced have both multiplied by five, the latter growing from 100,000 tons in 1975 to more than 500,000 tons in 2005. The crop represents 50–60% of the country's export revenues, fosters economic growth, and contributes to rural development, as three million people are estimated to rely directly or indirectly on cotton for their livelihoods (Wodon, Briand, Labaste, Nouvé, & Sangho, 2006).

However, although vertical integration succeeded in promoting cotton production, it has not been conducive to efficiency. First, while fixed prices (pan-seasonal and pan-territorial) isolate small-scale farmers against risk and allow redistributing resources through the territory, they disconnect farmers from international markets and bias incentives at the expense of the most efficient growers, resulting in a decline in average seed cotton yields since the early 1990s. Second, lack of competition in ginning has limited incentives to reduce costs (resources have been mismanaged; ginning industries are obsolete, etc.). Given the collapse in world cotton prices since the early 1980s,[4] the overall profitability of the crop has been reduced, and the deficit of the CMDT reached 1.8% of Mali's Gross Domestic Product (GDP) in 2005 (Tschirley *et al.*, 2009, p. 67). Moreover, an unfavorable euro-dollar exchange rate exacerbates the difficulties faced by the cotton sector, reducing the CMDT's turnover in local currency, and hence its capacity to pay producers. The combination of these factors has forced CMDT to significantly cut prices paid to producers, thereby undermining the profitability of the crop for many farmers; as well as their trust toward the ginning company. The distribution of gains between CMDT and producers *via* the seed-cotton price-setting mechanism is actually the sharpest point of contention as the latter suspect the former to reap the benefits of their work (see below and Bassett, 2008).

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

According to Poulton *et al.* (2004), there are only two ways to make the cotton sector profitable again: Increasing yields and/or promoting the quality of the Malian fiber to foster demand and get better prices on world markets. The problem is that costly programs would be needed to achieve these goals, and CMDT (which still remains publicly-owned even though reforms have been discussed for years, see Delpeuch & Vandeplas, 2012) cannot bear an additional financial burden. In this context, FT appeared as an obvious solution to improve quickly farmers' livelihoods. However, in order to increase its benefits, the different stakeholders (CMDT and its then French shareholder Dagris,[5] as well as donors) integrated the FT cotton project in the cotton sector development strategy as a key component of the quality policy. The next subsection details this strategy.

(b) Using Fairtrade to promote the quality of Malian fiber

(i) The deterioration of the Malian cotton quality

Quality is of utmost importance for survival in the cotton market as it contributes to determine premiums and discounts above or below the international benchmark given by the Cotlook A Index[6] (Larsen, 2003). Besides, in the context of an increasingly strong competition between growing countries, good quality lint can find ready buyers even in a situation of oversupply, whereas spinners would refuse low-quality fiber (Poulton *et al.*, 2004). Spinners particularly refuse to purchase sticky and contaminated cotton. Indeed, stickiness (which is mainly due to insect honeydew deposits on the lint) causes costly disruption in yarn-spinning processes and may damage the processing equipment. Contamination by leaves, branches, plastic waste, sand, dust, and so forth is even more feared because damages caused by foreign matter "become visible only after dyeing, when it is too late to remedy" (Larsen, 2003, p. 14).

Over the last years, both stickiness and contamination have increased in Mali. First, the intensive use of chemical products since the late 1970s resulted in pest resistance (Renou, Téréta, & Togola, 2011). Second, despite the fact that Malian cotton is hand-picked, and hence should contain less foreign matter than machine-stripped cotton, contamination of the Malian fiber has worsened as production increased, because of less care during picking. Indeed, because quality is not reflected in producers' prices (see below), it is more profitable for producers to grow more, rather than better, cotton. Polypropylene traces from harvesting sacks and organic matter are the main source of contamination. In 2003, the International Textile Manufacturers Federation (ITMF) biennial survey of spinners' perceptions ranked Mali the 20th "most contaminated" source of cotton out of 75 descriptions tested (ITMF, 2008, p. 116). This tarnishing reputation has led Mali to lose some clients, especially among Asian spinners (Bassett, 2010). The problem is that once the image of a national crop has suffered it becomes very difficult for it to recover its reputation and re-gain a specific market segment (Larsen, 2003).

(ii) The CMDT's quality policy

In an effort to improve the quality of cotton, CMDT extension agents try to diffuse new pest management practices, based on threshold-based sprays (e.g., five larvae per 25 cotton plants) instead of systematic chemical product spraying (which is inefficient and leads producers to use all their products early, leaving them without any solution at the end of the growing season when cotton is ready to be collected and potential losses are important). These better practices should also have a positive impact on yields as some pests (bollworms) also eat seeds and chew ragged holes in branches and flowers. Extension agents also recommend to carefully collect cotton and to use cotton-made harvesting sacks to minimize contamination.

However, producers are all the more unwilling to change their practices as they are paid the same price whatever the quality.[7] To understand this issue, it is important to note that cotton in Mali is graded twice. First, for every producer, seed cotton is weighed and graded at the village-level into three categories. The national producer price set by CMDT is for the best category of seed cotton. Second and third categories are generally paid 10 and 20 CFAF lower per kilogram. In practice however, as it is very difficult to discount the production of a farmer at the village-level, nearly all the production is classified in the best category.[8] Second, ginned cotton (i.e., cotton lint) is in turn graded at the factory, and classified into 10 grades (Sarama, Juli/S, Néré, Juli, Kati, Kati/C, Liba, Liba/C, Kola, and Bata, from the best to the worst grade)[9] that are sold at different export prices. Quality premiums are therefore captured by the CMDT through grading and trading practices that are opaque to producers, and that do not encourage them to improve quality (see Bassett, 2008, 2010). Indeed, because of the absence of price differentiation according to quality at the primary purchase stage, there are no individual and no immediate incentives to improve it. Quality investment could instead be of collective interest since quality premiums should allow the CMDT to secure higher prices for farmers when world market prices fall. However, this collective interest does not encourage producers to invest in quality anymore since in addition to a classic free-riding problem, most growers feel that quality premiums and financial resources in general are mainly used at the discretion of the CMDT to cover deficits of its own making (Badiane, Ghura, Goreux, & Masson, 2002). Lastly, while adopting better pest management practices should also increase yields, growers viewed extension agents' recommendations with skepticism due to years of systematic spraying (growers cannot help spraying insecticides when they see bollworms or insects on their plants), and to the lack of trust toward CMDT. By contrast, the Fairtrade cotton project in Mali could provide producers' incentives to adopt better practices and to improve the quality of Malian cotton.

(iii) The solution provided by Fairtrade

The Fairtrade cotton project was initiated in 2003 by Dagris and Max Havelaar France, the French affiliate of FLO. FLO has developed an international certification system for Fair Trade goods. For end-products to carry the Fairtrade (FT) label the entire production chain must be monitored by an independent certification body (FLO-Cert), which ensures that producers, traders, and retailers comply with a number of social, economic, and environmental requirements set by FLO. First and foremost, FLO requires the buyers to pay the "Fairtrade price" to producers (that is to say a price fixed by FLO that aims to cover at least production costs), and a "Fairtrade premium" to their cooperatives. In Mali, certified producers are paid 238 CFAF/kg for seed cotton, and 34 CFAF/kg go to their organizations. Second, producers have to observe many economic, social, and environmental standards. For example, they have to be organized in a democratic and transparent structure which does not discriminate against any member, invest the FT premium in order to promote the economic development and the autonomy of their organization, and comply with a number of environmentally sound agricultural practices.[10]

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

Table 1. *Fairtrade expansion in Mali, 2003–04 to 2007–08 Source: CMDT's data, collected by the author in March 2008.*

	Cotton seasons				
	2003–04	2004–05	2005–06	2006–07	2007–08
Certifications					
Number of newly certified cooperatives	4	12	56	0[a]	30
Wave	First wave	Second wave	Third wave		Fourth wave
Markers in Figure 1	●	○	•		○
Total number of certified cooperatives	4	16	72	72	102
Fairtrade production					
Seed cotton (tons)	404	1 065	5 816	4 935	3 804
Fiber (tons)	168	427	2 270	2 191	1 480
Fairtrade sales					
Fiber (tons)	57	300	1 608	1 862	0[b]
Sales/production ratio	34%	70%	71%	85%	0%
Producer prices (CFAF/kg of seed cotton)					
CDMT price	200	210	165	165	165
Fairtrade price	238	238	238	238	238

[a] There was no increase in FT cooperatives in 2006–07 because of lack of demand.
[b] In March 2008, Fairtrade cotton had not been sold yet because of lack of demand.

Given the difference between the FT and conventional prices (238 *versus* 180 CFAF/kg on average, see Table 1), introducing FT cotton in Mali was rather tricky. Indeed, given the organization of the cotton sector, all producers are organized in cooperatives and virtually eligible for FT certification. Furthermore, they have been benefiting from the same conditions (particularly the same price) for years. Offering better conditions to only some producers could thus entail a lot of conflicts. On the other hand, as no one harbored any "illusions that the cotton growing areas of West Africa [would] some day be exclusively growing Fairtrade cotton" (Bassett, 2010, p. 44), they had to find a solution to prevent rent dissipation *via* over-certification (as described in de Janvry *et al.*, 2012). CMDT and Dagris thus designed a project that would both justify a limited number of certifications and benefit to all growers. The basic idea was to use incentives provided by the FT contract to supply excellent quality FT-labeled cotton and to use it to improve the reputation of Malian cotton. Vested with the responsibility of being the "Ambassadors of Malian cotton" (CMDT, 2004; Giraudy, 2005), certified producers should thus appear legitimate in receiving a better price for their cotton.

The quality of cotton supplied by certified producers should actually increase, for several reasons. First, the FT price is used to reward quality as CMDT and Dagris required that only the four best qualities of cotton lint be exported to FT markets. In other words, certified producers would receive the FT price only for the part of their production which was graded in Sarama, Juli/S, Néré, or Juli. This provides them with strong and immediate individual incentives to adopt better practices to improve quality. Second, quality should further improve because of the cooperation and peer-controls that the collective premium (34 CFAF/kg) should reinforce.[11] Third, contrary to what occurs in the conventional sector, producers know that the certification process prevents CMDT from capturing FT premiums.

This good quality of FT cotton should then reassess the reputation of the Malian fiber. CMDT and Dagris actually thought that new clients first attracted by the FT label would change their perceptions and recognize the good quality of Malian cotton, and then buy (or buy again) conventional Malian cotton (see Giraudy, 2005). Of course, for this reputation-strategy to work, the quality of conventional cotton would have to improve too.[12] Noncertified growers were thus also encouraged to greatly improve the quality of their production. A "Quality Charter" was signed by the CMDT extension agents and the growers' representatives, where the former committed to support producers and the latter promised to apply their recommendations. In other words, FT was expected to have spillover effects on the quality of noncertified farmers' production. However, as the Charter has no enforcement value, spillover effects are expected to be restricted to the FT-cooperatives' closest neighborhood. Indeed, as the vast majority of producers distrust CMDT agents, the former are more likely to have confidence in both the reputation-strategy and the extension agents' advice if they could meet FLO agents and inspectors, and seeing by themselves quality improvement in FT cooperatives. Besides, producing cotton of as good quality as neighbors' gives "social prestige."

(c) Fairtrade cotton in Mali: Selection of the certified cooperatives and key figures

An important implication of this strategy concerns the selection process of the FT cooperatives. Cooperatives eligible for certification are pre-selected by CMDT, which chooses those that are thought able to improve quality once certified. The specific objective of promoting quality thus results in an obvious selection bias that complicates the impact evaluation. Unobservable cooperatives' characteristics such as ability, motivation, cooperation, and so forth may drive both the FT certification and subsequent quality performance. As a consequence, it might be very difficult to disentangle the impact of FT on quality from confounding explanations. However, it should be noted that after the certification of the first four cooperatives for the 2003–04 cotton season, cooperatives have been certified according to their distance to these first four cooperatives. More precisely, the extension of FT has been made gradually according to the demand for FT cotton (see Table 1), and in concentric circles around the first FT cooperatives (see Figure 1). This is due to the certification procedure: In Mali, second-degree organizations (the *Unions Communales* of Kita, Djidian, and Sébékoro) are certified for all or part of their members. It is therefore less costly to

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

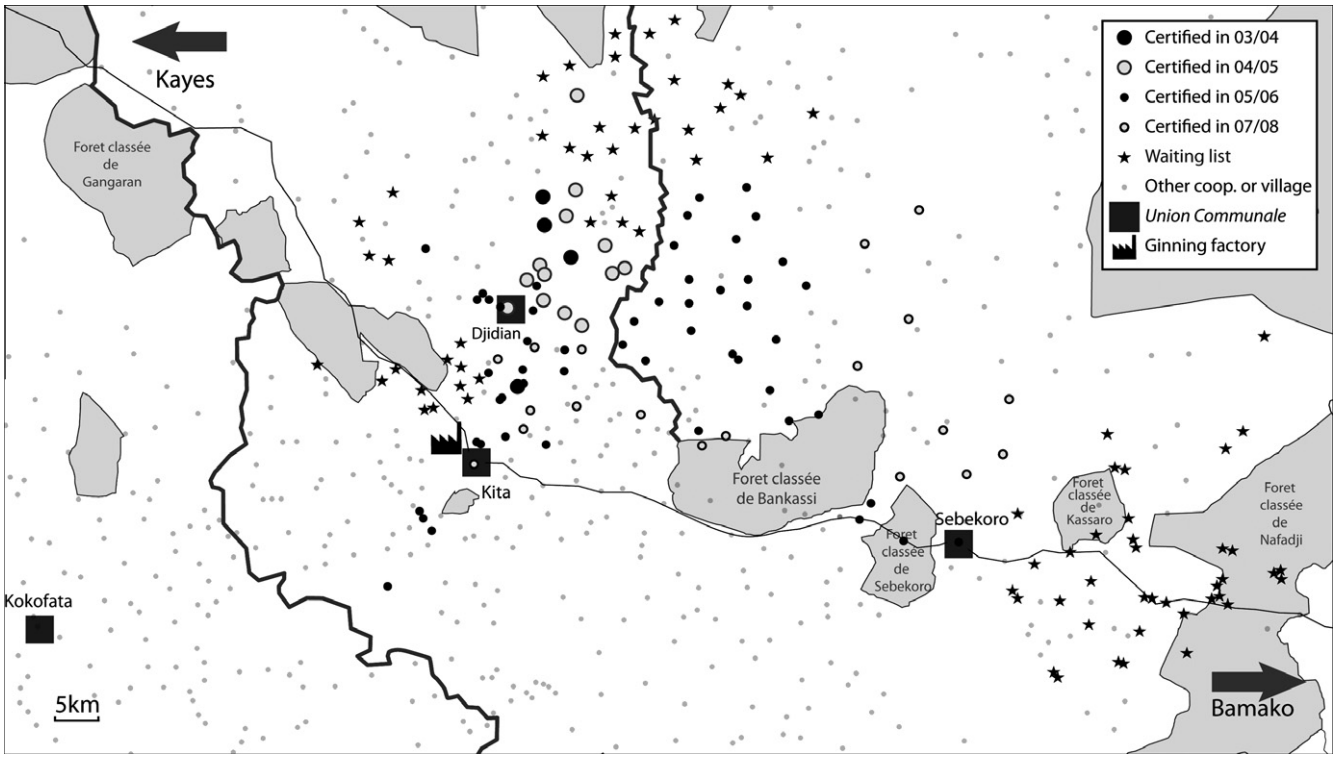

Figure 1. *Geographical location of Fairtrade cooperatives. Notes: All certified cooperatives (indicated by circles) and cooperatives on the waiting list (indicated by stars) are in the sample. Source: Author, from CMDT's document.*

first include all the cooperatives of a certified *Union Communale*. This staggered entry of cooperatives in FT implies a variation in the treatment over time which can be used to solve the selection bias problem (see Section 3). The estimation of the impact of FT on quality is further complicated by the expected spillover effects mentioned above, and by the possibility of a "mean reversion process" if certification is influenced by past value of quality performance (what is referred to as an "Ashenfelter's dip effect"). The next section details data used and the identification strategy.

3. EVALUATING THE IMPACT OF FAIRTRADE ON THE QUALITY OF MALIAN COTTON: METHODOLOGY

(a) Data

Data were obtained during a survey I conducted in Mali from January 2008 to March 2008, and cover 198 cooperatives (the 102 certified cooperatives and 96 noncertified cooperatives; see next subsection). They come from different sources. Data on the quality of cotton were obtained from two ginning factories (Kita and Fana), and from the CMDT sales department (Bamako). They cover four cotton seasons (from 2004–05 to 2007–08), and are available for a varying number of cooperatives according to years. For each cooperative, the quantities of seed cotton and cotton lint (itemized by grades) are available. Contrary to what occurs in other West African countries where cooperative representatives bribe the graders to classify their cotton as best grades, we can be confident in the reliability of data on quality. Indeed, as explained above, the grade of fiber determined at the ginning factory has never been of the slightest importance for producers' price, and hence corruption at the ginning factory. Of course, the quality of fiber is now of interest for certified producers. However, as the grading is part of FLO-Cert inspections, producers would have a lot to lose if bribing was discovered. While I was carrying out the survey, field informants did not suspect any corruption.

Data on seed varieties and rainfall were collected directly from the cooperatives records by hired enumerators, and cover five seasons (from 2003–04 to 2007–08) and all cooperatives.

(b) Identification strategy

As explained above, FT was introduced gradually in three *Unions Communales* (hereafter UC) of the Kita region, according to (i) the demand for FT cotton, and; (ii) the distance to the first four FT cooperatives (see Figure 1). Twelve cooperatives of the Djidian and Kita UC were certified in 2004–05. FT was then extended over the region since 44 cooperatives out of the 56 certified in 2005–06 are located in the UC of Sébékoro. No cooperatives were certified in 2006–07. The fourth wave of certification occurred in 2007–08 with 30 more cooperatives included in FT. To assess the impact of FT as well as its spillover effects, the survey covered a fifth group of 96 cooperatives that have been selected to participate in FT but have not yet been certified for lack of demand. Cooperatives on this "waiting list" (indicated by stars on Figure 1) are far from the first FT cooperatives and thus allow the identification of spillover effects on the cooperatives that are not certified but near from certified cooperatives.

This gradual certification of cooperatives leads to a variation in the treatment over time, which is most helpful to solve the selection bias problem. Indeed, provided that treatment varies over time and that panel data are available (as is the case here), cooperative fixed-effects models control for time-invariant unobservable variables which are supposed to affect both the participation and the outcome, and therefore provide

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

consistent estimates of treatment effects (see Wooldridge, 2002). [13] The basic empirical specification estimated then takes the following form:

$$Y_{i,t} = a\mathrm{FT}_{i,t} + b(1-\mathrm{FT}_{i,t})P_{i,t} + c(1-\mathrm{FT}_{i,t})(1-P_{i,t}) + \Phi X'_{i,t} + \delta_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ stands for quality performance of the ith cooperative ($i \in [1182]$) in the $t/t+1$ cotton season ($t \in [2004,2007]$). [14] Three measures of quality performance are used: (i) The percentage of lint production graded in Sarama, Juli/S, Néré, or Juli (the top four grades required for Fairtrade markets); (ii), the percentage of production graded in Sarama, Juli/S, or Néré (the top three grades), and; (iii) the percentage of production graded in Sarama (the best grade). To simplify, we refer to these three measures as the percentage of Fairtrade qualities (top four), Premium qualities (top three), and Sarama (top), respectively. The treatment variable $\mathrm{FT}_{i,t}$ is a dummy variable which takes the value 1 if the ith cooperative is certified in the $t/t+1$th season and 0 otherwise. What distinguishes treated cooperatives from the others is that the former can sell their products on FT markets and thus enjoy the FT price and the cooperative premium. $P_{i,t}$ stands for the proximity of certified cooperatives, and takes the value 1 if there is a certified cooperative located within ten kilometers of cooperative i in season $t/t+1$. [15] $X_{i,t}$ is a vector of control variables (see Table 4). δ_i and λ_t are cooperatives and period-specific effects, respectively, and $\varepsilon_{i,t}$ is the error term.

Eqn. (1) includes three dummy variables which correspond to the three following groups: Certified cooperatives ($\mathrm{FT}=1$), cooperatives that are not certified but which are located within ten kilometers of a certified cooperative ($\mathrm{FT}=0$, $P=1$), and cooperatives that are not certified, and which are far (more than ten kilometers) from a certified cooperative ($\mathrm{FT}=0$, $P=0$). In what follows, we refer to these three groups as, G1, G2, and G3, respectively. Rearranging Eqn. (1) to omit one dummy variable, we get Eqn. (2):

$$Y_{i,t} = \alpha + \beta_1 \mathrm{FT}_{i,t} + \beta_2(1-\mathrm{FT}_{i,t})P_{i,t} + \Phi X'_{i,t} + \delta_i + \lambda_t + \varepsilon_{i,t} \quad (2)$$

where $\alpha = c$, $\beta_1 = a - c$, and $\beta_2 = b - c$. If control groups are good counterfactuals, β_1 is the "overall" impact of FT, that is to say the difference between the average quality produced in G1 (certified cooperatives) and the one produced in G3 (distant noncertified cooperatives, see Figure 2). β_2 captures spillover effects, that is to say the difference between quality produced in G2 and the one produced in G3. The specific impact of FT certification is thus given by β_1–β_2.

To assess the validity of control groups (G3 is a good counterfactual for G2, the latter being a counterfactual group for G1), the next section starts by testing the parallel trend assumption necessary for the validity of the difference-in-differences techniques.

4. EMPIRICAL FINDINGS

(a) Testing for the parallel trend assumption

The identification strategy described above relies on the key assumption that, in the absence of FT, the change in quality in control groups (G2 or G3) would have been the same as in the treated groups (G1—being certified, or G2—becoming near to a certified cooperative). While this assumption cannot be tested directly, we can test whether the trends in control and treatment groups are the same in the pre-treatment periods. The availability of the data allows to compare the evolution of quality between the group of cooperatives certified in 2007–08 (the "fourth wave," which stands for G1) and the two others groups (neighboring nonFT cooperatives, G2; and distant nonFT cooperatives, G3) during 2004–05 and 2006–07. The right hand-side part of Figure 3 suggests similar trends for Fairtrade qualities. However, it seems that the percent of Premium qualities produced by the fourth wave was better than the average the year before its certification (see middle part of Figure 3, Panels A–C). NonFT cooperatives which are close to a certified cooperative display similar trends in quality as other nonFT cooperatives, except for Sarama (see Figure 3, Panel D).

Following Galiani, Gertler, and Schargrodsky (2005), I test the parallel trend assumption on pre-treatment periods by estimating different versions of Eqn. (2). First, I only use the observations of the control and the treatment cooperatives before the certification of the fourth wave (that is before 2007–08). I then modify Eqn. (2) by excluding the FT variable and including separate year dummies for eventual treatment and controls, which yields Eqn. (3):

$$Y_{i,t} = \alpha + \sum_{t=2005,2006} \beta_t t + \sum_{t=2005,2006} \eta_t (t \times 1[i \in \text{fourth wave}]) + \delta_i + \varepsilon_{i,t} \quad (3)$$

where t denotes year t of the $t/t+1$ cotton season (the dummy for the 2004–05 season is omitted). 1[A] is the indicator variable for event A (in this case, a dummy variable that takes the value 1 if the cooperative i belongs to the fourth wave, 0 otherwise). As in Eqn. (2), δ_i are cooperatives fixed-effects, and $\varepsilon_{i,t}$ is the error term. I test the hypothesis that the pre-certification year dummies are the same for the control groups and the eventual fourth wave by testing the joint significance of the η coefficients. The F-statistics for the joint significance are reported in Table 2 (a value in bold indicates that the corresponding H0 is rejected). Part D of Table 2 indicates that changes in quality in nonFT cooperatives have been the same, whatever their eventual distance to FT cooperatives in 2007–08. Parts A, B, and C indicate that we cannot statistically reject the hypothesis that the pre-certification dummies are the same for both the control and eventual certified cooperatives at conventional levels of statistical significance for Fairtrade qualities. However, they suggest that cooperatives certified in 2007–08 produced more Premium qualities (and, to a lesser extent, more Sarama) than controls before their certification, confirming that the possibility of a mean reversion process has to be taken into consideration while estimating Eqn. (2). The next-subsection explores this possibility.

(b) Testing for a reverse Ashenfelter's dip effect

Panel fixed-effects regressions generalize the difference-in-differences estimator when there are more than two periods and more than two groups (Duflo, 2002). However, these estimators are not valid if the program is implemented based on pre-existing differences in outcomes. For example, Ashenfelter (1978) and Ashenfelter and Card (1985) identified that many participants in training programs experience a dip in earnings just before they enter the program, which may explain why they enter the program in the first place (Duflo, 2002). If the pre-program drop in earnings is transient, difference-in-differences estimates overstate the impact of training programs, as the increase in earnings observed just after the program may

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

be partly due to a mean reversion process (Heckman & Smith, 1999). The phenomenon is known as the "Ashenfleter's dip effect." In our case however, we are led to assume the existence of a "reverse" Ashenfleter's dip effect. [16] If a temporarily higher quality performance has caused the FT certification of Malian cooperatives, a natural tendency toward mean reversion could underestimate the impact of FT. To explore this possible explanation I follow the two-step approach used by Chay, McEwan, and Urquiola (2005), examining first if the quality produced in $t-1$ determines the inclusion in FT in t, and then studying if there is a mean reversion process.

(i) Is quality a selection criterion?

Contrary to the school program assistance studied by Chay *et al.* (2005), pre-treatment value of the outcome variable (average students' test scores in their case, cotton quality in ours) is not an official selection criterion to be FT-certified. As explained above, certification depends on consumer demand for FT cotton, and is extended first to cooperatives which are (i) members of a certified *Union Communale*, and; (ii) close to certified cooperatives. However, if in a given year the demand was not sufficient to include all eligible cooperatives, it might have been that only cooperatives which produced the best quality in the previous year were eventually certified.

To see if this is the case Figure 4 plots the percentage of quality-grade produced in 2004–05 by the 182 nonFT cooperatives against their FT status in 2005–06 (Panel A), and the quality-grade produced in 2006–07 by the 126 nonFT cooperatives against their FT status in 2007–08 (Panel B). According to Panel A, only the share of Fairtrade qualities seems to have influenced the selection in 2005–06. Leaving aside the two cooperatives that produced only 10% of Fairtrade quality cotton in 2004–05, 29% seems to be a quality threshold below which certification was not possible. It should be noted that selection is stricter given that certification was not given to all cooperatives that produced more than 29% of Fairtrade quality cotton in 2004–05, confirming that distance and demand limit the inclusion. In 2007–08 (Figure 4, Panel B), the correlation between quality performance in $t-1$ and certification in t is more obvious: Only cooperatives that produced more than 51% of Premium qualities and/or 86% of Fairtrade qualities in 2006–07 were certified in 2007–08. In sum, if there is a correlation between quality produced in $t-1$ and certification in t, only Premium and Fairtrade qualities seem to be concerned. [17] This result is consistent with those contained in Table 2.

(ii) Evidence on mean reversion

This better-than-average pre-certification quality performance of certified cooperatives may lead fixed-effect regressions to understate the true effect of FT if, and only if, this quality performance is transient (due for example to exceptional climatic conditions or to less pest infestation). In that case, since these lucky circumstances are unlikely to reproduce in t, the average quality performance in t will tend to be lower than in $t-1$. This phenomenon should result in a peak in average quality the year before certification as is shown by Figure 3, especially for Premium qualities (middle column of Figure 3). [18]

I test for the existence and the significance of a mean reversion process by applying a "false treatment" as in Chay *et al.* (2005). To do this, I first retain the threshold identified in Figure 4 Panel A as a certification criterion for 2005–06 (Fairtrade qualities $\geqslant$ 29.13%). Then, I identify a sample of 76 cooperatives which were not certified or subject to spillover effects in 2004–05 and 2005–06, and divide this sample in two groups according to the quality performance achieved in 2004–05: Those who produced more or 29.13% of Fairtrade qualities cotton in 2004–05 are considered as "treated" (T) in 2005–06. Lastly, I estimate the impact of this "false treatment" using the difference-in-differences estimator (η in Eqn. (4.a)).

$$Y_{i,t} = \alpha + \beta \cdot 1[t = 2005] + \gamma \cdot 1[i \in \mathrm{T}] + \eta \cdot 1[t = 2005] \times 1[i \in \mathrm{T}] + \varepsilon_{i,t} \quad (4.a)$$

where 1[A] is the indicator variable for the event A. As there are no expected FT effects (due to certification or spillovers) for these cooperatives at that time, this false treatment should yield no effect (η should be zero), unless driven by mean reversion.

I also apply a false treatment in 2007–08 to 41 out of 57 cooperatives which were not certified or subject to spillovers in 2006–07 by retaining the thresholds identified in Figure 4 Panel B (51.88% of Premium qualities and 49.71% or 86.08% of Fairtrade qualities). The effects of these fictitious treatments are given by coefficients η' in Eqn. (4.b).

$$Y_{i,t} = \alpha' + \beta' \cdot 1[t = 2007] + \gamma' \cdot 1[i \in \mathrm{T}] + \eta' \cdot 1[t = 2007] \times 1[i \in \mathrm{T}] + \varepsilon_{i,t} \quad (4.b)$$

Table 3 gives the different estimates of coefficients η and η' according to the selection criterion retained and the outcome variable (Y could be the percent of Sarama, Premium or Fairtrade qualities). The sign, size, and significance of the estimated η and η' suggest that mean reversion is actually of primary importance, especially for Premium and Fairtrade qualities. As the regression discontinuity approach applied by Chay *et al.* (2005) to address the mean reversion phenomenon is not applicable in our case (there is not a strict threshold, and quality is not an official selection criterion), the next subsection presents an adapted identification strategy and its results.

(c) Bounding the impact of Fairtrade

Identifying assumptions tested above imply that I have to control both for unobservable cooperatives characteristics and for past quality performance. The empirical model should thus include both cooperative fixed-effects and the lagged dependent variable (LDV) (Angrist & Pischke, 2009), leading to Eqn. (5).

$$Y_{i,t} = \alpha + \theta Y_{i,t-1} + \beta_1 \mathrm{FT}_{i,t} + \beta_2 (1 - \mathrm{FT}_{i,t}) P_{i,t} + \Phi X'_{i,t} + \delta_i + \lambda_t + \varepsilon_{i,t} \quad (5)$$

Due to the correlation between the LDV and the fixed-effects, Eqn. (5) cannot be estimated by Ordinary Least Squares (OLS) (see Cameron & Trivedi, 2005). I thus estimated Eqn. (5) with the Generalized Methods of Moments in system (GMM system) as developed by Arellano and Bover (1995) and Blundell and Bond (1998). However, results were not conclusive: The over-identification Hansen test leads to reject the validity of instruments, and only the impact of FT certification on Fairtrade qualities (equal to +3 percentage points) was robust to the modification of instruments.

To solve the dilemma entailed by the estimation of dynamic panel data models, Angrist and Pischke (2009, p. 245) demonstrate that "fixed-effects and lagged dependent variables estimates have useful bracketing property" (see also Guryan, 2001). Applied to our case, the intuition is the following: The estimation of Eqn. (2) reproduced, which controls for

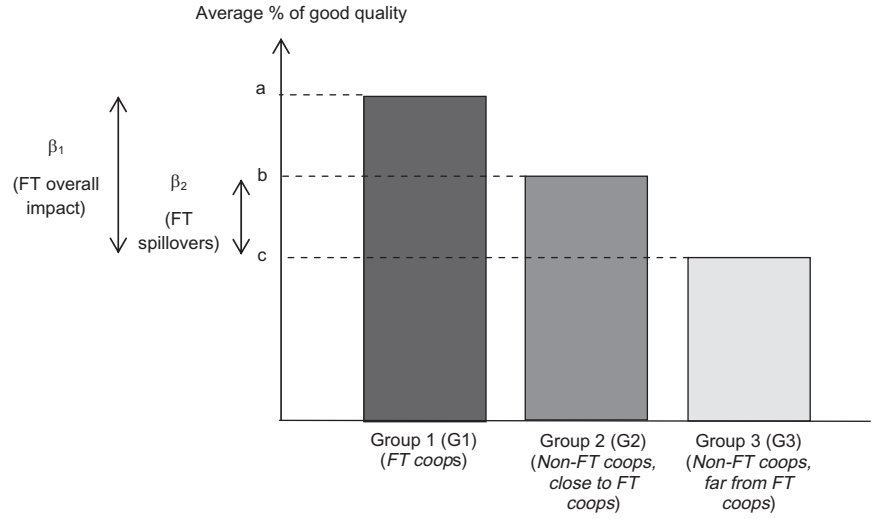

Figure 2. *Expected effects of Fairtrade on the quality of Malian cotton. Source: Author, adapted from Janssens, 2006.*

cooperative fixed-effects but does not include the LDV, provides lower-bound estimates of the effects of FT. Indeed, fixed-effects rid our estimates from the *positive* impact that unobserved cooperatives characteristics could have on quality performance (fixed-effects control for the classic selection bias problem). However, as Eqn. (2) does not include the LDV, it does not purge for the *negative* impact that the mean reversion process detected in the previous subsection should have on quality performance. On the contrary, estimations that include the LDV but ignore fixed-effects (as in Eqn. (6) below) provide

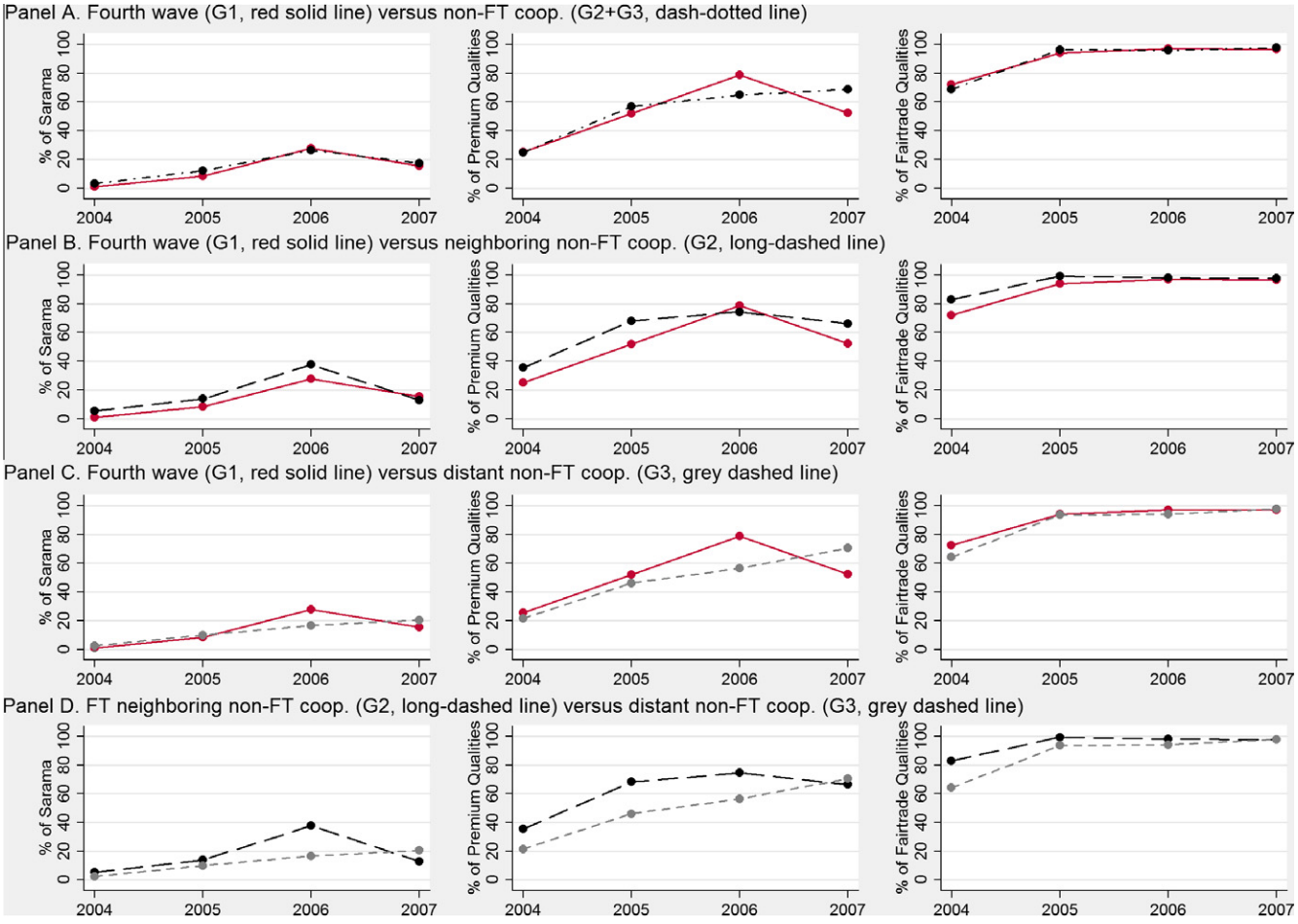

Figure 3. *Evolution of quality in FT versus nonFT cooperatives. Notes: The fourth wave was certified in 2007/08. Year t stands for season t/t+1. Sarama = best grade of cotton lint; Premium qualities = top three grades; Fairtrade qualities = top four grades. Source: Author, from CMDT's data.*

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

Table 2. *Testing for the parallel trend assumption*

Quality	Sarama	Premium	Fairtrade
Part A. H0 : quality in the fourth wave and in noncertified coops has evolved in the same way during 2004–05 and 2006–07 (see also Figure 3, Panel A)			
F-stat(2, 276)	1.368	**3.540**	0.418
Part B. H0 : quality in the fourth wave and in neighboring noncertified coops has evolved in the same way during 2004–05 and 2006–07 (see also Figure 3, Panel B)			
F-stat(2, 169)	0.133	**3.601**	1.435
Part C. H0 : quality in the fourth wave and in distant noncertified coops has evolved in the same way during 2004–05 and 2006–07 (see also Figure 3, Panel C)			
F-stat(2, 215)	**7.795**	**4.136**	1.392
Part D. H0 : quality in the in FT-neighboring noncertified coops and distant noncertified coops has evolved in the same way during 2004–05 and 2006–07 (see also Figure 3, Panel D)			
F-stat(2, 177)	1.079	1.703	0.875

Notes: The critical values of $F(2, \infty)$ are 4.61 (99% probability level), 3.00 (95%), and 2.30 (90%). The null hypothesis (H0) can be rejected at the corresponding level of confidence when the critical value is lower than the observed value (these cases are indicated in bold). The fourth wave was certified in 2007–08.
Sarama = best grade of cotton lint; Premium = top three grades; Fairtrade = top four grades.

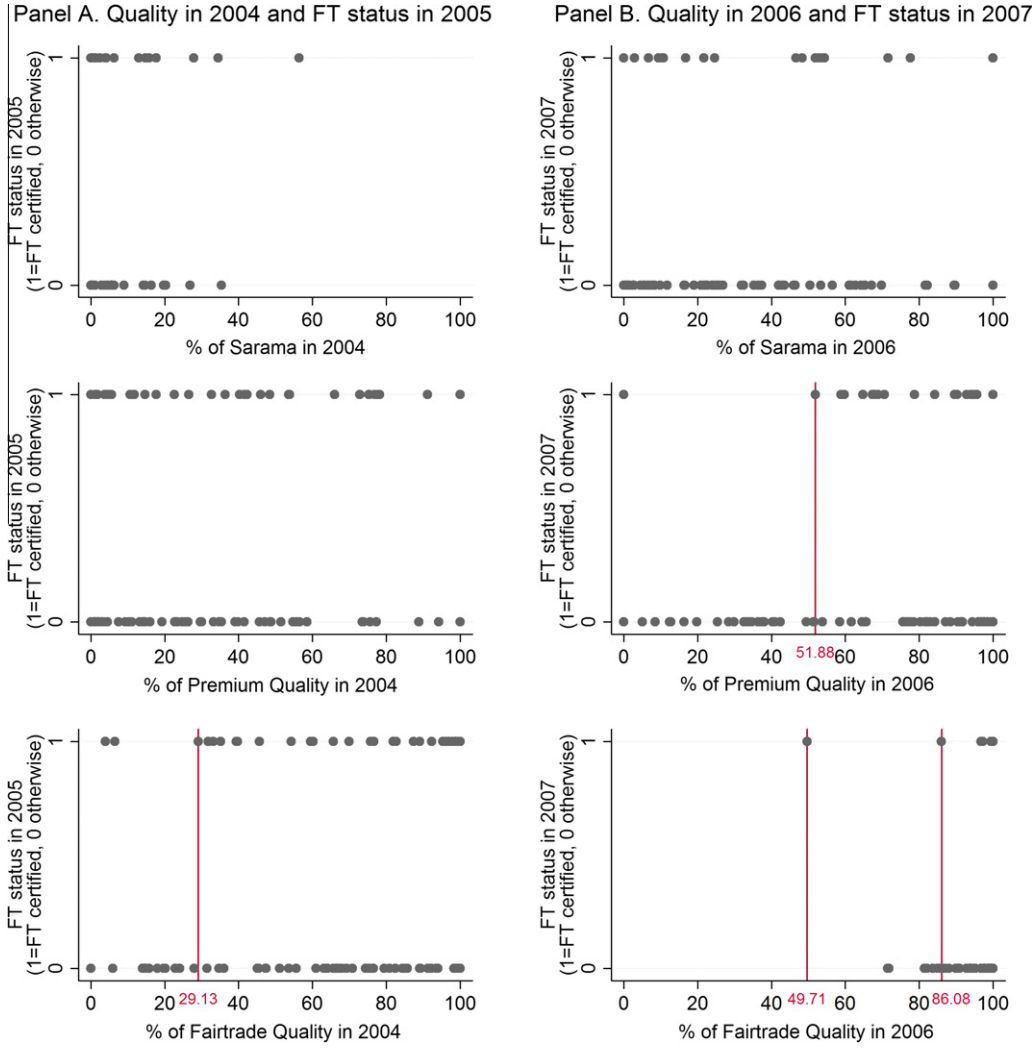

Figure 4. *Quality in year t versus FT status in t+1. Notes: Year t stands for season t/t+1. Panel A plots the quality produced in 2004/05 by the 182 nonFT cooperatives against their FT status in 2005/06. Panel B plots the quality produced in 2006/07 by the 126 nonFT cooperatives against their FT status in 2007/08. Due to overlap or to the availability of data on quality, all 182 (resp. 126) coops (indicated by dots) are not visible in Panel A (resp. Panel B), especially for Sarama as the percent of the production graded in Sarama is zero for many coops. Sarama = best grade of cotton lint; Premium qualities = top three grades; Fairtrade qualities = top four grades. Source: Author, from CMDT's data.*

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

Q4

Table 3. *Testing for a mean reversion process*

Part A. Impact of a false treatment applied in 2005–06 to cooperatives which produced more than 29.13% of Fairtrade qualities in 2004–05 (η in Eqn. (4.a))	
Left hand-side variables	Estimates of η
% of Sarama	2.132 (4.266)
% of Premium qualities	−26.181 (9.353)***
% of Fairtrade qualities	−65.172 (4.733)***
Part B. Impact of a false treatment applied in 2007–08 to cooperatives which produced more than 51.88% of Premium Qualities in 2006–07 (η' in Eqn. (4.b))	
Left hand-side variables	Estimates of η'
% of Sarama	−15.254 (10.425)
% of Premium qualities	−52.100 (9.700)***
% of Fairtrade qualities	−9.064 (3.429)***
Part C. Impact of a false treatment applied in 2007–08 to cooperatives which produced more than 49.71% of Fairtrade Qualities in 2006–07 (η' in Eqn. (4.b))	
Left hand-side variables	Estimates of η'
% of Sarama	−19.762 (10.018)**
% of Premium qualities	−352.431 (10.110)***
% of Fairtrade qualities	−44.084 (2.432)***
Part D. Impact of a false treatment applied in 2007–08 to cooperatives which produced more than 86.08% of Fairtrade Qualities in 2006–07 (η' in Eqn. (4.b))	
Left hand-side variables	Estimates of η'
% of Sarama	−6.576 (12.208)
% of Premium qualities	−18.346 (15.402)
% of Fairtrade qualities	−22.601 (5.340)***

Notes: Robust standard deviations in parentheses.
Sarama = best grade of cotton lint; Premium qualities = top three grades; Fairtrade qualities = top four grades.
** Significant at 5%.
*** Significant at 1%.

upper-bounds as they control for the *negative* impact just mentioned but do not take into account unobservable characteristics that are *positively* correlated with quality performance.

$$Y_{i,t} = \alpha + \beta_1 \mathrm{FT}_{i,t} + \beta_2(1 - \mathrm{FT}_{i,t})P_{i,t} + \Phi X'_{i,t} + \delta_i + \lambda_t + \varepsilon_{i,t} \qquad \text{(eq. 2, lower bound)}$$

$$Y_{i,t} = \alpha + \theta Y_{i,t-1} + \beta_1 \mathrm{FT}_{i,t} + \beta_2(1 - \mathrm{FT}_{i,t})P_{i,t} + \Phi X'_{i,t} + \lambda_t + \varepsilon_{i,t} \qquad \text{(eq. 6, upper bound)}$$

Thus, estimating Eqn. (2) with the first-difference or within estimator provides the minimum impact of FT, and the OLS estimate of Eqn. (6) provides the maximum impact of FT. Table 4 provides these three sets of estimates. Columns (1) to (3) give within estimates of Eqn. (2), columns (4) to (6) give first-difference estimates of Eqn. (2), and columns (7) to (9) give OLS estimates of Eqn. (6). Two important determinants of the quality of cotton are included: Rainfall (in millimeters), and the variety of seed used where "Cleaned seed" is an indicator variable which takes the value 1 if the cooperative is provided with seed cleaned from seed-coat fragments. Findings are consistent with previous results as (i) LDV estimates give higher coefficients than differences estimates, (ii) differences and LDV estimates give quite different results only for Premium and Fairtrade qualities (and especially for Premium qualities, for which the Ashenfelter's dip is most suspected), and; (iii) the coefficient of LDV is significant only for Premium qualities. On the contrary, results for Sarama do not change that much.

To test the robustness of these results, I estimated other versions of Eqns. (2) and (6). [19] First, I used other proximity variables (five instead of ten kilometers for example, or the number of certified cooperatives in a neighborhood instead of a dummy variable, see Miguel & Kremer, 2004). Results remained consistent with those in Table 4 as I found smaller effects (FT has spillover effects outside the five kilometers zone, so that the control group in this case is affected by FT). Second, GMM estimates, while not conclusive, do not provide contradictory results. Third, I used an alternative control group which comprises all the cooperatives of the *Unions Communales* of Kita, Djidian and Sébékoro. Again, results are quite similar. Lastly, results are unaffected by the choice of alternatives specifications (e.g., logarithmic transformation of the dependent variable) or the choice of estimators. [20]

Table 5 sums up findings and gives the lower and upper-bounds of the impact of Fairtrade. Results suggest that FT induces a seven percentage points (pp) increase in the proportion of Sarama cotton in certified cooperatives, and a 5 pp rise in the cooperatives subject to spillover effects. At most, FT induces a 8–9 pp increase in Sarama and Premium qualities, and a 2.5 pp increase in Fairtrade qualities, and spillovers and overall effects are similar. In other words, FT accounts for at least half of the quality improvement observed in the FT zone (where the proportion of Sarama increased from 3% in 2004–05 to 16% in 2007–08 whereas the Malian average increased from 1.4% to 3.7%). Had this improvement concerned the whole cotton sector, it would have increased the CMDT's 2007–08 turnover by 250 million CFAF (0.4% of its 2007–08 turnover). [21]

5. IMPLICATIONS AND CONCLUSIONS

Controlling for selection bias and the possibility of a mean reversion process, this study finds that Fairtrade has a signif-

Table 4. *The impact of Fairtrade on cotton quality: differences versus lagged dependent variable estimates*

	Left hand-side variables ($Y_{i,t}$ in Eqns. (2) and (6))								
	Within estimates of Eqn. (2)			First-differences estimates of Eqn. (2)			OLS estimates of Eqn. 6		
Right hand-side variables (corresponding coefficient in Eqns. (2) and (6))	% of Sarama	% of Premium qualities	% of Fairtrade qualities	% of Sarama	% of Premium qualities	% of Fairtrade qualities	% of Sarama	% of Premium qualities	% of Fairtrade qualities
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
FT (β_1)	6.797*	−3.134	−2.868	6.890*	−1.800	−1.882	7.699***	7.991**	2.380*
	(3.858)	(6.659)	(5.166)	(4.245)	(7.106)	(5.149)	(2.960)	(4.023)	(1.301)
(1-FT)P (β_2)	5.178	4.534	1.043	7.429**	7.323	0.992	9.656***	9.417**	2.603**
	(3.904)	(5.865)	(4.519)	(3.771)	(6.805)	(4.785)	(3.218)	(4.100)	(1.129)
Cleaned seed	20.717***	29.648***	9.485***	28.497***	36.367***	8.831***	19.843***	25.381***	5.993***
	(5.910)	(7.085)	(3.334)	(6.990)	(8.091)	(1.836)	(5.267)	(5.898)	(1.272)
Rainfall (mm)	0.017	−0.030	−0.004	0.019	−0.023	0.017	−0.021	−0.080***	−0.017***
	(0.021)	(0.021)	(0.009)	(0.028)	(0.024)	(0.012)	(0.016)	(0.020)	(0.005)
2004–05	0.145	−43.116***	−24.354***	1.246	−38.956***	−17.751***	−9.544*	−57.994***	−31.849***
	(7.821)	(9.493)	(5.292)	(9.827)	(11.551)	(5.684)	(5.785)	(8.791)	(9.967)
2005–06	−0.634	−1.267	2.036	0.128	0.186	2.011	−0.185	2.566	2.620
	(2.687)	(3.999)	(1.665)	(4.130)	(5.272)	(1.290)	(3.041)	(4.469)	(1.664)
2006–07	18.342***	1.496	0.858	19.679***	3.886	3.956*	12.890***	−5.895	−1.635
	(4.784)	(5.581)	(2.342)	(5.500)	(6.099)	(2.228)	(4.242)	(5.222)	(1.412)
Lagged dep. var $Y_{i,t-1}$ (θ)							0.041	0.096*	0.055
							(0.068)	(0.052)	(0.037)
Constant	−10.069	89.888***	99.148***				25.018	127.151***	104.920***
	(21.113)	(22.496)	(10.465)				(16.630)	(21.636)	(6.860)
Coop. fixed-effects	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Number of observations	603	603	603	420	420	420	421	421	421
R^2	0.21	0.30	0.34	0.19	0.21	0.34	0.13	0.16	0.30

Notes: robust standard deviations in parentheses.
All variables, except rainfall in millimeters and the lagged dependent variable, are dummy variables taking of value of 1 if condition is satisfied. The total number of observations is not equal to 728 (182 * 4) because the availability of data varies according to years.
Sarama = best grade of cotton lint; Premium qualities = top three grades; Fairtrade qualities = top four grades.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

Table 5. *Upper and lower bounds of the impact of Fairtrade on cotton quality (in percentage points)*

	Overall impact (estimates of β_1)		Spillover effects (estimates of β_2)	
	Upper bound (1)	Lower bound (2)	Upper bound (3)	Lower bound (4)
Sarama	+7699***	+6797* (+ 6890*)	+9656***	+5178* (+7.429**)
Premium qualities	+7991**	Null[a]	+9417**	Null[a]
Fairtrade qualities	+2380*	Null[a]	+2603**	Null[a]

Notes: coefficients of columns (1) and (3) are OLS estimates of β_1 and β_2 in Eqn. (6). Coefficients of columns (2) and (4) are *within* estimates of β_1 and β_2 in Eqn. (2) (first-differences estimates in parentheses in columns (2) and (4)).
Sarama = best grade of cotton lint; Premium qualities = top three grades; Fairtrade qualities = top four grades.
[a] Null means not statistically different from zero.
* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

icant impact on the quality of cotton produced by certified Malian growers. It also shows that the quality produced by noncertified but geographically close producers also increases *via* spillover effects.

Quality upgrading in certified cooperatives can be accounted for by reduced uncertainty and enhanced incentives provided to producers.[22] FT actually introduces two equally important factors that encourage producers to improve quality: Price differentiation and a credible commitment enforced by a third party which fosters producers' trust in contract enforceability. Because improving quality entails the adoption of new pest management practices whose results are uncertain, price differentiation is a necessary condition, but not sufficient in itself. Guarantees provided by FLO-Cert—which checks both the price paid by the CMDT to certified producers and cotton grading—reduce growers' uncertainty from engaging in quality improvement. In this sense, the results presented here corroborate the importance of independent third-parties in reducing small producers' uncertainty about the net returns to engage in new agricultural practices highlighted by Torero and Viceisza (2011) in a Vietnamese dairy, by Bolwig, Gibbon, and Jones (2009) in the context of organic contract farming in Uganda, and by Barham and Weber (2012) for certified coffee in Mexico and Peru.

Spillovers can be explained by a "demonstration effect," as suggested by Bassett (2010) in the case of organic cotton in Mali and Burkina-Faso and by Weber (2012) for the Rainforest Alliance coffee in Peru. Indeed, while extension agents have advised producers to adopt integrated pest management practices to improve both quality and yields from the early 2000s, Malian cotton growers have always been skeptical (due to the prevailing lack of confidence toward CMDT) adding further to traditional resistance to changes and/or risk-aversion. As they can observe the efficiency of these practices in neighboring cooperatives, their adoption is fostered.

Though project-specific, these findings have two main implications. First, while the future of West African cotton is a "question of quality" (Bingen, 2006, p. 219) and, more generally speaking, given the increasing importance of private labels and premium segments, the necessity of an independent and transparent grading mechanism at the cooperative- or farm-level should be taken into account by major stakeholders concerned with the reform process in Mali to prevent any further drop in the quality (Larsen, 2002, and Poulton *et al.*, 2004, report similar results in other African regions). This element should be associated with a revision of the price-setting mechanism so that the benefits of higher quality are being realized at the producer level (Bassett, 2010).

The second implication concerns the future of Fair Trade and particularly the evolution of the Fairtrade system and its actors (FLO and its national affiliates, and the independent third-party certification body FLO-Cert). Given that there is restriction on Fairtrade demand, respective roles of the FLO's system operators could be redesigned to be made more efficient in helping small producers increase the profitability of their farms. FLO and its national affiliates, on the one hand, have developed support and marketing competencies that could help many small producers in developing countries to design, produce, and market high-quality products (see also Ruben & Zuniga, 2011). They could also foster the adoption of new technologies or innovative agricultural practices through the funding of (demonstration) trials. As suggested by Barham and Weber (2012), further research is needed to improve the design of sustainable initiatives and lead to greater effects. In our case for example, further research is needed to "attest to the power of seeing neighbors succeed with a technology" (Weber, 2012, p. 2) as we do not know if noncertified producers really adopt innovative agricultural practices and what are the respective role of observation and information spillovers in fostering adoption. FLO-Cert, on the other hand, could diversify its services and act as an independent third-party in other sectors than only Fairtrade.[23] In a nutshell, Fairtrade actors and their competencies should be included in contract farming initiatives for agricultural development to make them more efficient in supporting small-scale farmers' production upgrading and marketing.

NOTES

1. Throughout the remainder of the paper, "Fair Trade" refers to the general movement that seeks to offer better trading conditions to producers in developing countries, whereas "Fairtrade" (abbreviated FT) specifically refers to the certification system carried out by the Fairtrade International foundation (or FLO) and its national affiliates. For a detailed description of the FLO's system, see Raynolds (2009).

2. Whether Fair Trade is a new form of product-differentiation or it introduces a market distortion *via* higher prices for non-differentiated products remains the cornerstone of the theoretical debate on Fair Trade. According to de Janvry *et al.* (2012), for example, this is precisely because Fair Trade is not based on altering the process through which a product is produced that over-certification is likely to occur (virtually all producers

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

could be certified). Leclair (2002, 2008), and Yanchus and de Vanssay (2003), share this point of view. Based on philanthropic consumers and not on a real differentiation (Mendoza & Bastiaensen, 2003), Fair Trade is thus likely to prolong the dependence of producers on products "which have poor prospects in the long run" (Leclair, 2002, p. 949). Indeed, while products such as coffee are already characterized by oversupply, the Fair Trade price floor deters diversification and removes the incentive for growers to upgrade production or invest in market knowledge (Zehner, 2002). Moreover, although this conclusion may depend upon restrictive hypotheses (see Hayes, 2008); the Fair Trade price could increase overproduction and deteriorate the condition of non-Fair Trade producers. This argument is frequently put forward by multinational firms to defend their own quality-labels against FT (for example, Nestlé argues that its "specialty coffees" offer better perspectives than Fair Trade, see Fridell, Hudson, & Hudson, 2008). On the contrary, Balineau and Dufeu (2010), Becchetti and Rosati (2007), and Kaplinsky (2006), consider Fair Trade products as differentiated because they are produced and exchanged according to specific terms and conditions. However, inefficiency may still arise from higher costs of processing and marketing, due to small volumes traded and higher associated costs (certification, membership fees, advertising and campaigning, see World Bank, 2007).

3. Until recently, CMDT was owned by the Malian government (60%) and the CFDT (40%), restructured in 2001 to become Dagris (*Développement des agro-industries du Sud*). Dagris has been recently privatized and the new company (Géocoton) now holds less than 5% of CMDT.

4. Cotton prices divided by two during 1980–81 and 2004–05. Although the decline in world cotton prices has been mostly attributed to the effect of government subsidies given to cotton growers in the US, the EU, and China (Wodon *et al.*, 2006), there are other forces at work: On the supply side many technological improvements (improved seed varieties for example) have reduced production costs. On the demand side, *per capita* consumption is stagnant and suffers competition from synthetic products. For more details and references on the decline in world cotton prices, see Tschirley, Poulton, and Labaste (2009).

5. See endnote 3.

6. The daily quotation provided by the Cotlook A Index is an average of the cheapest five offering prices from a selection of sixteen national (or regional) origins traded internationally. For more details, see Larsen (2003, p. 6).

7. Since 2003, a premium is annually awarded to the best cooperative. However, given that there are more than 5,000 cotton cooperatives in Mali, the premium is not sufficient to significantly improve incentives.

8. Since the CMDT's reform in 2001 (see Wodon *et al.*, 2006), seed cotton has been graded by a few members of the cooperative at the village level, and not by the CMDT's agents (in other words, producers grade their own cotton). In the FT region surveyed for the purpose of this study, all the seed cotton has been classified in the best seed cotton category since 2003 (source: Data collected by the author; see also Tschirley *et al.*, 2009, p. 88).

9. The grade is a multidimensional indicator which takes into account the color of the lint, and its degree of contamination and stickiness. The quality of the lint also depends on its length, its strength, and its maturity, which are not considered in this paper (for more details on the determinants of the quality of cotton see Larsen, 2003).

10. In the Kita region, Fairtrade-certified producers are not organic-certified. There is an organic/Fairtrade project in the Bougouni region of the southern Mali (for more details see Bassett, 2010, p. 49).

11. 80% of certified producers actually claim that cooperation has been reinforced since certification (source: Producers' data collected by the author during the same survey).

12. And, as underlined by Bassett (2010, p. 52)), "this vision assumes, of course, that all cotton growers will receive their fair share of the profits from higher quality cotton, something that cotton growers find very difficult to obtain in the conventional commodity chain".

13. The idea, sometimes referred to as the "pipeline approach" (Ravallion, 2005, p. 30), is to take cooperatives yet to be included in FT as control group. As these cooperatives have been selected to participate in FT but have not yet been certified, they should constitute a valid comparison group as they are probably a good approximation of what would have happened in certified cooperatives in the absence of FT. The key assumption behind this approach is that the timing of treatment is exogenous (as is the case here since FT extension depends on Northern demand and on the distance from the first FT cooperatives).

14. Because data on quality are not available before their inclusion in FT, the first two waves are excluded from the regressions ($i_{\max} = 182$).

15. It should be noted that this identification strategy may be subject to spatial autocorrelation. Unfortunately, the absence of GPS data prevents us from applying recent developments in spatial econometrics to test if spillover effects are due to unobservable FT zone characteristics. However, these may be included in cooperatives characteristics (soil quality for example).

16. Studying the relationship between teachers' abilities and student achievement, Goldhaber and Anthony (2007) use this expression to describe the following situation: Teachers who have gained recognition for their knowledge and teaching skills through a voluntary certification process may appear less effective than others if a temporary increase in their performance has encouraged them to apply for certification.

17. Estimated β of the following equation $FT_{i,t} = \alpha + -\beta Y_{i,t-1} + \delta_i + \lambda_t + \varepsilon_{i,t}$ (variables described in Section 3) are indeed positive and significant for Premium qualities.

18. Producers might also believe that FT certification depends on quality improvement, and hence do their best to improve quality. Once certified, they might relax their efforts so FT certification would lead to a decrease in quality. However, the producers' survey (see endnote 11) shows that, in 2008, non-FT producers do not know anything about FT criteria. It is therefore justifiable to think that it was all the more so in 2004 and 2005 when FT was new in the region.

19. Results are available upon request.

20. On Tobit *versus* OLS estimators with a limited dependent variable see Wooldridge, 2002, p. 517.

21. Source: Author's estimation made from CMDT's sales department information (keeping quantities sold unchanged).

22. If truck drivers and gin workers adopt better practices for cotton provided by certified cooperatives, this could provide another explanation for quality improvements. That would not change the global picture (FT improves the quality of Malian cotton), but it would modify substantially the explanation and the implications derived. However, field observations do not support the alternative explanation as transport and ginning practices are the same for certified and conventional cotton. Moreover, if ginning practices were different for Fairtrade cotton, one would certainly

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

observe different ginning ratio (seed cotton weight/lint weight), which is not the case (while the average ginning ratio in conventional cooperatives—39%—is statically different from the one of FT cooperatives—41%—the difference is very small). Similarly, if FT had led to differentiated transport practices for Fairtrade cotton, we should observe differences in the "cooperative-to-factory" weight ratio (cotton weight at the village/cotton weight at the factory entrance). Again this is not the case as the average ratio is 1.053 for conventional cotton and 0.999 for certified cotton (and the difference is not statistically different from zero). Lastly, one could think that the impact of Fairtrade is mainly due to better agricultural advice provided to certified cooperatives. Indeed, CMDT's agents indicated that they have much more work in certified cooperatives. However, this effect is still attributable to a change in producers' behavior as extension agents would not spend so much time explaining standards if producers did not listen to them.

23. FLO-Cert has actually begun such a diversification as the company now proposes carbon footprint assessment according to the GHG protocol (GreenHouse Gas protocol).

REFERENCES

Angrist, J. D., & Pischke, J.-S. (2009). *Mostly harmless econometrics: An empiricist's companion*. Princeton, NJ: Princeton University Press.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics, 68*(1), 29–51.

Arnould, E. J., Plastina, A., & Ball, D. (2009). Does Fair Trade deliver on its core value proposition? Effects on income, educational attainment, and health in three countries. *Journal of Public Policy and Marketing, 28*(2), 186–201.

Ashenfelter, O. (1978). Estimating the effect of training programs on earnings. *Review of Economics and Statistics, 60*(1), 47–57.

Ashenfelter, O., & Card, D. (1985). Using the longitudinal structure of earnings to estimate the effect of training programs. *Review of Economics and Statistics, 67*(4), 648–660.

Bacon, C. M. (2005). Confronting the coffee crisis: Can Fair Trade, organic, and specialty coffees reduce small-scale farmer vulnerability in northern Nicaragua?. *World Development, 33*(3), 497–511.

Bacon, C. M. (2010). Who decides what is fair in fair trade? The agri-environmental governance of standards, access, and price. *Journal of Peasant Studies, 37*(1), 111–147.

Badiane, O., Ghura, D., Goreux, L., & Masson, P. (2002). Cotton sector strategies in West and Central Africa. World Bank policy research working paper n°2867, Washington, D.C.: World Bank.

Balineau, G., & Dufeu, I. (2010). Are Fair Trade goods credence goods? A new proposal, with French illustrations. *Journal of Business Ethics, 92*(Issue Suppl. 2), 331–345.

Barham, B. L., Callenes, M., Gitter, S., Lewis, J., & Weber, J. (2011). Fair Trade/organic coffee, rural livelihoods, and the 'Agrarian Question': Southern Mexican coffee families in transition. *World Development, 39*(1), 134–145.

Barham, B. L., & Weber, G. J. (2012). The economic sustainability of certified coffee: Recent evidence from Mexico and Peru. *World Development, 40*(6), 1269–1279.

Bassett, T. J. (2010). Slim pickings: Fairtrade cotton in West Africa. *Geoforum, 41*(1), 44–55.

Bassett, T. J. (2008). Producing poverty: Power relations and price formation in the cotton commodity chains of West Africa. In W. G. Moseley, & L. C. Gray (Eds.), *Hanging by a thread: Cotton, globalization and poverty in Africa* (pp. 35–64). Athens, Ohio, U.S.A.: Ohio University Press.

Becchetti, L., & Costantino, M. (2008). The effects of fair trade on affiliated producers: An impact analysis on Kenyan farmers. *World Development, 36*(5), 823–842.

Becchetti, L., Costantino, M., & Portale, E. (2008). Human capital, externalities and tourism: three unexplored sides of the impact of FT affiliation on primary producers. Working paper n°262. Rome: CEIS, Tor Vergata University.

Becchetti, L., & Rosati, F. C. (2007). Global social preferences and the demand for socially responsible products: Empirical evidence from a pilot study on fair trade consumers. *World Economy, 30*(5), 807–836.

Beuchelt, T. D., & Zeller, M. (2011). Profits and poverty: Certification's troubled link for Nicaragua's organic and fairtrade coffee producers. *Ecological Economics, 70*(7), 1316–1324.

Bingen, J. (2006). Cotton in West Africa: A question of quality. In J. Bingen, & L. Busch (Eds.), *Agricultural standards: The shape of the global food and fiber system* (pp. 219–242). Dordrecht, The Netherlands: Springer.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), 115–143.

Bolwig, S., Gibbon, P., & Jones, S. (2009). The economics of smallholder organic contract farming in tropical Africa. *World Development, 37*(6), 1094–1104.

Cameron, A. C., & Trivedi, P. K. (2005). *Microeconometrics: Methods and applications*. Cambridge M.A.: Cambridge University Press.

Chay, K. Y., McEwan, P. J., & Urquiola, M. (2005). The central role of noise in evaluating interventions that use test scores to rank schools. *American Economic Review, 95*(4), 1237–1258.

CMDT (Compagnie Malienne pour le Développement des Textiles) (2004). *Note technique sur le commerce équitable du coton*. Bamako, Mali: CMDT.

De Janvry, A., McIntosh, C., & Sadoulet, E. (2012). Fair Trade and free entry: Can a disequilibrium market serve as a development tool? Working paper version (September 2012).

Delpeuch, C., & Vandeplas, A. (2012). Revisiting the "Cotton Problem" – A comparative analysis of cotton reforms in sub-Saharan Africa. *World Development*, http://dx.doi.org/10.1016/j.worlddev.2012.06.020.

Duflo, E. (2002). *Empirical methods*. Mimeo: MIT.

Fridell, M., Hudson, I., & Hudson, M. (2008). With friends like these: The corporate response to fair trade coffee. *Review of Radical Political Economics, 40*(1), 8–34.

Galiani, S., Gertler, P., & Schargrodsky, E. (2005). Water for life: The impact of the privatization of water services on child mortality. *Journal of Political Economy, 113*(1), 83–120.

Giraudy, F. (2005). *Comment insérer harmonieusement le commerce équitable dans les filières cotonnières d'Afrique francophone?* Paris: Dagris, Unpublished. Q7

Goldhaber, D., & Anthony, E. (2007). Can teacher quality be effectively assessed? National board certification as a signal of effective teaching. *Review of Economics and Statistics, 89*(1), 134–150.

Guryan, J. (2001). Desegregation and black dropout rates. NBER working paper n°8345. Cambridge, MA: NBER.

Hayes, M. G. (2008). Fighting the tide: Alternative trade organizations in the era of global free trade – A comment. *World Development, 36*(12), 2953–2961.

Heckman, J. J., & Smith, J. A. (1999). The pre-programme earnings dip and the determinants of participation in a social programme. Implications for simple programme evaluation strategies. *Economic Journal, 109*(457), 313–348.

ITMF (International Textile Manufacturers Federation) (2008). *Cotton contamination surveys: 1999–2001–2003–2005–2007*. Zürich (Switzerland): ITMF.

Jaffee, D. (2008). Better, but not great: The social and environmental benefits and limitations of fair trade for indigenous coffee producers in Oaxaca, Mexico. In R. Ruben (Ed.), *The impact of fair trade* (pp. 195–222). Wageningen, Netherlands: Wageningen Academic Publishers.

Janssens, W. (2006). Measuring externalities in program evaluation. Discussion paper. Amsterdam (Netherlands): The Tinbergen Institute.

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005

Kaplinsky, R. (2006). Revisiting the revisited terms of trade: Will China make a difference?. *World Development, 34*(6), 981–995.

Larsen, M. N. (2002). Is oligopoly a condition of successful privatization? The case of cotton in Zimbabwe. *Journal of Agrarian Change, 2*(2), 185–205.

Larsen, M. N. (2003). Quality standard-setting in the global cotton chain and cotton sector reforms in sub-Saharan Africa. Working paper 03.7. Copenhagen (Denmark): Institute for International Studies.

Leclair, M. S. (2002). Fighting the tide: Alternative trade organizations in the era of global free trade. *World Development, 30*(6), 949–958.

Leclair, M. S. (2008). Fighting the tide: Alternative trade organizations in the era of global free trade – A reply. *World Development, 36*(12), 2962–2965.

Mendoza, R., & Bastiaensen, J. (2003). Fair trade and the coffee crisis in the Nicaraguan Segovias. *Small Enterprise Development, 14*(2), 36–46.

Miguel, E., & Kremer, M. (2004). Worms: Identifying impacts on education and health in the presence of treatment externalities. *Econometrica, 72*(1), 159–217.

Poulton, C., Gibbon, P., Hanyani-Mlambo, B., Kydd, J., Maro, W., Larsen, M. N., *et al.* (2004). Competition and coordination in liberalized African cotton market systems. *World Development, 32*(3), 519–536.

Ravallion, M. (2005). Evaluating anti-poverty programs. World Bank policy research working paper n°3625. Washington D.C.: World Bank.

Raynolds, L. T. (2009). Mainstreaming fair trade coffee: From partnership to traceability. *World Development, 37*(6), 1083–1093.

Renou, A., Téréta, I., & Togola, M. (2011). Manual topping decreases bollworm infestations in cotton cultivation in Mali. *Crop Protection, 30*, 1370–1375.

Ronchi, L. (2006). Fairtrade and market failures in agricultural commodity markets. World Bank policy research working paper n°4011. Washington D.C.: World Bank.

Ruben, R., & Fort, R. (2012). The impact of fair trade certification for coffee farmers in Peru. *World Development, 40*(3), 570–582.

Ruben, R., & Zuniga, G. (2011). How standards compete: comparative impact of coffee certification schemes in Northern Nicaragua. *Supply Chain Management International Journal, 16*(2), 98–109.

Torero, M., & Viceisza, A. (2011). Potential collusion and trust evidence from a field experiment in Vietnam. IFPRI discussion paper n°01100. Washington, D.C.: IFPRI.

Tschirley, D., Poulton, C., & Labaste, P. (2009). *Organization and performance of cotton sectors in Africa. Learning from reform experience*. Washington, D.C.: World Bank.

Valkila, J. (2009). Fair Trade organic coffee production in Nicaragua – Sustainable development or a poverty trap?. *Ecological Economics, 68*(12), 3018–3025.

Weber, J. G. (2011). How much more do growers receive for Fair Trade-organic coffee?. *Food Policy, 36*(5), 678–685.

Weber, J. G. (2012). Social learning and technology adoption: The case of coffee pruning in Peru. *Agricultural Economics, 43*(Issue Suppl.), 1–12.

Wodon, Q., Briand, V., Labaste, P., Nouvé, K., & Sangho, Y. (2006). Cotton and poverty in Mali. Draft World Bank working paper. Washington, D.C.: World Bank.

Wooldridge, J. M. (2002). *Econometric analysis of cross-section and panel data*. Cambridge, M.A.: MIT Press.

World Bank (2007). World development report 2008: Agriculture for development. Washington, D.C.: World Bank.

Yanchus, D., & de Vanssay, X. (2003). The myth of fair prices: A graphical analysis. *Journal of Economic Education, 34*(3), 235–240.

Zehner, D. C. (2002). An economic assessment of 'fair trade' in coffee. *Chazen Web Journal of International Business*, (Fall), 1–24.

Please cite this article in press as: Balineau, G. Disentangling the Effects of Fair Trade on the Quality of Malian Cotton, *World Development* (2013), http://dx.doi.org/10.1016/j.worlddev.2012.12.005