Fair Trade and Free Entry:
The Dissipation of Producer Benefits in a Disequilibrium Market

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Abstract

The Fair Trade (FT) initiative has been hugely popular with coffee consumers around the world, and yet the creation of durable producer rents is challenging in a competitive market environment. We model the FT premium actually received by producers and suggest that rents are in fact dissipated, but that this occurs in ways that are quite obscure to consumers. First, over-certification dilutes the effective premium even during years in which the nominal FT premium is high. Then, the use of a quality-invariant FT floor price in the very heterogeneous market for coffee creates a second, completely unrelated mechanism through which producer benefit is eroded. We use unique data from a large association of coffee cooperatives in Central America to measure nominal FT premiums received by member cooperatives, comparing coffee of the exact same quality sold with and without the FT label. We confirm that nominal premiums are dissipated by over-certification and unrewarded quality differentials. In effect, FT membership is priced like a put option: producers are willing to lose a small amount through participation during years in which the market price is high in order to retain future access to the FT floor price. We conclude by discussing ways in which the FT mechanism could be adjusted to take advantage of ethical consumers' willingness to pay in order to achieve the desired transfers of rents to smallholder producers.

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1. INTRODUCTION

Fair Trade coffee markets have grown exponentially over the past 15 years with annual sales now in excess of $1.8 billion worldwide (FLO, 2009), leading advocates to hail the initiative as a "success story of the decade" (Mathews, 2009). This market demonstrates the existence of a large number of "ethical" consumers willing to pay a higher price to benefit qualifying producers (Arnot et al., 2006). While ethical consumers are now presented with a wide array of different labels (organic, dolphin-friendly, shade grown, etc.), FT coffee is unique in that it is not based just on altering the *process* through which a product is produced, but intends primarily to improve the *price* that producers receive.[2] For economists this premise is puzzling, as we expect rents to be dissipated by competitive entry. By using theory and administrative data from a large association of coffee cooperatives, this paper examines this "puzzle of FT". We find that effective price premiums were indeed minimal even when market prices were low, and that the rent dissipation mechanisms at play are far from transparent for ethical consumers.

For FT consumers, willingness to pay a higher price for the same product is mainly motivated by altruism in the expectation that it will result in a higher revenue on sales for poor and deserving producers. Experiments on ethical demand have shown that there exists significant willingness to pay for charity-linked products (Elfenbein and McManus, 2010). Consistent with this, FT coffee consumers have been shown to be less price sensitive than non-FT consumers (Arnot et al., 2006) and to be willing to pay an increasing price premium when it raises revenues accruing to beneficiaries, at least over a certain range (Basu and Hicks, 2008). This literature makes it clear that demand for a revenue-transmitting device of this type is substantial. Our data suggest that the nominal contract terms claimed by FT are honored to a remarkable degree, and yet that the market works inside the system to unwind producer rents through mechanisms other than the nominal price premium. FT consumers participate in the market largely in order to create producer rents; they are willing to pay to generate these rents, and yet the market as currently constituted does not permit them to do so, and this in ways that are not transparent to them.

For producers, the presence of a real FT price premium will encourage entry over time, driving the market to a long-run equilibrium in which a premium can only exist if the supply of certifiable output is constrained given prices. While FT certification requires that a producer cooperative

[2] The first sentence of the legal Suggested Fair Trade Messaging reads: "Fair Trade Certified™ products directly support a better life for farmers and farm workers in the developing world through fair prices, community development, and environmental stewardship." The last sentence reads: "all farmers and farm workers benefit from premiums that allow them to invest in building their communities and bettering their lives."

satisfy a variety of standards (such as transparent and democratic management), in general inspectors from the certification agency are identifying candidate cooperatives that already satisfied these criteria rather than inducing them to change behavior in order to qualify.[3] These actions do not entail direct costs in production in the same way as would producing without chemical fertilizers or using different nets in fishing. Hence FT is the only large-scale labeling effort that includes as an explicit purpose the generation of economic rents for producers via disequilibrium prices in an otherwise competitive market. A very large number of producers exist worldwide who satisfy the criteria for FT certification, and most will wish to join a system generating rents.

Under the current certification mechanism, producers interested in selling through FT must contract through a global network of more than 120 inspectors in 50 countries overseen by FLO-CERT, the core third-party certifier based in Bonn, Germany. Local certifying agencies are typically paid piece-rate, based on the number of certifications performed. This demand-driven process provides strong incentives for over-certification, creating an open-access problem in FT rents. The global supply of coffee certified to be sold as FT has been estimated to be two to five times as large as the actual size of the FT market. For certified producers, rent dissipation occurs through a declining share of their total certified production that they can sell under the FT label, despite the fact that they pay to certify the entire output of the cooperative as FT. At the limit, the premium received on the coffee actually sold through the FT channel may be entirely absorbed by the certification costs. The analogy is to a common property resource: rents dissipate if there are no barriers to entry, leading to the "tragedy of the commons" (Hardin, 1968; Ostrom, 1990).

The core feature of the FT contract is the floor price. The floor price provides a service to producers which appears to operate like a put option: in return for incurring current costs of certification, they gain access to this floor in the event that the market price should collapse. With high price volatility and pervasive insurance market failures among smallholder coffee producers, the put option provided by the FT floor price will be an important part of producers' decision to enter FT. During the period 1999-2005 the market price was below the FT floor, meaning that the

[3] For details on the FT certification criteria, see the document "Generic Fair Trade Standards" from FLO http://www.fairtrade.net/fileadmin/user_upload/content/Jan09_EN_Generic_Fairtrade_Standards_SPO.pdf or the "FLO Prohibited Materials List" http://www.fairtrade.net/fileadmin/user_upload/content/FLO_Prohibited_Materials_List_Dec_2007_EN.pdf Criteria include democratic management, producer participation to decision-making regarding use of the FT social premium consisting in an additional fixed per pound transfer paid to the cooperative, capacity building of members, and economic strengthening of the organization.While there are environmental and labor standards on the books, these typically are worded in terms of achieving goals 'as far as possible' and are anyways difficult to verify on the ground among smallholder producers. That producers be organized in relatively transparent and democratic cooperatives seems to be the most binding of the constraints to entry to the system.

decision to acquire the put option was apparently remunerative. In reality, however, the analogy to a put option is inexact: the certifier does not have the capacity to guarantee that certified output will in fact be bought on the FT market, meaning that FT provides only the right to *attempt* to exercise the put option. In this case the price of the put option is fixed (the cost of certification) and arbitrage is achieved through an erosion of benefits (the probability that the option can be exercised). Therefore over-certification undermines not only the expected price rents but also the insurance benefits to producers as they may be least able to exercise the FT option when it is most needed.

The FT pricing mechanism is also particular in not recognizing quality in a market where quality is increasingly a key attribute of price determination, and where there are potentially large quality premiums to be captured, including for organic coffee. This quality invariance of the FT floor price implies that FT buyers can obtain any quality that would sell on the traditional market at a price equal to or lower than the FT price they offer. Producers will want to sell on whichever market gives them the highest price, and buyers will obtain the highest quality coffee that their price can command. Hence an increase in the nominal FT premium will increase the quality of coffee that moves through the FT channel in equilibrium, but may not increase the profits of producers using the FT channel relative to what they would have gotten on the traditional market. Not only does the quality invariance of the FT floor inject a negative correlation into the relationship between the market price and the quality of FT coffee; this unrewarded quality becomes another instrument through which effective FT premiums are driven toward zero.

The FT mechanism attempts something that appears simple, adding a voluntary transfer from producers to consumers over a counterfactual contract price. A third-party certifier stipulates contractual premiums that must be met and then hands the actual trading over to a marketplace. In this marketplace producers are strategic and competitive in their pursuit of rents, and buyers purchase the highest-quality coffee they can. By fixing only price and not quantity or quality, the current mechanism is subject to arbitrage on the other contract margins, and consumers cannot easily verify these other parameters. Seeing the correct premium paid on the bag you purchased does not tell you about the quantities that the producer *failed* to sell on the FT market. Similarly, verifying that a given premium was paid over a reference price does not tell you how much *this* coffee would have sold for had it been traded on the non-FT market. The opacity of these mechanisms arises from the fact that the party controlling access to the market (the certifiers) is not the same as the one honoring the purchase contract (intermediary buyers). Market entry and quality

arbitrage push producer benefits towards zero despite the fact that contracts nominally satisfy the terms of Fair Trade.

We model these propositions formally in section 2. Section 3 uses data from a large association of coffee cooperatives in Central America[4] to test the theory. There has been considerable controversy in the literature on the effective FT price premium, ranging from highly supportive advocates (Smith, 2009) to those exposing over-certification (Levi and Linton, 2003) and low transfers (Berndt, 2007; Henderson, 2008; Sidwell, 2008). We contribute to this debate using a unique dataset that allows us to observe coffee from the same cooperative and even the same delivery being split and sold on the FT and traditional markets at the same time. Our results show that, properly accounting for the share of certified production sold through FT and for quality heterogeneity, the average effective FT premium per pound of coffee produced under the FT label never rose above 12¢ at the worst of the coffee crisis in 2002, and has remained below 2¢ since 2005.[5] Despite a peak nominal premium of 62¢/lb over a market price of 63¢/lb in 2002, the share of certified production that could be sold as FT fell below 15% in that year. When we include the cost of certification (estimated as at least 3¢/lb) this indicates that FT never yielded a profit to producers of more than 10¢/lb and has on average been a loss-making proposition over the past five years, as we would expect from competitive insurance pricing. Our results also confirm the existence of an inverse relation between market price and the quality of coffee sold as FT: when international market prices were low FT quality was superior to non-FT coffee, but average quality was the same when market prices were high.

Section 4 calculates the welfare effects on producers from participation in the FT mechanism. Here as well, there is considerable controversy in the literature. Becchetti and Constantino (2008) for Kenya and Utting-Chamorro (2005) for Nicaragua report positive gains, but these studies are either descriptive or suffer from potential endogeneity bias. Applying our rigorously estimated FT premium to the observed prices, we find that the average estimated benefit of the FT option over the entire period of our data amounted to $3-$11 per year for the median Guatemalan coffee grower, representing 1.5 to 5% of coffee-related income. This is far short of what the FLO price rule would provide if producers could sell all their certified coffee on the FT market. The negative returns over recent years suggest that producers are willing to pay for the limited hedge that

[4] Thereafter referred to as "the Association". At its request, the name of the Association is not mentioned to protect its identity.

[5] Because the FT floor is quoted in nominal dollars, we use dollar values for the entire analysis and do not adjust for inflation so that the prices quoted can always be easily compared to the floor.

the floor price provides against a potential future coffee bust. Given the existence of consumers' ethical demand as well as the presence of an effective labeling mechanism, we conclude in section 5 with a discussion of alternative interventions that would be needed to transfer more consistent price rents to certified producers.

There is a large popular literature on FT, and the movement has provoked great expectations in the development community that this newfound mechanism could make trade more equitable. Despite this, there has been a remarkable paucity of analysis of 'ethical trade' markets in professional economics journals, whether on the theoretical description of equilibria or the empirical estimation of actual premiums, properly accounting for quality heterogeneity. This paper aims at filling this gap.

2. MODELING THE FAIR TRADE MARKET

2.1. Benchmark model: Arbitrage through free entry and flexible premiums

The theory underlying an 'ethical' demand market is as yet quite undeveloped. We provide here a simple linear environment in which to consider equilibria in markets where consumers gain utility from producer welfare. We begin with a benchmark model with flexible FT prices before introducing the floor price mechanism in the next section. The dynamics of this market will naturally be driven by producer entry, and we use a linear demand structure to make the supply-side points as clearly as possible. We start from a non-FT market, which we refer to as the "traditional" market (*t*), when there is no FT supply or demand. Linear traditional demand is $Q_t^D = 1 - \gamma p_t$. We think of the aggregate coffee supply as being an exogenous and stochastic $\bar{Q}$, driven primarily by weather shocks to major producers such as Brazil.[6] Thus the equilibrium price of traditional coffee is given by $p_t = \frac{1}{\gamma}\left(1 - \bar{Q}\right)$.

The emergence of ethical demand creates potential for the existence of a FT market in which consumers are provided with an additional product beyond the coffee purchase, namely the special set of attributes embedded in FT coffee. Following Poret and Chambolle (2007), we model FT demand as being composed of two underlying goods: the coffee itself and the 'new' product offered by FT. We parameterize this additional FT demand as being a function of θ, which represents an intrinsic benefit to the consumer from the inherent attributes of FT coffee, and $\alpha\pi$, where π is the

[6] We suppress time subscripts through the theoretical presentation in order to simplify notations.

profit to certified producers from selling coffee with the FT label and α is the altruistic preference weight that consumers place on producers' welfare. Absent these two attributes, consumers respond to increases in the relative price of FT coffee in precisely the same way as they do to traditional coffee. We can then write demand for FT coffee as: $Q_f^D = \theta + \alpha\pi - \gamma\left(p_f - p_t\right)$, where p_f is the FT coffee price. In order to guarantee that the aggregate demand for FT coffee slopes down, we must assume that $\alpha < \gamma$, or that the altruistic component of demand is not so strong as to make FT consumers actually desire higher prices. The per-unit FT premium, π, is the excess of FT prices over traditional prices, net of the per-unit cost of certification. For a producer (which may most naturally be thought of as a cooperative, since it is the cooperative that makes the certification decision) that generates a fixed quantity of output q, and pays a certification cost of c, $\pi = p_f - p_t - c/q$. Substituting into the demand for FT coffee gives:

$$Q_f^D = \theta - (\gamma - \alpha)\left(p_f - p_t\right) - \alpha\, c/q\,.$$

Due to altruistic demand, the slope of the FT demand curve, $-(\gamma - \alpha)$, is flatter than the slope of non-FT demand, $-\gamma$, because the knowledge that higher FT premiums translate into higher producer profit dampens the pace at which demand falls off with higher prices. Arnot, Boxall, and Cash (2006) provide evidence that the elasticity of demand for traditional coffee is higher than it is for FT, and indeed their study cannot reject that FT coffee demand is completely inelastic. In our formulation, as $\alpha \to \gamma$, FT demand becomes completely insensitive to changes in price because the dislike of high prices is completely offset by the desire to transfer profits.[7]

We can model the intersection of supply and demand in this marketplace by considering an exogenous (small) certified quantity of output $\bar{Q}_f$, as would be created by a nascent FT labeling initiative. Because the two goods are perfect substitutes in terms of the underlying coffee, in a first-order sense FT sales are simply 'cancelled' out of the traditional market, with both supply and demand of traditional coffee reduced by the amount sold as FT. This leaves the price on the traditional market unchanged, set as above by aggregate output $\bar{Q}$. We will thus observe traditional

[7] We can lay out a more general model of demand that endogenizes $\alpha(\pi)$, meaning that the willingness to transfer profits is a direct function of the profits themselves. The shape of $\alpha(\pi)$ will be an inverted-U over the distribution of π. If there is any *range* of the distribution of transfers over which $\alpha(\pi) > \gamma$, demand will slope upward and there are multiple equilibria in the market. The free-entry outcomes will all take place at the 'poverty trap' equilibrium, which is what would be suggested by a strictly downward-sloping demand curve for FT transfers.

price $p_t = \frac{1-\bar{Q}}{\gamma}$, FT price $p_f = p_t + \frac{1}{\gamma-\alpha}\left[\theta - \alpha c/q - \bar{Q}_f\right]$, and the per-unit FT premium will be given by $p_f - p_t = \frac{\theta - \alpha c/q - \bar{Q}_f}{\gamma-\alpha}$. This expression says that the FT premium in a nascent market will be increasing in ethical consumers' intrinsic and altruistic valuations, decreasing in the certification costs, and decreasing in the FT supply.

If we now permit free entry into the FT mechanism, then Q_f will expand as long as rents are present for the certified. For the producer, incurring the variable cost κ in production, output can be sold on the traditional market, in which case profits are $(p_t - \kappa)q$, or on the FT market, in which case profits are $(p_f - \kappa)q - c$. The open access FT output is nailed down by the arbitrage condition that $\pi^* = 0$, implying that $p_f^* - p_t = c/q$. At this point, $Q_f^* = \theta - \gamma c/q$ and $Q_t^* = \bar{Q} - Q_f^*$, meaning that the open-access size of the FT market is determined only by the intrinsic demand for FT θ and by consumers' aversion to the higher prices induced by certification. The motive to transfer profit is irrelevant in the open-access equilibrium because profit has been competed away through entry.[8]

2.2. Imposing a price floor: Arbitrage through over-certification

The previous stylized model demonstrates the effects of the presence of ethical consumers on aggregate demand for traditional and FT coffee, endogenizing prices and quantities. We now consider more explicitly the actual rules of the current FT market, which fix prices while leaving quantities free.

The economic benefits delivered to producers under FT are composed of two parts. The first is the floor price, which we denote by $\underline{p}_f$. This floor price varies by regions of the world, and was set for Central America at \$1.21/lb until June 2008, when it was raised to \$1.25/lb, with organic coffee receiving an organic premium of 15¢/lb until June 2007 and 20¢/lb after. The second is the

[8] While we do not formally model it here, it is interesting to consider the effects of consumer heterogeneity on this equilibrium. If both θ_i and γ_i display variation at the individual level, it might be reasonable to assume that $\text{cov}(\theta_i, \gamma_i) > 0$, meaning that individuals who value FT are less price sensitive to coffee overall than the average consumer. The demand curve in each market would have a slope determined by those who participate in that market, and so as these price-inelastic consumers are drawn into the FT market then average demand on the traditional market becomes more elastic. Because price will fluctuate less in response to quantity shocks, the existence of FT would thereby provide an indirect form of income insurance to producers in the traditional market.

'social premium', a separate and additional payment for social investment by the producer group, which was originally set at 5¢/lb until June 2007 when it was raised to 10¢/lb. This nominal social premium we write as ρ. The price-setting rule for FT coffee is that producers should be paid no less than the floor price or the market price, whichever is higher, where the reference market is the New York Coffee Exchange 'C' contract, plus the FT social premium. This defines a minimum price, $p_f = \max\left(\underline{p}_f, p_t\right) + \rho$, where p_t is the NY 'C' price. Hence, whenever the floor price is above the market price, the social premium acts just as an addition to the floor price. When the floor price is below the market precise, the sole potential benefit of FT is the social premium.

The NY 'C' market price has remained below the FT floor price for most of the past 20 years since FT was established, excepting periods around 1994 (frost damage in Brazil), 1997-99 (droughts in Brazil), and 2006 to 2009 (world food crisis). Particularly during the coffee crisis of 1999-2003, FT was successful in delivering large nominal premiums to producers, in some cases exceeding 60¢/lb. Thanks to effectiveness of the audits conducted by the 19 world labeling initiatives (such as TransFair for the USA), there appear to be virtually no documented cases of corrupt sales in which FT contracts were transacted below the minimum price, meaning that the mechanisms in place to monitor prices seem to be effective. The FT floor was not mechanically inflation-adjusted (Valkila, 2009) and despite the recent discrete increase in the floor it is again currently below the NY 'C'.

How do the FT and traditional markets relate in this context? As before, the traditional market has a price that is invariant to the size of the FT market. The FT market, on the other hand, *will* respond to the traditional price if we think about holding the FT floor price constant while the traditional price fluctuates. Because our assumptions generate downward-sloping demand curves, the FT market will shrink as the price premium above the traditional market increases. Given an overall market driven by supply shocks and a FT market that attempts to exercise a price floor, then, the two most relevant comparative statics are that $dp_t / dQ_f\big|_{\bar{Q}} = 0$ but $dQ_f / dp_t\big|_{p_f} = (\gamma - \alpha) > 0$. The first says that for a given overall supply of coffee the non-FT price will be unaltered by the share of the market that is FT. The second says that when we hold FT prices constant and introduce a supply shock that drives down traditional prices, the size of the FT market will shrink (because the effect of higher relative prices on demand is stronger than the desire to transfer profit).

Does the fact that, for a number of years, the FT system was effective in maintaining a minimum price $p_f > p_t + c/q$ mean that the system was effective in generating profits for producers? The difficulty with this interpretation can be seen in the massive over-certification of supply that occurred during this period. Estimates of the share of certified coffee that was actually successfully sold on the FT market during the high-premium era vary from 13.6% in 2001 (Muradian and Pelupessy, 2005) to around 50% in 2003 (Levi and Linton, 2003). Berndt (2007) reports that, in 2006, Fedecocagua in Guatemala could only sell 23% of its certified coffee to FT buyers. For Costa Rica, she reports that average FT sale of certified coffee was 20%, rising to 40% in cooperatives with the highest quality coffee. Therefore, when a credible price floor is in place, the free entry equilibrium is manifested not through a decrease in the FT price, but rather through a decrease in the share of total output that each producer is actually able to sell at the FT price.

To state this concept more formally, we write the share of output certified FT that is actually sold through the FT mechanism as s and assume that this share is uniform across certified producers. Producers therefore receive an average price $sp_f + (1-s)p_t$, with associated per-unit profits $s(p_f - p_t) - c/q$. Under the open access equilibrium, and provided the premium is larger than the unit certification cost, $p_f - p_t \geq c/q$, entry now pushes this term to zero through a decrease in s, rather than pushing $(p_f - p_t) - c/q$ to zero through a fall in p_f. Recognizing that s can also be written as Q_f^D / Q_f^S, this says that entry will push up the supply of FT-certified coffee until $Q_f^S = Q_f^D \dfrac{(p_f - p_t)}{c/q} > Q_f^D$. Hence, the equilibrium share is $s^* = \dfrac{Q_f^D}{Q_f^S} = \dfrac{c/q}{(p_f - p_t)}$. Producer profits are zero in this equilibrium despite the presence of per-unit rents at the margin. The total FT market is smaller here than in the previous equilibrium so consumer surplus is smaller, producer surplus is the same, and only the certifiers benefit.

The result from this analysis to be taken to the data (in section 3.3 below) is that while a FT premium is duly paid on FT sales when the NY 'C' price is below the floor price, over-certification of FT production relative to demand will curtail the premium effectively received on FT production.

2.3. FT membership as a price insurance mechanism.

A natural argument in favor of the FT floor price from the producers' perspective is that it insulates farmers from the highly volatile world price of coffee and thereby provides them with an important source of price insurance. Given the smallholder status of most FT producers, and the persistent problems of access to credit and insurance for them, it is reasonable to think of producers as risk-averse agents maximizing expected utility rather than expected profits. The initial intuition for this problem would suggest that a fixed floor price would be strictly preferable to a volatile premium, but we show that again these benefits are not robust to open entry.

The presence of the FT floor price provides producers with an alternative to the NY 'C' price. By removing downside risk while still providing upside risk, the FT contract both decreases risk exposure and increases the *expected* returns relative to the distribution of the NY 'C' price. The open access equilibrium however will again let the share adjust to equate the *utility* of producers across the two markets. Again, a decline in the share sold in equilibrium is the mechanism through which the risk benefits are priced into producer benefits.

In order to keep the notation as simple as possible, we posit a mean-variance utility function $U(y)-\delta \text{var}(y)$, where y is producer income and δ is a coefficient of risk aversion. We continue to assume that an individual producer's output q is constant, and so the source of risk for producers comes from aggregate output, which generates a price variance of σ^2.[9] In this case producer welfare on the traditional market is $(p_t-\kappa)q-\delta q\sigma^2$, decreasing in risk aversion and in the variance of prices.

Consider first the case where certification could be obtained each year after the NY 'C' price was revealed. In response to a state of nature k in aggregate output that would lead to a traditional market price p_{tk} lower than the floor price $\underline{p}_f$, instantaneous arbitrage will give $s_k^* = \dfrac{c/q}{\underline{p}_f + \rho - p_{tk}}$. In years where the market price is above the floor price, certification would only occur if the social premium is sufficient to cover the certification cost, and arbitrage would give $s^* = \dfrac{c/q}{\rho}$. This would generate zero additional profit from entry to the FT market for every state of nature. This would be

[9] The primary source of volatility in global coffee prices has been the weather in Brazil, which drives the quantity exported by this dominant producer. Hence for individual producers in other countries their traditional price risk can be thought of as a function of the aggregate output of Brazil.

analogous to a put option sold on today's price; it is always 'on the money' and hence provides no hedge.

With certification decisions taken before the price is realized and lasting several harvests[10], the equilibrium share is determined by expectations on prices at decision time:

$$E\left[\left(p_{tk}-\kappa\right)+s^{*}\left(p_{f}-p_{tk}\right)\right]q-c-\delta q\sigma_{f}^{2}=E\left(p_{tk}-\kappa\right)q-\delta q\sigma^{2}$$

where σ_f^2 is the smaller price variance expected for certified producers. This gives

$$s^{*}E\left[p_{f}-p_{tk}\right]=c/q-\delta\left(\sigma^{2}-\sigma_{f}^{2}\right).$$

In this world, we observe an effective premium equal to $s^{*}\left(p_{f}-p_{tk}\right)-c/q$. The standard benefit of the put (the price differential) can only be exercised on a fraction of the output, while the whole output must be certified. Overall participation brings a negative expected value that exactly pays for the decrease in risk.

Hence, depending on the speed of adjustment of certification and aggregate FT supply response to changes in the international price, the FT market will either provide a put option priced to reflect risk-aversion (no dynamic adjustment) or exactly zero effective benefit in every state of nature (perfect dynamic adjustment). In neither case does the FT market generate any aggregate welfare benefits. We return to this question in section 3.3, where we present evidence suggestive of some frictions in dynamic adjustment.

The result from this analysis to be taken to the data (in section 4.1 below) is that, given some rigidity of adjustment, the insurance provided by the FT floor price will make risk-averse producers willing to pay to retain access to the FT market, e.g. to lose money in years when the floor does not bind.

2.4. Quality heterogeneity and its impact on the effective FT premium

So far, we have focused on the ways in which entry reduces effective premiums, but quality generates a second, quite unrelated way in which producer rents are dissipated. A dominant feature of coffee markets is the steep price gradient over quality. Typically price contracts are quoted as a

[10] While renewal of certification is done every year, re-certification of a lapsed producer is substantially more expensive than maintaining ongoing certification. This, plus narrative reports that producers fear losing relationships with FT buyers if they fall out of the mechanism, appears to represent the sources of rigidity in the speed at which FT supply can adjust to changes in price. At the very least it appears to be impossible to successfully enter the mechanism if the harvest was not done when FT certified, and so adjustment to within-season price swings would appear to be minimal. These rigidities are the source of the option value in the system.

differential from the NY 'C' price, meaning that there is an aggregate international price with a benchmark quality set by aggregate supply and demand, and the deviation from this benchmark price is the quality premium. To capture this feature of the market as simply as possible, we modify the inverse demand curve for traditional coffee as follows: $p_{it} = \beta_i + \frac{1}{\gamma}\left(1 - \bar{Q}\right)$, where β_i is the quality premium paid to producer *i* with mean 0 and associated density $\phi(\beta)$. This says that the overall price for coffee is set by aggregate supply, but that each producer *i* has a stochastic quality intercept. We consider the NY 'C' price to refer to a quality draw of zero, meaning the average quality, which receives a price of p_0, so $p_{it} = p_0 + \beta_i$.

As before, the quality-invariant FT price is the highest of the floor or the NY 'C' price, plus the social premium, or $p_f = \max(\underline{p}_f, p_0) + \rho$. We can think of the *nominal* FT premium, $p_f - p_0$, as corresponding to an equivalent quality premium in the distribution $\phi(\beta)$, this reference quality $\beta^{\max}$ changing as the NY 'C' fluctuates. We define the *effective* FT premium for a coffee of quality β_i sold on the FT market at price p_f as $p_f - p_0 - \beta_i$. This shows that measuring the effective premium requires knowledge of the specific quality of coffee, a task that we will perform in empirical section 3.2.

2.4.1. *Market segmentation*

In modeling how this quality-asymmetric market works we must add slightly more structure to the information and decision-making process. Specifically, we assume that producers know their own quality draw β_i but that they must make certification decisions prior to knowing the market price at the harvest season. Further, we assume that producers will always sell their output on the market that gives them the best price and that FT buyers will always purchase the highest quality coffee that their prices allow them to. This set of assumptions, as we now show, segments the market into three parts: a high-end quality market, a middle-tier FT market, and a low-quality commodity market.

We begin by shutting off the entry-driven effects modeled in the previous section, and consider the decision of producers as if everyone had decided to become FT certified at the beginning of the season. For such producers, the certification costs are sunk at harvest time, and so they want to sell on the FT market if $p_f - p_{it} > 0$, which holds if their quality premium is smaller

than the nominal FT premium over the NY 'C' price, $\beta_i \leq \beta_f^{\max} = p_f - p_0$. Producers with higher quality than $\beta_f^{\max}$ will choose to sell on the 'gourmet' market, whose average quality would thus be $\int_{\beta_f^{\max}}^{\infty} \phi(\beta) d\beta$. FT buyers will then start purchasing coffee from the producer with quality $\beta_i = \beta_f^{\max}$, and will go down the quality distribution from there to the minimum FT quality threshold $\beta_f^{\min}$, which would be the solution to the problem $\int_{\beta_f^{\min}}^{\beta_f^{\max}} q\phi(\beta) d\beta = Q_f^D$. This threshold is the lowest quality on the FT market, which will be given by integrating down from the highest-quality producer willing to sell through FT until the size of the FT market equals demand.

Note that the individual indifferent between selling and not selling on the FT market gains no benefit from existence of the FT market (relative to the quality-specific counterfactual traditional market price), and benefit to producers increases as we move to the left within the quality distribution that manages to sell on the FT market.

The result from this analysis to be taken to the data (see section 3.4 below) is thus that FT coffee is sold on a quality segment of the coffee market that lies between the high quality gourmet market and the low quality commodity market.

2.4.2. *How the market price and FT quality become linked when the floor binds*

Next we show that when the floor price binds, there is an inverse relationship between the price of coffee on the traditional market and the quality of coffee sold on the FT market. This can be seen by visualizing an increase in $\bar{Q}$ holding Q_f^D constant. This shock translates into a fall in p_0, and if the floor binds then an increase in the nominal FT premium $p_f - p_0$. Producers of higher-quality coffee become willing to sell through the FT mechanism, and thus the upper limit of integration $\beta_f^{\max}$ that defines quality on the FT market rises.

In Figure 1, for two different market prices, a high p_0^0 and a low p_0^1, (and therefore for two different FT premiums holding the floor price constant), we integrate downward from each maximum quality $\beta_0^{\max}$ and $\beta_1^{\max}$ the area Q_f^D, and thereby define the minimum FT quality under each regime, $\beta_0^{\min}$ and $\beta_1^{\min}$. The average effective premium, $p_f - p_0 - \beta_i$ under each regime is the

mean deviation from the FT price within each of these integrals, and because the higher FT premium lies at a lower value of the PDF of quality than the lower FT premium, the average effective FT premium is higher when the nominal FT premium is higher.

Critically, the average effective FT premium is also increasing in the FT premium for any distribution whose PDF is monotonically decreasing above the NY 'C' price p_0. While this relationship appears obvious and mechanical, in fact it only arises in a market with heterogeneous quality because the density of quality beneath the FT premium gets smaller as the FT premium rises. To see this, observe that holding demand constant, $\beta_f^{\max} - \beta_f^{\min}$ gets larger as $p_f - p_0$ gets larger because we are integrating the same area over a density whose PDF is lower. Thus while a similar *number* of producers sell on the FT market no matter what the NY 'C' price is, the average difference between their quality-specific non-FT price and the price they receive on the FT market increases as the density of producers just below the FT price gets smaller. The average effective FT premium enjoyed by producers is given by $\int_{\beta_f^{\min}}^{\beta_f^{\max}} (p_f - c/q - \beta)\phi(\beta)d\beta \Big/ \int_{\beta_f^{\min}}^{\beta_f^{\max}} \phi(\beta)d\beta$. This premium is increasing in total demand on the FT market (Q_f^D) because the average quality sold on a larger market is further below the quality that would otherwise be commanded by the FT price.

As the FT premium and therefore the effective premium increases, the variance of quality of coffee sold through the FT network also increases. This indicates that the variance of quality inside the FT mechanism is an indirect proxy for the effective premium being generated for producers.[11] Ironically, we see that the link between nominal and real FT premiums comes *only* from the lower density of premium-equivalent coffee when the FT premium is high.

The two results from this analysis to be taken to the data (see section 3.4 below) are thus:

[11] If there is a demand for FT coffee that is quality-specific, then FT contracts can be traded above the floor price. If the FT certification is unconstrained inside each quality bin, then none of these contracts can trade at an effective premium. If there is an above-floor price quality at which the quantity of FT supply is directly constrained (meaning that only a share of the producers of that quality satisfy the criteria for certification), then you can have FT contracts trading above the floor and trading at a real effective premium. A related question is the differential premium for organic FT coffee. Because the overall supply of organic coffee is much smaller than the supply of non-organic coffee and demand for organic FT is relatively large, we may expect that FT supply is more constrained in the organic market. Thus the question of the effective FT premium must be addressed carefully, market by market, using a data source that permits us to compare FT and non-FT coffee of exactly the same quality.

(1) there exists an inverse relation between quality of coffee sold on the FT market and the NY 'C' price when prices are below the price floor, and (2) the variance of quality sold on the FT market increases with the size of the effective FT premium.

2.4.4. *The decision to certify with quality heterogeneity*

The introduction of quality discrimination changes the logic of the certification decision for two reasons. First, it creates an additional rent extraction mechanism that produces heterogeneity in rents across coffee qualities. And second it defines a range of coffee qualities that will be purchased by the FT market that varies with the NY 'C' price. Producers with the 'right' quality will be able and willing to sell 100% of their coffee through FT; qualities above some level will not want to use the system; and qualities below some level will not be able to use it, even if such producers had paid to be certified. Producers know their own quality with a great deal of certainty, but there is substantial variability in the NY 'C' price which determines these cutoff quality values, and this is unknown at time of certification. The decision to certify for FT now becomes a probabilistic game of guessing where in the quality distribution of coffee the FT purchases will fall.

To illustrate this point, refer to Figure 1 and assume that p_0^0 and p_0^1 represent the highest and lowest NY 'C' possible; neither producers with quality lower than $\beta_0^{\min}$ will want to certify, and nor will producers with quality higher than $\beta_1^{\max}$. Producers with quality in between those will be willing and able to sell on the FT market in certain states of nature but not in all. Note however that producers with the lowest quality in this range are least able to sell on the FT market during times of 'crisis', and producers with highest qualities are less likely to want to use the FT market but will be able to sell on it during times of greater crisis on the overall market.

By parameterizing both the quality-specific benefits from the FT market and the distribution of aggregate output $\bar{Q}$ we could arrive at an expected benefit from certification for producers of each specific quality. Again the logic of open access will dictate that across the distribution of quality and across all states of aggregate output the expected returns to certification must be zero, but it now permits ex-post benefits to producers of specific qualities in specific states of nature, because the supply of coffee at each quality is limited. Given the sunk certification costs, some producers will choose to sell through the FT market at a loss for the season, simply because they have already incurred the certification costs and as of harvest time the FT floor is slightly above the NY 'C'.

This analysis highlights several ways in which the analogy between the FT contract and a standard 'put' option is inexact. First, the option is sold with its face price fixed and arbitrage occurs through entry driving down the ability to exercise it, and since the market is composed of risk-averse producers we expect the returns to the use of the option to charge a risk premium.[12] Second, while standard put contracts have clearly defined dates of purchase and of expiry, there is an option value in FT that extends beyond a single certification decision. Finally, producers do not in fact buy a put option but the right to try to exercise this option, and their success at doing so in any given year will be quality-dependent.

We conclude the theoretical presentation of quality heterogeneity by summarizing our core results: Effective premiums cannot be estimated without taking the FT sales share and the quality into account, FT coffee is likely to occupy a very specific part of the quality distribution for any price, and shocks to the NY 'C' price will translate into changes in the quality of FT coffee. Evidence that producers lose money certain years where the market price is relatively high is consistent with rigidities in the speed of adjustment of FT supply.

3. EMPIRICAL ANALYSIS OF THE FT PRICE PREMIUM

The preceding arguments show that establishing the effective FT premium empirically is not a straightforward task. While FT contracts are supposed to be (and indeed are) quoted as a premium over the NY 'C' market price, the tremendous quality heterogeneity of coffee means that the correct counterfactual traditional market price for a specific lot of coffee sold on the FT market is not easily established. There is a close analogy here to the problem of causal inference in impact analysis: If we think of FT as a 'treatment' whose impact on prices we wish to establish, we do not in general observe the same lot of coffee in both markets at the same time. The treated (FT) state gives a quality-invariant price, while the untreated (traditional) state reveals quality. Measuring the correct effective FT premium requires that we know what price each lot of FT coffee *would have received* had it been sold on the traditional market. Because quality (in the absence of a quality-dependent price) contains some unobservable component, and given that we have shown that the decision to certify as FT is driven precisely by a quality known to producers but not to the econometrician, any simple measure of the effective premium is likely to suffer from omitted variables bias.

[12] A recent literature in US financial markets indicates that put and call options there also appear to be overpriced relative to their risk-neutral valuation, and so this phenomenon may be more general (Bondarenko 2009)

Our solution to this problem is to use data from a large Association exporting FT coffee. The feature that makes this organization ideal for the estimation of actual FT premiums is that its entire production is certified to be sold as Fair Trade. In a typical year, the Association sells somewhere between a fifth and a quarter of its total output as FT despite the potential to sell it all, and this intensive-margin variation over FT sales over the course of many years gives us a unique window on the relative merits of FT versus traditional markets for producers. Furthermore, the complexity of the internal supply chain in the Association means that within a single year (and even within a single delivery) a given cooperative's production may be split into different lots and these lots are then sold to different buyers. Thus we can focus on the cases in which a given delivery of coffee is split and sold on both the FT and the traditional markets. The differential in price for these two sales gives us a clean measure of the counterfactual quality-specific price, and hence of the premium earned on the FT market.

3.1. Data

Our data consist of the Association's records on all coffee acquisitions and sales for the period 1997 to 2008. Each year the Association procures coffee from about 100 cooperatives and individual members. Over the 12-year period, the Association purchased coffee from 300 cooperatives and individual members. Suppliers deliver parchment coffee in small batches from September to the following May. The median supplier sells 940 quintals of coffee per year, the average is 2800 quintals, in 10 to 12 separate deliveries. The Association then processes and stocks the coffee, and sells green coffee to international exporters in bags of 69kg. Annual sales have increased from less than 100,000 bags to 250,000 bags over this 12-year period. Shipment size has not increased; it is the number of sales that has increased from less than 200 per year to more than 400. Over the whole period, we thus observe 15,340 deliveries of coffee from cooperatives and individual members to the Association and 3,556 sales from the Association to exporters.

All of the coffee processed by the Association is FT certified, but as demand for FT is not sufficient, only a fraction averaging 22% over the 1997-2009 period for non-organic coffee was sold with the FT label. Less than 5% of its coffee was organic, and it was all sold with the FT label. We will therefore not use the organic coffee transactions, as they cannot inform on price comparisons between the FT and regular markets. This corner solution does, however, indicate both that a real premium existed and that FT organic markets were supply-constrained during this period, two features that are synonymous in our setup.

Coffee quality. Although some observable characteristics of the delivery could inform on coffee quality (such as its color, moisture, presence of debris, etc.) most of it is revealed after processing and tasting. Characteristics and tasting results at the delivery level are not systematically recorded. The only systematic records on quality we have are those reported on the sale contract. They consist in 13 quality labels such as Extra Prime Washed, Prime Washed, Extra Prime, Strictly Hard Bean, Hard Bean, Small Bean, etc. There is no doubt however that quality factors unobservable to us are known to the Association. We will take them into account through a cooperative/supplier specific fixed effect, exploiting the fact that most producers sell on both markets at some point.

Prices. On the purchase side, all coffee is paid by the Association to the different cooperatives the same average price per year, regardless of its quality. This is therefore not informative. On the sale side however, each price is negotiated between the Association and international exporters. Quality coffee is a highly differentiated product, and buyers have specific preferences. Sale contracts are negotiated throughout the year, but mostly from September to March, for deliveries to take place several weeks and months later. Price negotiations revolve around a differential to be paid over the future NY 'C' price for the position just prior to the planned delivery. The coffee future market has 5 positions per year, in March, May, July, September, and December. For example, a sale contract negotiated on September 8 for a delivery of coffee the following June, will use as reference price the September 8 quotation for the May position. Contracts report both the future NY 'C' price and the differential, with a mention that the differential accounts for quality and, when applicable, the FT social and organic premiums. This information on the NY 'C' future price is however not reported in the database. We thus use the time series provided by the International Coffee Organization, labeled "Indicator price for other Arabica", which we refer to in the rest of the paper as the NYC price without quotation marks on the C.[13] It is built as a monthly average of the future price for the following 2nd and 3rd positions, which approximates the future price that serves in most contracts.

Figure 2 shows the inter-temporal trajectories for a variety of prices. The average non-FT coffee price received by the Association is very close to the NYC price in all years. The average FT price calculated from the Association data tracks the FT minimum price perfectly during periods in which the NYC price falls beneath the floor. During periods when the NYC price rises above the floor, the FT price tracks the NYC price quite closely, with some small surplus visible in average

[13] http://www.ico.org/coffee_prices.asp

prices. The FT organic coffee, on the other hand, while only sold by the Association from 2004 onwards, trades at a large premium compared to all other kinds of coffee. However, because the Association never sells organic coffee on the non-FT market, it is impossible to distinguish what part of this premium relates to the higher costs of producing organic coffee and what part may potentially correspond to a true FT premium. We therefore restrict our empirical analysis to non-organic coffee.

3.2. Estimating the FT premium

3.2.1. Controlling for quality

Our first approach to controlling for quality in estimating the actual FT premium is to include fixed effects for the thirteen quality labels recorded in the Association data. The regression specification is:

$$p_{smt} = Z_{smt}\beta + \gamma_t FT_{smt} + \mu_{mt} + \varepsilon_{smt}, \quad (1)$$

where p_{smt} is the contract price of sale *s* in month *m* of year or quarter *t*, Z the vector of indicator variables for each quality label as well as UTZ certified, μ_{mt} are month of shipment fixed effect, and *FT* is an indicator variable indicating coffee sold as Fair Trade. The γ_t parameters are thus the average annual or quarterly FT premiums, holding quality premiums constant across time and within quality categories.

As sales prices are explicitly established in reference to the NY 'C' price, this suggests an alternative specification as follows:

$$(p_{smt} - NYC_{mt}) = Z_{smt}\beta + \gamma_t FT_{smt} + \varepsilon_{smt}, \quad (2)$$

for the price differential calculated over the NYC price in the corresponding month.

Estimated annual premiums from these two models without and with individual quality indicators are reported in Table 1, columns (1) and (2) for the contract price and (3) for the price differential. They show similar results, except for year 2009 where the price differential model estimates a lower premium.

The condition for obtaining an unbiased estimation of the FT premium is that no unobserved coffee quality be correlated with the *FT* variable. However, since all sales are done based on individual negotiation between the Association and the buyer, this is a difficult assumption to defend. We therefore proceed to a more stringent measure of the Fair Trade premium.

3.2.2. Using cooperative fixed effects

Each sale made by the Association to foreign exporters combines coffees from different batches delivered by the member cooperatives. By matching each delivery to the corresponding sale, we can thus attribute a sale price to each delivery. The matching is complicated by the fact that deliveries of coffee from cooperatives are processed into batches of green coffee, and there are cases of batches of green coffee feeding into different sales as well as sales taking coffee from different batches. We therefore estimate a price equation for each matched pair of delivery and sale. The quality of this particular coffee consists in the observed quality categories noted on the sale contract described above and an unobserved cooperative fixed effect. The contract price equation that can be estimated is:

$$p_{csmt} = Z_{smt}\beta + \gamma_t FT_{smt} + \mu_{mt} + \nu_c + \varepsilon_{csmt}, \quad (3)$$

where the unit of analysis is the delivery from cooperative c included in sale s in month m from year t. The advantage of this approach is the possibility of adding a cooperative fixed effect ν_c that absorbs all the cooperative-specific coffee quality known to the Association or the buyers and hence potentially used in the selection of coffee for the FT contracts and in the price negotiation. A similar equation for the price differential with the NYC price is also estimated. Results are reported in columns (4) and (7) of Table 1.

In column (5), we restrict the sample to the deliveries that were only sold as either FT or without the FT label. In column (6), instead of using individual quality categories, we use a quality index defined by the sale price in non FT contracts (see below for an explanation of its construction). The idea is to ensure that the quality measure is not affected by some potential different appreciation of quality in FT contracts.

We find a remarkable stability of the FT premium estimations across the different specifications and samples, until around 2004-05. However, in the later period 2005-2009, estimated premiums without accounting for cooperative or delivery fixed effects are larger than those estimated with fixed effects. This suggests that FT coffee was sold relatively more often from cooperatives with higher quality coffee during these years. A more systematic analysis of the coffee quality sold under the FT label is done further in the paper.

3.2.3. Using split deliveries

An even more rigorous control of the potential selection bias in the choice of which coffee is sold under FT can be obtained from the coffee deliveries that are partially sold under FT and partially sold without the FT label. We observe between 80 and 300 such deliveries each year. As

we noted above, the splitting and recombination of deliveries to compose sale batches is very common, and these split deliveries are not different from any other cooperative deliveries in terms of coffee quality, cooperative size, and average sale price fetched. For each of these deliveries we have a price for the part sold under the FT contract and a price for that sold without the FT label, while in all aspects the product is completely homogeneous. This is a rare case of a perfect counterfactual for a FT price because we effectively observe the same unit in the 'treated' and 'untreated' states. The only potential substantial difference between these sales is their timing. We therefore control for the sale time by estimating the following equation:

$$p_{dsmt} = \gamma_t FT_{dsmt} + \mu_{mt} + \nu_d + \varepsilon_{dsmt} \quad (4)$$

where p_{dsmt} is the price observed for the part of the delivery d that was sold in sale s in month m of year t. With a delivery fixed effect ν_d, the coefficient γ_t measures the average premium on these split deliveries. Results are reported in column (8) of Table 1. The sample is further restricted to the split deliveries sold in the same month in column (9). There are no substantial differences with the other estimations that account for cooperative unobserved quality, except for a lower estimated premium in 2002, at the peak of the coffee crisis.

In conclusion, the results of these estimations of the FT premium with alternative methods to control for quality show that the premium was quite significant in the years 2001 to 2004 with low NY 'C' price, reaching an average of 62¢/lb over a market price of 63¢/lb, but falling to 6¢/lb over a market price of $1.26/lb in 2006-2008. These estimated Fair Trade premiums are around 10¢/lb below the value expected from the FLO formula due to the fact that the quality of the coffee sold as Fair Trade is higher than the coffee that sells at the NYC price.

3.3. Share of coffee sold under the FT label and the effective premium

The empirical counterpart to Section 2.2 is to analyze the share of the Association's output sold on the FT market, given that it is all certified. Clearly, were it facing unconstrained demand and a positive effective premium, it should sell no coffee on the traditional market (as is the case with organic FT coffee). On the non-organic market, the share of coffee sold as FT averages around 20% and never exceeds 30%. As seen in the theory section, free entry into the FT market would, at the aggregate level, induce over-certification until the rent is fully dissipated. While we cannot take the Association to be representative of the global market, the relationship between the measured FT

premium and the share of coffee sold as FT could not be explained by any supply-side story, and seems consistent only with the process of entry into the FT market by other producers.

As seen in Table 2 and in Figure 3, the share of coffee that was sold as FT was particularly low (down to 13%) in the years where the premium was high, and then as the premium fell over the past five years the share of coffee sold as FT began to rise again, reaching 27% in 2008-09. This negative correlation between premiums and sales shares is consistent with a relatively static demand combined with a global FT supply whose size is increasing in the premium (as well, potentially, as demand that decreases with the premium). Thus the Association, uniquely certified to sell whatever it can as FT, saw its ability to move coffee through the FT channel restricted as other producers enter the certification mechanism and improved as they exit. As can be seen in Figure 3, the result is that the effective premium (calculated as the product of share and price) on FT production by member cooperatives remained very low, never exceeding 12¢/lb while the coffee sold under the FT label carried a 60-70¢/lb premium. The three estimates that we could obtain of the global share of certified coffee that was sold as FT are 27% in 2000, 14% in 2001, and 37% in 2003.[14] While these estimates do not agree exactly with our case study, it does appear that the Association provides a reasonable microcosm of the overall market in terms of the share sold through the FT market.

In order to arrive at a final estimate of per-unit premiums, we need estimates of certification costs. Data from the Association give a figure of 3.09¢/lb. Because this organization is large it has somewhat lower per-unit costs than those estimated based on a small sample of 16 first-tier Guatemalan cooperatives (3.4¢/lb) for which we collected certification expenses ourselves. Certification costs are higher in the first year (6.2¢/lb), and so as a means of picking a conservative number that captures the ongoing per-pound costs of certification, we use 3¢/lb for our analysis. Substracting this amount off of the effective quality-adjusted premium gives our final annual estimate of the per-pound benefit of FT certification. As can be seen in Figure 3, the net premium from FT certification has never exceeded 10¢/lb (although coffee was selling for 60¢/lb when the premium was at its highest) and the average net premium over the 13 years of our data is 1.6¢/lb over an average NY 'C' price of $1.07/lb. Over the past five years the average result of participating in the FT market is a loss of 1.2¢/lb, reinforcing the idea both that some kind of risk-adjusted insurance value is priced into the contract by producers, but also that these producers believe that they will in fact be able to exercise that put option and gain access to the floor price in the event of

[14] All are from sources citing FLO's unpublished data: Muradian and Pelupessy (2005), Raynolds (2002), and Calo and Wise (2005).

another coffee crisis. These results are entirely consistent with the story that we have free entry to a mechanism that provides probabilistic benefits to risk-averse producers.

3.4. Estimating the price-quality relationship in FT sales

We begin the empirical discussion of quality by demonstrating that, as predicted by the theoretical model in section 2.4.1, FT coffee sales are concentrated around the middle of the quality distribution.

We use an estimation equation similar to (2) to extract an observed quality index for coffee. Specifically, we regress the differential between the sale price and the NYC price on the observed quality characteristics, including a cooperative fixed effect:

$$(p_{cst} - NYC_t) = Z_{st}\beta + \nu_c + \varepsilon_{cst} \quad (5)$$

for all non FT sales, and define the quality index of any delivery from cooperative c in sale s as $Q_{cst} = Z_{st}\hat{\beta} + \hat{\nu}_c$. The model is estimated on coffee sold on the traditional market to ensure that the quality measure is not affected by some potentially different appreciation of quality in FT contracts. Because there is no organic coffee sold as non FT, this does not provide a quality scale for organic coffee.

Quality is measured in ¢/lb, and can be interpreted as the differential that, on average, this coffee quality (identified by the type recognized on the sale contract and the cooperative of origin) would fetch above or below the NYC price (that is, it measures β_i). Estimating equation (5) on observed quality types alone, cooperative fixed effects alone, or both, indicates the relative importance of these quality factors in explaining price differentials. Results show that the quality types recorded on sales contracts can explain 24% of the variance in prices, the cooperative fixed effects alone can explain 28%, and together 37%. This suggests the existence of some, but not perfect, correlation between the cooperative quality and the quality types, as confirmed by a correlation of 0.46 between the quality indices based solely on quality types and solely on cooperative fixed effects. The densities of quality reported in Figure 4 show pounds of coffee sold under FT to be more homogenous than coffee sold without the FT label. FT contracts include neither the highest quality coffee, nor the lowest quality that would otherwise garner a price below the NYC. This is as expected since FT contracts are required to pay a price at least equal to the NYC. Overall, the range of quality differentials is relatively small, with a width of about 10¢/lb across the different coffees sold as FT. Among coffee qualities not sold as FT, around 5% of the

volume is of very high quality, 20% of quality below the NYC standard, and the rest exhibits very homogeneous qualities within a 10¢/lb range.

What the theory predicts (section 2.4.2) is that the relative quality of coffee sold under FT varies with the reference international price. With a low international price for coffee, like that prevailing in the early 2000s, the fair trade premium allows FT international exporters to select higher quality coffees, while with a high international price, in particular when it surpasses the minimum floor price, FT exporters cannot attract coffee of quality higher than what the non-FT market would get with the same price. This suggests existence of an inverse relationship between average FT coffee quality and the international price of coffee. The theory also suggests that when the international market price is close to the FT floor price, FT buyers can fulfill their demand within a narrow range of coffee quality, suggesting a negative relationship between the variance in FT coffee quality and the international price.

These relationships are estimated by regressing the quality index of each delivery-sale pair on the NYC price in the following specification:

$$\begin{aligned} Q_{csmt} &= \alpha^{q} FT_{smt} + \beta^{q} NYC_{mt} + \gamma^{q} FT_{smt} * NYC_{mt} + \mu_{t}^{q} + \varepsilon_{csmt} \\ \hat{\varepsilon}_{csmt}^{2} &= \alpha^{sd} FT_{smt} + \beta^{sd} NYC_{mt} + \gamma^{sd} FT_{smt} * NYC_{mt} + \mu_{t}^{sd} + \zeta_{csmt} \end{aligned} \quad . \tag{6}$$

Results are reported in Table 3, panels A and B for the conditional mean and variance equations, respectively. The mean equation is estimated with weighted least squares, to correct for heteroskedasticity as modeled in the conditional variance equation. The variance equation is estimated with OLS, with robust standard errors. In column (4), we also estimate a model with multiplicative heteroskedasticity, i.e., with the second equation written for $\ln\left(\hat{\varepsilon}_{csmt}^{2}\right)$ rather than $\hat{\varepsilon}_{csmt}^{2}$, using the maximum likelihood estimator with robust standard error for the system.[15]

These equations are estimated only on the observations for which the FT floor price was binding, meaning when the NYC price was below the FT floor price.[16] Results reported in Table 3, columns (1) and (2), show as expected that the γ parameters, which account for the sensitivity of the FT coffee quality mean and variance to the NYC price, are negative. In column (1) there are no

[15] The concern with heteroskedasticity arises from the fact that we are estimating quality premia using data on price premia above the NYC for non-FT sales, and then regressing the discrete quality premium for each sale on variables including the NYC price. This regression may be expected to feature multiplicative heteroskedasticity.

[16] The FT minimum price is quality-invariant whether or not the floor binds, and so the market segmentation should always be observed. However, the link between the NYC price and the quality of FT exists only when the floor price binds.

time fixed effects, μ_t. In column (2) we control for the crop year to account for possible variation in quality or changes in the demand for FT coffee across years not otherwise accounted for in the analysis. The direct effect of the NYC price changes sign depending on whether one controls or not for the crop year. This is simply the result of the year effect taking up much of the variation in price. The critical results, however, are that both the direct effect of the FT variable and its interaction with the NYC price are robust to these additional controls for time effects. Results show that for an average NYC price of 115-130¢/lb for example, which is around the FT floor, FT coffee quality is essentially the same as that of non-FT coffee, while at a NYC price of 50¢/lbs, the FT coffee quality is 1.4-1.6¢/lb above the non-FT coffee. This seems like a small number, but it is not so small when compared to the range of quality observed in Figure 4. [17] In contrast, in column (4), we consider the months where the NY'C' was clearly above the FT price (FT floor price plus social premium) and verify that the relative quality of the coffee sold as FT is unaffected by the international price.

The relationship between the variance in quality and the NYC price is easier to interpret in the log estimation (column 3). While average quality of coffee sold as FT was rising during the 1998-2000 period, its variance also rose by an estimated 63% (for 70¢/lb increase in NYC price). But, as the NYC price rose back to the FT floor price, the FT quality narrowed again.

Variation of the average FT quality with the NY 'C' price is the outcome of a selection process. An alternative way to see this is thus to estimate the probability that a delivery of a given quality be sold with a FT label in the following specification:

$$FT_{csmt} = \beta_0 + \beta_1 Q_{csmt} + \beta_2 NYC_{mt} + \beta_3 NYC_{mt} * Q_{csmt} + \varepsilon_{csmt}, \qquad (7)$$

where Q_{csmt} is the quality of the delivery. Expectations are that $\beta_3 < 0$, meaning that, when the NYC price is low, a high quality coffee has a relatively higher probability of being sold to FT exporters. This is verified in Panel C of Table 3, columns (1) and (2). A decline of the NYC price of 70¢/lb increases the probability that a high quality coffee with an index of 10 be sold as FT by 3.7-4.3 percentage points relative to a coffee of quality index 0. This is a large increase considering that, in that range of quality, the share of coffee sold as FT is 35%.

[17] Note that what we are observing here is simply the relationship between one supplier (the Association) and its clients, and hence it does not necessarily reflect aggregate market movements. We would need data from a larger segment of the coffee market to verify whether this ratchet effect on quality applies to the Fair Trade market at large.

4. ASSESSING THE WELFARE GAINS FROM FT PREMIUMS

Using the rigorously estimated FT premium, we now assess the welfare gains of FT by simulating alternative price schemes for the 1997-2009 period. This is done for producers on a per pound sold basis and, using information on average farm household coffee production, on a per household basis.

4.1. Welfare gains per pound sold

We can simulate price increases to producers in two ways. First, taking out the average annual FT premium from the price of each FT sale, we can calculate what prices would have prevailed in absence of the FT opportunity. The difference between this price and the NYC price is attributable to quality. At the other extreme, applying the FLO price rule to all sales that were sold below this prescribed minimum price, we can compute the prices that would have prevailed had the FT contract applied to all sales. Note that this rule leaves out on the gourmet market those sales that fetched a higher price than the FLO price rule.

The distributions of these simulated prices for all sales made over the period are shown in Figure 5 and Table 4. Under the FLO rule, no prices should have been observed below the floor price. This is not the case. However, prices observed below the floor are less frequent than would have prevailed had all sales been at the NYC price, showing that FT did offer some price protection in spite of over-certification.

Mean prices with all sales at the NYC price (no FT and no quality premium) would have been 107.1¢/lb, rising to 111.6¢/lb with observed prices less the estimated FT premium (no FT but quality premium), and to 139.5¢/lb applying the full FLO rule honoring the put option. However, with observed prices (FT with over-certification), mean prices were only 116.3¢/lb. The standard deviation of prices would have been 30.9¢/lb with all sales at the NYC, falling to 14¢/lb had the full FLO put option been honored, but rising to 33.3¢/lb with over-certification.

These mean and variance effects can be combined in a welfare measure per pound sold using a mean-variance utility function

$$U = \overline{p} - \frac{1}{2}\frac{r}{\overline{p}}\,\mathrm{var}\left(p\right),$$

where r is the coefficient of relative risk aversion, arbitrarily set equal to 1.5. This shows that welfare that would have risen from 100.4 had all prices been at the NYC to 138.4 had the full FLO put option been honored, only reached 109.1 with prices observed for sales over the period. Welfare

gain was thus a modest 9% instead of the 38% expected by ethical consumers. Because these estimates include the early years of our data (the mid '90s) during which supply may not have fully adjusted to premiums, these estimates are likely to be overstatements.

4.2. Welfare gains per farm household

We can also assess the welfare value of these economic impacts by combining them to the sales and revenues of a typical Guatemalan coffee farmer. To do this, we use the 2006 *Encuesta Nacional de Condiciones de Vida* (ENCOVI), a nationally representative household survey. Among coffee producing households, median coffee sales for that year were 910 lbs of parchment coffee, which corresponds to roughly 725 lbs of green coffee. This means that if the whole FT average effective transfer of 1.6¢/lb were transferred through to producers (a big if), the producer's income would have increased by about $11 over the course of a year, relative to a median reported coffee sales value of $206. However, these data also suggest that producers receive around 28¢/lb in a year where the NY'C' was just over a dollar, so if an analogous share of the FT premium is passed through, this average annual benefit would fall to $3. Taking the actual 2006 effective premium of –0.5 cents, the median farmer would have lost about $3.65 by participating in FT that particular year.

5. CONCLUSION

We used unique data from a large Central American association of coffee cooperatives to measure the price premium effectively paid to member cooperatives for Fair Trade coffee. We observed 13 years of deliveries to and sales by the Association, with market prices fluctuating above and below the FT floor price. Coffee batches delivered by a particular cooperative were often split between FT and non-FT sales, allowing us to observe exactly the same coffee being sold at the same time on the two markets and providing us with an ideal identification of the role of FT in price formation. We find that, while the nominal FT price premium was up to 60¢/lb at the worst of the coffee crisis, the effective premium at that time was only about 10¢/lb once adjustments have been made for over-certification and for unrewarded quality. Over the 13 years period for which sales are observed, the average NY 'C' market price was $1.07/lb. Subtracting a conservative certification cost of 3¢/lb, the adjusted FT premium over the period was 1.6¢/lb. Over the last 5 years, the premium was negative, equal to –1.2¢/lb. Once rent dissipation mechanisms have been taken into account, it appears to be the case that FT price premiums have been very close to zero.

Guided by a simple theoretical setting, we seek to unravel the threads that bind a FT market to its traditional counterpart in a product with strong quality heterogeneity. We confirm that over-supply is a major feature of these markets and demonstrate the existence of an inverse relationship between FT sales share and FT premiums, consistent with dynamic entry. The FT price commands middle-quality coffee when traditional market prices are high, but during market crashes paying the FT floor price enables to procure high-quality coffee. Given oversupply problems, we reconsider the degree to which the option value offered by the FT floor price can be realized. The data suggest that in equilibrium FT is priced like a put contract with negative net benefits in years where the option is not exercised and positive benefits when it is. The insurance value of the FT option only works when there is sufficient hysteresis in certification to prevent immediate dissipation of rents.

Lack of transparency in the rent dissipation mechanisms helps explain the puzzling coincidence of growing popularity among ethical consumers and lack of substantial benefits to producers. Benefits may effectively be large when the system is nascent, but as competitive entry generates arbitrage on the margins of certification and quality selection, these benefits erode.

Our results are based on a single organization within a single country, and so it is natural to question the extent to which they are representative of FT coffee markets as a whole. Our estimates of the effective premium are composed of three basic quantities: the nominal FT premium, the share of certified coffee sold as FT, and the per-unit costs of certification. Because of the internal diversity and second-tier certification of our study institution, we have an unusual ability to look at price variation within seasons, within sub-cooperatives, and even within specific lots across FT and non-FT sales. We therefore believe that the most rigorously estimated portion of the study is the nominal FT premium. As for the share sold as FT, there is no particular reason that any one institution is representative of the market as a whole, given the issues of quality heterogeneity presented in Section 2.4. However, the average share sold as FT by our study institution (22%) is close to the average of the independent estimates of the global sales share (26%) and so it appears that this institution is broadly representative of the overall market.[18] Finally, our per-unit certification costs (3 cents per pound) are based on a large cooperative recertifying, and therefore if anything underestimate the costs of an average-sized cooperative considering the decision to undertake certification decision on the margin. While a single institution naturally contains less

[18] Replacing the observed annual share sold as FT from our institution with the constant average from the independent estimates (26%) makes virtually no difference to our results; the peak effective premium is 2-3 cents higher during the coffee crisis but has still been negative for four of the last five years.

overall quality heterogeneity than the potential FT market as a whole, our average traditional price is very close to the NY 'C' price and we are nonetheless able to reject the null in testing theoretical predictions on the comovement of market prices and FT quality within our data. Overall, it therefore appears that our results do provide some real insights into the workings of global FT coffee markets.

In terms of mechanism design, we suggest that the current FT market has failed to deliver large benefits because the system codifies prices while leaving quantity and quality as free parameters. Given this and the mismatch between the party permitting entry to the mechanism on the supply side (certifiers) and the party that honors the contract (intermediary buyers), benefits to producers are competed away. In the current system, FLO-CERT is a third-party certifier who ensures that the terms of the contract—only approved certified sellers, prices not inferior to a floor level, and a social premium added to the price paid—are accurately relayed to buyers and sellers in the market. In the presence of a contractual price wedge between FT and traditional markets, producers will re-optimize their certification decisions. Over-entry on the price margin and strategic behavior by FT buyers to acquire the best-quality coffee will conspire to eliminate any real benefit to producers, despite the fact that the contracts all nominally satisfy the FT criteria.

Resolution of this strategic flaw would seem to take us in two opposite directions. One path would be to increase the centralization of the FT system, attempting to fix all three terms of the contract simultaneously. A 'FT cartel' that tries to fix only two of the three arguments will still face arbitrage on the third margin (for example, a cartel fixing both price and quantity but not quality will shift to include better coffee and hence the 'rent' will be arbitraged out through quality). To generate lasting benefits, then, this FT cartel would have to pick a specific group of producers (qualities), and then by restricting access to the market to a subset of these producers a tradeoff between quantity and price is achieved. This then becomes the monopolist's problem in revenue maximization, where the mechanism could either transfer large benefits to a few producers or small benefits to more. In this full-information environment a floor price appears to be a particularly difficult contract to maintain because it would require setting the quantity ex-post to the realization of traditional market prices, again leading to a breakdown in the degree of guarantee provided by the apparent put option of the floor. Endogenizing quality and quantity of output over time will complicate the ability to maintain a cartel, but the fact that a premium seems to exist in the organic FT market suggests that rents may be possible if the certification criteria are set tightly enough so that demand exceeds supply in equilibrium.

Moving to the opposite extreme, a second path would consist in stepping back to a more decentralized and dyadic set of fair trade agreements (examples of this would be Equal Exchange and the 'Direct Trade' movements). Such structures would be less informationally efficient and likely impose search and contracting costs far in excess of the current FT system, but dyadic contracting has several advantages. First, consumers can take upon themselves the transactions costs of the system, a feat difficult for FT consumers to achieve. Then, because of the direct contact between buyer and seller, the informational environment permits a clearer understanding of counterfactual prices, thereby preventing quality arbitrage. Finally, direct contracting should credibly permit buyers to transfer real benefits without having them competed away through entry.

Given these constraints, it is worth asking whether it in fact makes sense to attempt to transfer rents through a market mechanism rather than through NGOs or inter-governmental transfers. Several arguments suggest that it does. First, we already have a supply chain connecting a buyer and a seller, and a financial transaction is already linking a purchase by one party to a payment to the other. Hence this way of adding a remittance on to a purchase would appear to be a relatively frictionless way of making transfers. Next, a growing literature demonstrates the existence of a substantial pool of 'ethical' consumers, and this pool represents an unusual form of win-win economic exchange: consumers reveal by their actions that they experience enough selfish utility to justify paying a higher price, and thus both sides of the market are made better off by the existence of this transfer channel. This unique trade of psychological for material welfare motivates continued experimentation with the design of 'ethical' market institutions.

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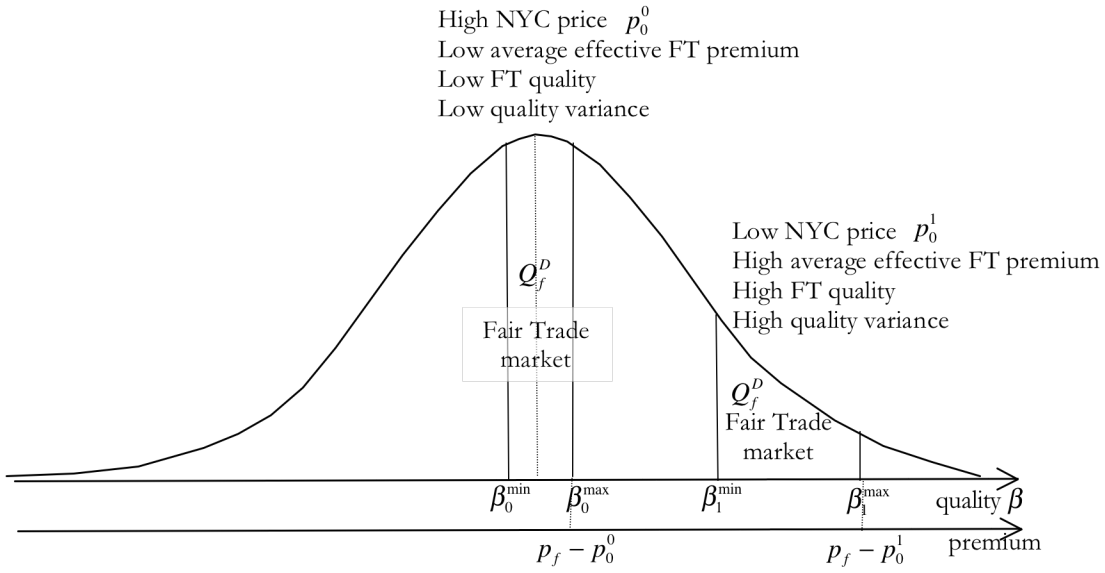

Figure 1. The Relationship between nominal FT premiums and average effective FT premiums

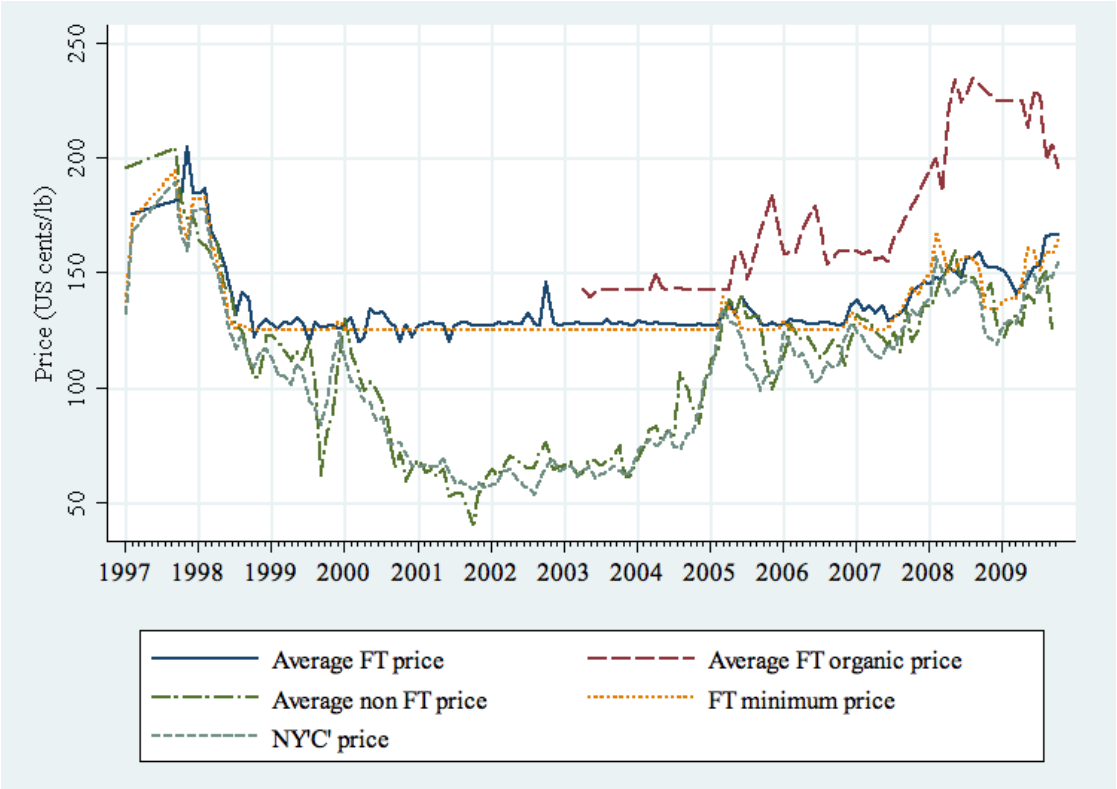

Figure 2. Evolution of coffee prices over time (US¢/lb)

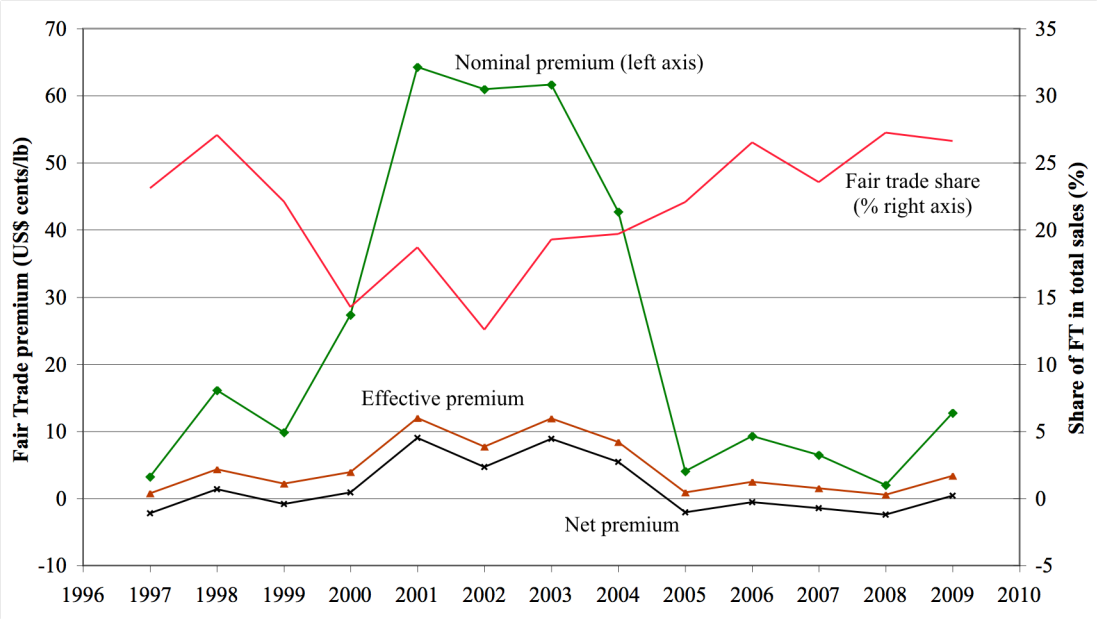

Figure 3. Nominal, effective, and net FT premiums in US¢/lb, and share of non-organic coffee sold under FT contracts

Note: The nominal FT premium reported is from column (4) in Table 1

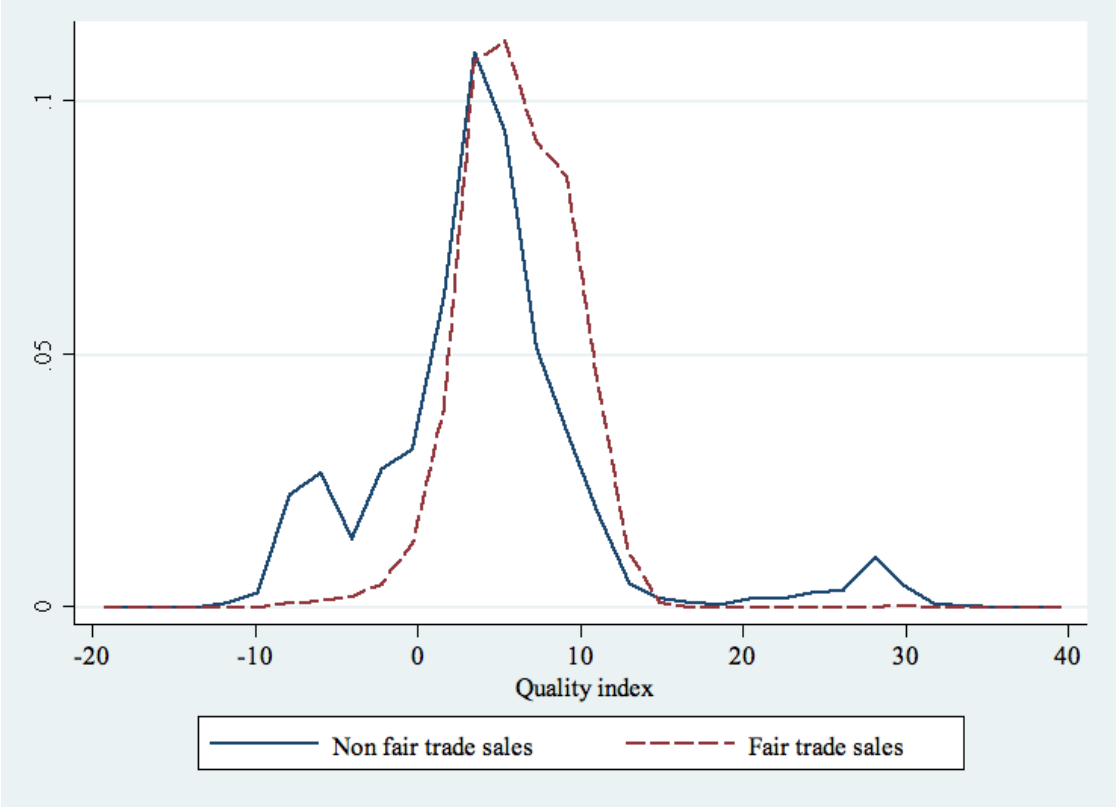

Figure 4. Observed quality distribution of non-organic FT and non FT coffee

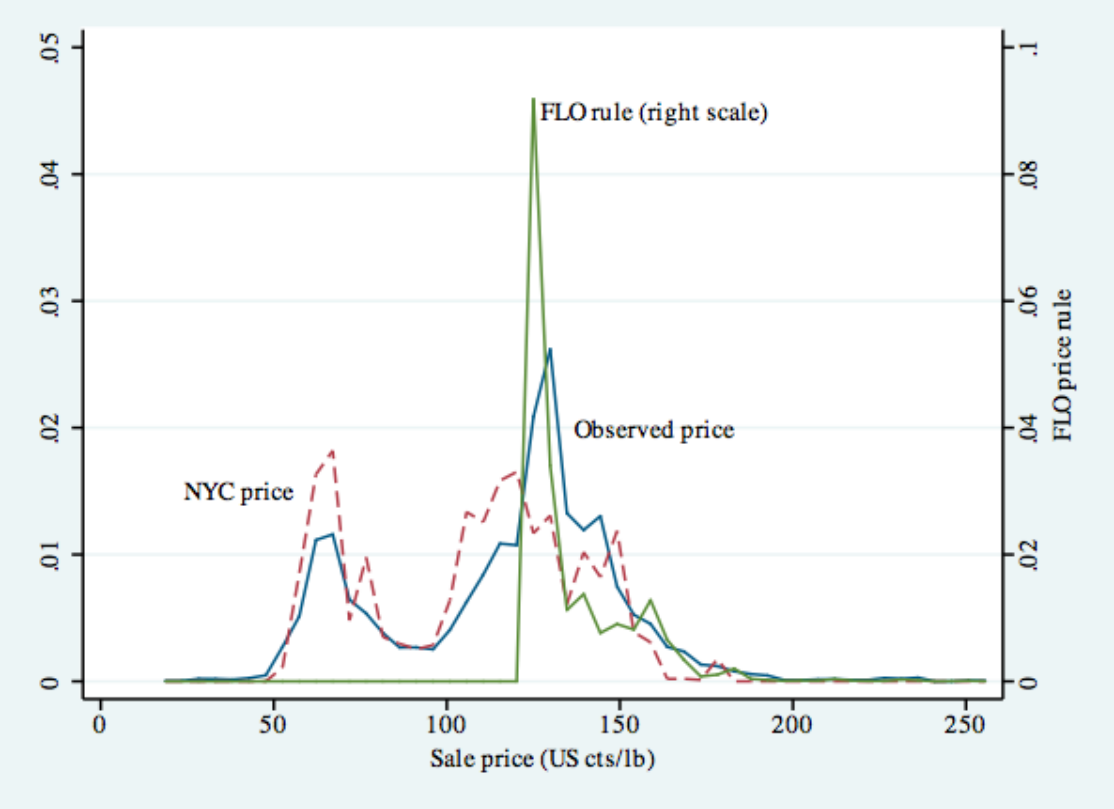

Figure 5. Decomposing the welfare effects of FT: Price distribution and utility under different pricing rules

Table 1. Estimation of the annual FT premium

	Contract price (US cts/lb) (1)	Contract price (US cts/lb) (2)	Price differential (US cts/lb) (3)	Contract price (US cts/lb) (4)	Contract price (US cts/lb) (5)	Contract price (US cts/lb) (6)	Price differential (US cts/lb) (7)	Contract price (US cts/lb) (8)	Contract price (US cts/lb) (9)
Fair trade premium									
1997	11.25	6.31	10.07	3.26	14.86	4.74	8.80	4.73	4.73
	[5.16]*	[5.21]	[7.28]	[4.70]	[5.80]*	[4.47]	[7.00]	[1.03]**	[1.02]**
1998	7.87	11.79	8.51	16.12	14.42	15.75	7.01	18.22	22.50
	[3.19]*	[2.85]**	[1.95]**	[3.91]**	[4.45]**	[3.72]**	[3.24]*	[1.27]**	[1.20]**
1999	10.79	12.54	15.60	9.83	13.06	9.79	13.45	10.97	10.95
	[1.70]**	[1.50]**	[1.51]**	[1.48]**	[1.90]**	[1.49]**	[1.88]**	[0.65]**	[0.66]**
2000	25.14	24.03	27.59	27.36	27.97	27.42	31.17	19.62	20.35
	[2.94]**	[2.80]**	[2.71]**	[2.78]**	[7.49]**	[2.81]**	[2.86]**	[0.75]**	[0.73]**
2001	64.57	64.41	58.52	64.26	64.73	63.24	58.08	60.88	61.11
	[1.09]**	[1.08]**	[0.96]**	[0.88]**	[1.15]**	[0.82]**	[0.80]**	[0.60]**	[0.59]**
2002	61.85	61.90	64.72	60.97	62.34	60.84	63.55	53.71	52.80
	[1.24]**	[1.28]**	[1.08]**	[1.65]**	[1.07]**	[1.49]**	[1.15]**	[2.80]**	[3.27]**
2003	60.60	61.69	60.66	61.69	61.57	60.82	58.33	57.51	53.83
	[0.87]**	[0.79]**	[0.66]**	[0.55]**	[0.65]**	[0.49]**	[0.58]**	[1.16]**	[1.46]**
2004	45.19	46.51	46.17	42.71	43.18	41.92	42.56	41.17	45.22
	[1.45]**	[1.40]**	[0.87]**	[1.72]**	[1.47]**	[1.71]**	[0.94]**	[1.84]**	[1.68]**
2005	6.73	7.62	12.24	4.09	3.92	4.04	9.91	0.79	2.63
	[1.17]**	[1.10]**	[1.14]**	[1.11]**	[1.18]**	[1.06]**	[1.29]**	[1.62]	[2.32]
2006	12.58	13.55	16.54	9.26	9.19	8.89	10.14	6.87	6.76
	[1.33]**	[1.30]**	[1.35]**	[0.69]**	[0.76]**	[0.67]**	[0.76]**	[0.80]**	[1.07]**
2007	12.36	12.86	14.83	6.44	6.1	6.59	7.00	8.27	9.14
	[1.27]**	[1.22]**	[1.11]**	[0.99]**	[1.03]**	[0.91]**	[0.95]**	[0.82]**	[1.03]**
2008	17.79	17.66	19.63	2.01	1.96	1.93	4.56	0.14	3.34
	[2.49]**	[2.41]**	[2.50]**	[1.28]	[1.45]	[1.25]	[1.58]**	[1.05]	[1.29]**
2009	19.74	21.49	14.60	12.77	13.32	11.44	4.09	5.55	2.83
	[2.54]**	[2.50]**	[2.32]**	[1.32]**	[1.33]**	[1.30]**	[1.43]**	[2.41]*	[3.31]
Controls									
Quality	N	Individual	Individual	Individual	Individual	Index	Individual	-	-
Shipment month FE	Y	Y	N	Y	Y	Y	N	Y	-
Coop FE	N	N	N	Y	Y	N	Y	N	N
Delivery FE	N	N	N	N	N	N	N	Y	Y
Unit of analysis	Sale	Sale	Sale	Coop delivery - sale					
Observations	3934	3934	3934	16312	12480	16312	16312	5759	4403
Number of coops / deliveries FE				296	286		296	1874	1451
R-squared	0.83	0.86	0.57	0.94	0.94	0.93	0.67	0.73	0.68

Robust standard errors in brackets (clustered at the sale level for columns (4) to (7)).
* significant at 5%; ** significant at 1%
Individual quality indicators are: Prime-washed, Extra Prime washed, HB, SHB, Fancy SHB, SHB-HH, SHB-EPW, GAP, and Small Beans. All regressions also control for UTZ certification.
Restricted samples: (5) deliveries exclusively sold as FT or non-FT, (8) deliveries sold partly as FT and partly as non-FT, (9) deliveries sold partly as FT and partly as non-FT with same shipment month.

Table 2. Share of non-organic coffee sold under FT contract and effective premium

Shipment year	Total sales (bags of 69kg)	Fair Trade share (%)	NYC price US$ cents/lb	FT av. price US$ cents/lb	FT premium (US$ cents/lb) FLO formula	on FT sales	Effective	FT premium (% of FT price)
1997*	14,065	23.1	171.5	190.6	5.0	3.3	0.8	1.7
1998	65,025	27.1	143.0	161.4	7.9	16.1	4.4	10.0
1999	105,801	22.1	105.3	127.9	25.7	9.8	2.2	7.7
2000	131,805	14.3	91.6	126.7	39.4	27.4	3.9	21.6
2001	128,293	18.7	64.9	127.8	66.1	64.3	12.0	50.3
2002	153,290	12.6	60.8	129.8	70.2	61.0	7.7	47.0
2003	153,533	19.3	64.2	130.1	66.8	61.7	11.9	47.4
2004	164,237	19.7	78.7	130.2	52.3	42.7	8.4	32.8
2005	187,302	22.1	119.5	134.3	13.2	4.1	0.9	3.0
2006	200,744	26.5	113.3	133.0	17.8	9.3	2.5	7.0
2007	216,474	23.6	120.0	138.6	14.4	6.4	1.5	4.6
2008	251,739	27.3	143.6	159.1	11.3	2.0	0.5	1.3
2009*	227,360	26.6	139.4	153.0	12.4	12.8	3.4	8.3

NYC price: Indicator price for other Arabica, International Coffee Organization

The FLO formula is based on the FT floor price, the NYC price, and the social premium; The premium on FT sales is estimated, controlling for observed quality characteritics, and cooperative and shipment time fixed effects. The effective premium is obtained by multiplying the premium of FT sales by the share of the coffee sold with the FT label.

* Sales in 1997 are only those of the 1997 harvest, which occurred in November and December. Sales in 2009, up to July 2009.

Table 3. Quality of FT coffee and the international price

	FT floor price binding			FT floor price not binding
	(1)	(2)	(3)	(4)
Panel A: Mean quality	(WLS)	(WLS)	(mult. het.)	(WLS)
Fair Trade	2.655	2.188	1.393	1.536
	(5.27)**	(4.59)**	(2.74)**	(0.71)
NYC price	0.026	-0.078	-0.136	-0.064
	(6.89)**	(8.28)**	(9.12)**	(3.83)**
NYC price * Fair Trade	-0.023	-0.017	-0.011	0.003
	(4.11)**	(3.12)**	(1.88)	(0.24)
Panel B: Variance of quality	(OLS)	(OLS)	(mult. het.)	(OLS)
Fair Trade	25.659	10.859	0.329	-100.5
	(2.55)*	(1.08)	(0.80)	(3.01)**
NYC price	0.521	-0.697	-0.019	-1.12
	(8.22)**	(3.13)**	(2.29)*	(3.60)**
NYC price * Fair Trade	-0.660	-0.469	-0.009	0.348
	(6.21)**	(4.50)**	(2.00)*	(1.52)
Panel C: Coffee sold as Fair Trade (coefficients multiplied by 100)				
	(OLS)	(OLS)		(OLS)
Quality index	0.802	0.718		-0.524
	(3.66)**	(3.28)**		(0.49)
NYC price	0.164	-0.183		0.178
	(7.84)**	(2.54)*		(1.92)
NYC price * quality index	-0.0062	-0.0054		0.0085
	(2.67)**	(2.31)*		(1.17)
Crop year FE	N	Y	Y	Y
Observations	11189	11189	11189	3634

Absolute value of t statistics in parentheses from robust standard errors. * significant at 5%; ** significant at 1%
Col. 1-4: Sample of sales in months where the NYC price was lower than the FT floor price. Col. 5: months where the NYC price is greater than the FT floor price + social premium.
Over all observations, mean quality is 5.6cts/lb, variance is 48 , and the share of coffee sales that are FT is 27%.

Table 4. Decomposing the welfare effects of FT: Price distribution and utility under different pricing rules

	Mean price (US cts/lb)	Standard deviation of prices (US cts/lb)	Mean-variance welfare
1 All prices equal to NYC	107.1	30.8	100.4
2 Observed prices less estimated FT premium	111.6	33.5	104.1
3 Applying FLO rule	136.1	15.8	134.7
4 Observed prices	116.3	33.3	109.1

Welfare = (mean - 0.5 (rho/mean) variance), where relative risk aversion rho = 1.5.