Efficient Consumer Altruism and Fair Trade Products*

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Abstract

Consumers have shown a willingness to pay a premium for products labeled as "Fair Trade" and a preference for retailers that are seen to be more generous to their suppliers/employees. A fair trade product is essentially a bundle of a base product and a donation to the supplier (e.g., a coffee farmer). An altruistic rational consumer will only choose this bundle if doing so is less expensive than buying the base product and making a direct donation. For fair trade to be sustainable either in a competitive equilibrium or in a monopolistic environment, this bundling must yield an efficiency. This efficiency is generated in the following context. A supplier's investment reduces the retailer's cost or boosts the final product's quality, but this investment is not immediately observable and cannot be enforced, hence there exists a moral hazard problem. In this environment, the altruism of the consumer can facilitate a more efficient contract: by paying the supplier more, the retailer can both extract more consumer surplus and increase the level of contracted investment, while preserving the supplier's incentive compatibility constraint. We assess our model in the context of the coffee industry.

Keywords: fair trade, consumer altruism, non-verifiable investment, contracts

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1 Introduction

A significant subset of consumers have shown a willingness to pay a premium for products labeled as "Fair Trade" (henceforth, FT) and a preference for retailers that are seen to be more generous to their suppliers and employees, domestically and internationally (The Economist [2007], Maietta [2003], De Pelsmacker, Driesen and Rayp [2005], Howard and Allen [2008], Basu and Hicks [2008]).[1] The size of fair trade and "ethical products" market is large and growing: global sales exceed €3.4 billion worldwide (Fairtrade Labeling Organizations International (FLO)[2010]) for FLO labeled products alone. The main goal of the FT movement is to improve the standards of living for farmers and artisans by ensuring a "fair" price. The most prominent product is FLO-certified coffee. The FLO selects and maintains a registry of cooperatives that meet certain minimum requirements. To qualify for a FT label, importers and roasters must buy from these cooperatives at a set minimum price at or above the world market rate, plus a "social premium".[2]

Does this practice actually help the targeted group and/or improve welfare? Several economists and policy analysts have been dismissive of this practice, arguing that altruistic consumers could help the suppliers more effectively by making direct transfers (Zehner [2002], Booth and Whetstone [2007], The Economist [2006]). These authors imply that consumers who purchase fair trade products must be uninformed or irrational. On the contrary, we show through a formal model that even consumers who are fully informed and rational may prefer to purchase the fair trade product.[3]

We model a fair trade product as a bundle of a base product and a donation. For intuition,

[1] We are not discussing "fair trade" in the context of a government's international trade policy. Our model applies to products directly marketed to consumers as fair trade. It is also relevant when consumers care about employees' surpluses, such as in the case of the anti-sweatshop movement.

[2] The social premium is currently (as of 2007) \$0.10/lb., and must be used for specific projects to benefit members of the cooperatives. Requirements for cooperatives and importers/roasters include labor, governance, environmental standards, and specified contract terms which include providing short-term credit to farmers. For simplicity, our model naturally abstracts away from many of these institutional features. Note that our analysis is generalizable to altruistic products beyond FLO registered Fair Trade coffee. Further institutional details and description can be found in Renard (2003) and Smith (2009).

[3] Some recent work, such as Smith (2009) and Nicholls and Opal (2005) has discussed and responded to prominent criticisms of fair trade.

we state our model in terms of coffee, and give anecdotal evidence from this industry, but our analysis applies to a wider set of markets and interactions. In our model, one type of consumer is *altruistic*; this consumer's utility function partly depends on the impact of her actions on others – in particular, the effect of her purchase on the welfare of coffee farmers.[4,5] The rational altruistic consumer will choose this bundle (the base product and a direct donation) only if purchasing the bundle is cheaper than purchasing both elements separately. The bundle can be produced at a lower cost through the following mechanism.

We model a vertically-structured industry in which a retailer (henceforth, the "roaster") buys inputs from a supplier (henceforth, the "farmer"), and the two parties have a repeated contractual relationship.[6] In producing these inputs, the farmer can make an investment that will reduce the cost (to the roaster) of providing the final product. Because this investment is non-verifiable, it will typically be set below the first-best efficient level.[7] A roaster who pays the farmer more than the price of the regular coffee is in essence offering a direct donation, and thus can capture the increased altruistic component of the consumer's utility. At the same time, this larger payment also increases the farmer's net benefit of complying with the contract. Thus, the contract can specify a higher

[4]The consumer weighs these outcomes according to an anonymous social welfare function (e.g., Rawls [1971] or Harsanyi [1955]). This implies that utility from altruism does not depend directly on the amount sacrificed, nor on the manner of the contribution, but on the amount the targeted group receives. This is consistent with several models of giving, including the public goods model (Becker [1974]), the impact model (Duncan [2004]), and a specific interpretation of the reciprocity model (Sugden [1984]) or the warm glow model (Andreoni [1990]).

[5]We can not rule out that other psychological motives such as "group fairness" (Rabin [1993], Moreno [2008]): if a consumer identifies with farmers, she may be willing to pay more to a producer who is kind to these farmers. However, such models of "psychological games" are known to predict very broadly, and are tied to a particular definition of fairness. In contrast, our model is able to explain FT in a more standard setup, merely assuming a degree of rational altruism.

[6]We are not assuming a fixed long term contract *per se*, but two parties who are in this industry for the indefinite long-term and have the opportunity to repeatedly meet and agree on, or reaffirm, the contract terms (which must be self-enforcing). This resembles the typical interaction between farmers and professional importing firms (roasters), as described in Nicholls and Opal (2005).

[7]There is much evidence of a moral hazard problem in the coffee industry. Zehner [2002] notes "growers may lie about the geographical origin of their crop or add low-quality beans or dirt and stones to the bags of coffee they supply."

self-enforcing level of the farmers' investment and thus reduce the roaster's costs. Through this increased investment and through capturing the increased altruistic component of the consumer's utility, the bundling yields an efficiency. Thus, the bundle can be produced at a lower cost than its elements, as claimed above. Consequently, we further show that the rational altruistic consumer's willingness to pay a premium for a fair trade product results in an even larger premium going to the supplier. A variation of the mechanism above, where the investment boosts the quality of the base product, yields the same results.

Our setup bears some similarities to Shapiro (1983) and Klein and Leffler (1981) in that these authors also considered the agency problem in an infinitely repeated context; however, they do not consider altruism. The efficiency benefits (and profitability) of altruism in the context of agency costs has been modeled by Casadesus-Masanell (2004) and various models surveyed by Rotemberg (2006), who notes that an altruistic supervisor puts less weight on "the cost of transferring resources to a subordinate." These papers investigate the value of committing to be altruistic (or hiring an altruist), either for an agent or for a principal – this contrasts from our own model which takes preferences as given.[8] More importantly, our paper is the first to consider the effect of an altruistic third-party, the consumer. In fact, the explicit marketing appeal to the consumers' altruism is the hallmark of FT products, and the presence of this altruistic third-party is the defining characteristic of our model.

Some scholars have argued that labeling certain products as fair trade will decrease market efficiency by distorting market price (Lindsey [2004], Booth and Whetstone [2007], Harford [2006], Sidwell [2008]). In contrast, our model suggests that fair trade is a successful innovation *even* in a competitive environment (and with rational consumers).[9] This innovation increases welfare, even when we measure the welfare excluding the altruistic component of consumers' utilities.

Our model offers advantages over previously proposed explanations for the existence of fair trade

[8]Several of these papers follow Rotemberg (1994) in allowing an agent "to mold his behavior payoffs to serve best his object self" – in other words, an individual has some ability to commit to a level of altruism that will maximize his material payoffs.

[9]The perfectly competitive environment also offers the clearest demonstration of the welfare gain from FT. However, we also show that most of the results derived in a competitive environment are still valid with a monopolistic retailer.

products. None of these models can explain the retailer paying a larger premium than the consumer while explaining FT products' survival in a competitive environment. Hayes (2006) argues that FT achieves this through the elimination of monopsony rents; but his model cannot explain how fair trade roasters can take over a market controlled by a monopsony.[10] The proponents of "trade not aid" (Rugasira [2007]) do not provide an economically meaningful distinction between *trade* and *aid*.[11] When consumers are rational altruists, the argument that FT allows for profitable price discrimination (Harford [2006]) requires counter-intuitive assumptions.[12] Finally, neither a market segmentation story (Booth and Whetstone [2007], Bechetti and Solferino [2008]) nor a marketing strategy argument can explain why there are roasters serving FT coffee exclusively and others serving both FT and non-FT coffee.[13]

Section 2 presents our model and our theoretical results. Throughout this section we incorporate anecdotal evidence from the coffee industry to assess our assumptions and results. Section 3 concludes and offers suggestions for future research.

2 Model

Our model shows how consumer altruism can lead a firm to offer a fair trade product in a competitive environment. (In the appendix, we also present a model with a monopolistic retailer and show that most of the results derived here are preserved.) We assume that all retailers have access to the

[10]Monopsony rents can be maintained through barriers to entry, or if a local market is a natural monopsony (Bain [1956]). FT retailers would need to enter these markets and force the incumbent to exit, in spite of the higher input costs implied by the premium to the farmer.

[11]They argue that traditional public-sector aid and charity will have a demoralizing and dis-incentivizing effect, fostering a dependent mentality. But offering a higher-than-usual price could also be considered a "handout".

[12]Bundling coffee and a donation is only useful for price discrimination if altruists have a lower valuation of the base product; this is illustrated in the Appendix A.1. However, conventional wisdom (e.g., Harford [2006] himself) suggests that consumers of fair trade are premium consumers.

[13]These authors claim that FT can be used to segment the market and give firms greater market power. However, the coffee market is not highly concentrated; there are many choices (FT and non-FT) in supermarkets and boutique cafes. The segmentation story also fails to explain why stores like Starbucks offer both types of coffee. Another argument is that the roasters offer fair trade coffee as a "loss-leader"; this cannot explain why some roasters *solely* offer FT products.

same production process, and that fair trade producers do not have an inherent advantage over charities in providing the altruistic good.

2.1 Primitives

There are four types of actors in our model: coffee farmers, coffee roasters, altruistic consumers, and non-altruistic consumers.

A unit of coffee is produced jointly; a farmer (F) grows and prepares the beans and a roaster/retailer (R) buys them, processes them, and sells them to a consumer whose valuation of the coffee is v. The retail market for coffee is perfectly competitive. However, each roaster has bargaining power over the farmers he buys from. Empirical work suggests that the retail coffee market is a fairly competitive industry, while small coffee farmers have little to no market power, and are not well-organized (Dicum and Luttinger [1999], Hayes [2006], Zehner [2002], Lindsey [2004]).[14]

Each farmer can either produce a unit of coffee or produce nothing. A roaster bears the cost of processing a unit of coffee $c(m)$. This cost is determined by the farmer's investment $m \geq 0$. For example, a farmer may carefully sort and clean the beans, and thus save the roaster the cost of doing so.[15] Investment m decreases the processing cost at a decreasing rate, i.e., $c'(m) < 0$ and $c''(m) > 0$.

Alternatively, we could interpret $c(0) - c(m)$ as an improvement of quality resulting from investment m. Under this interpretation, the consumers' utility from the coffee will be $v - c(m)$, and all of the subsequent results will be preserved. We model this interpretation in A.2.

A roaster pays $p \geq 0$ to a farmer for each unit of coffee. The farmer's net profit from (p, m)

[14]The roaster is assumed to be a natural monopsony in the local coffee bean market, as long as his technology is as efficient as any other firm. At the same time, the roaster is a perfectly competitive retailer. As an example, consider the case with a single consumer having unit demand, two roasters each of whom has the potential to produce one unit of roasted coffee beans, and three farmers each of whom has the capacity to produce one unit of coffee beans.

[15]Such investments are important in the coffee growing industry. Coffee production generally involves several basic stages – growing, harvesting, de-pulping, drying, sorting, grading, and bagging – but there are variations in technique and quality at each stage (Dicum and Luttinger [1999]). De Janvry et al (2009) note "tremendous quality heterogeneity." The most important investments may be those that ensure reliable production and maintenance of the organic certification.

is $\pi := p - m$. Profit π will have the same effect on the altruistic consumer's utility as making a donation of π to the farmer. Thus, we often refer to the farmer's net profit π as the consumer's "donation". However, while the altruistic consumer values this "donation", the regular consumer does not – she is indifferent to any level of π. We refer to (π, m) as "the contract" between a farmer and a roaster. The roaster's bargaining power allows him to set the contract.

Once having purchased and processed the coffee, the roasters sell this product to the consumers. The coffee is branded "coffee π", or simply coffee(π), representing the bundle of the base coffee product and the profit π given to the farmer. Roasters face market price $P(\pi)$ for coffee(π). The profit of a roaster producing and selling coffee(π) with contract (π, m) is

$$\Pi_R(\pi, m) = P(\pi) - p - c(m) \quad \text{where} \quad \pi = p - m.$$

Both the altruistic and the non-altruistic consumers have unit demand for coffee. The altruistic component of utility is additively separable from the coffee consumption component. Let v represent the two consumers' identical valuation of coffee. Thus, the utilities are v for the non-altruistic consumer and $v + a(\pi)$ for the altruistic consumer, where $a(\pi)$ is the altruistic component. We assume that v is large enough so that consumers always choose to consume coffee. We further assume that the consumers have quasi-linear utility with respect to money, so their net utilities given price $P(\pi)$ are

$$U_A(\pi) = v + a(\pi) - P(\pi) \quad \text{and} \quad U_0(\pi) = v - P(\pi)$$

for the altruistic consumer and the non-altruistic consumer, respectively. The altruism value of zero donation is normalized to be zero, and the marginal utility of donation π is positive, decreasing in π, and less than unity:

$$a(0) = 0,\ a'(\pi) > 0,\ a''(\pi) < 0,\ a'(0) \leq 1. \tag{1}$$

Note that these four conditions imply $a(\pi) \leq \pi$. Inequality $a'(0) \leq 1$ means that the first dollar donation gives less than a dollar utility to the altruistic consumer. We impose this stringent condition to make the strongest case for the potential efficiency of fair trade. This assumption implies that consumers will only buy fair trade coffee if the premium they pay for such coffee is less

than the resulting increase in the farmer's income. Thus, our story of fair trade must explain how and when this "magnification" can occur. In A.3, we provide intuition for inequality $a'(0) \leq 1$, and illustrate that relaxing this stringent assumption only strengthens the case for fair trade.

We consider the following repeated interaction:

(i) A roaster R announces contract (π, m), which becomes common knowledge.

(ii) A farmer F invests $\tilde{m}$.

(iii) The roaster R pays $p = \pi + m$ to F.

(iv) The roaster observes his production cost $c(\tilde{m})$, but $\tilde{m}$ is unverifiable.

(vi) Consumers buy coffee (giving profit $\tilde{\pi} := p - \tilde{m}$ to the farmer) at price $P(\pi)$.

There is information asymmetry. Within each period, $\tilde{m}$ is unverifiable even after the roaster observes $c(\tilde{m})$ and infers $\tilde{m}$. In the event that the farmer unilaterally strays from equilibrium behavior and fails to invest, the roaster has already paid him and cannot sue to get his money back. The typical small farmer or cooperative is poor and can be seen to have limited liability (see, e.g., Duflo [2003]). Moreover, it would be costly to launch a suit over what is likely to be a small amount of money, and the court systems in the origin country of many coffee growers are problematic.[16]

On the other hand, we assume that the roaster always pays the $p = \pi + m$ that is specified in the contract. This allows us to simplify our analysis and ignore the roaster's incentive compatibility constraint. To justify this assumption, we can assume that if the roaster pays $\tilde{p} \neq p$, this is publicly observed, and the roaster will be sued by an NGO such as the Fair Trade Labeling Organization (FLO) or Transfair and pays damages D. If D is large enough (including direct damages, negative publicity, and loss of reputation), the roaster will always pay p. This general claim is supported by De Janvry et al (2009), who highlight the "effectiveness of the audits conducted by the 19 world

[16]This problem, the limited ability of the poor to make binding commitments, is widely cited in the development literature; e.g., Ray (1998). For evidence on legal conditions, see an earlier draft of this paper.

labeling initiatives" and note "the mechanisms in place to monitor prices seem to be effective."[17]

This interaction may be repeated once or infinitely. We refer to $(\pi, m) = (0, 0)$ as the termination of contract. This might be used to punish the farmer for deviation $\tilde{m} \neq m$ in the previous period.

2.2 Maximization and competitive equilibrium

As a benchmark, we present a one-period interaction between the farmer and the roaster. The farmer's profit is $p - \tilde{m}$. For any level of $p = \pi + m$, it is always optimal to choose $\tilde{m} = 0$. Considering $a(\pi) \leq \pi$, the roaster does not want to implement $\pi > 0$ since even the altruistic consumer's appreciation $a(\pi)$ of the farmer's profit π is smaller than the cost, π. Thus the only sustainable contract is $(\pi, m) = (0, 0)$.

Next we consider an infinitely repeated interaction. Cooperation implementing strictly positive π and m can be sustained if the roaster plays a *grim trigger strategy*. Each party cooperates as long as all parties previously cooperated; otherwise, the roaster will propose $(\pi, m) = (0, 0)$, and the farmer sets $\tilde{m} = 0$ for any (π, m). If the farmer defects from contract (π, m) by investing $\tilde{m} = 0$, he receives $p = \pi + m$ for that period. However, the roaster will terminate contract (π, m) after detecting the deviation. Thus the farmer will get zero profit from the next period onwards.[18] Therefore, the incentive compatibility constraint for a farmer with discount factor δ_F is

$$(p - 0) + \sum_{t=2}^{\infty} \delta_F^{t-1} 0 \leq \sum_{t=1}^{\infty} {\delta_F}^{t-1} \pi \quad \Longleftrightarrow \quad \pi \geq \frac{1 - \delta_F}{\delta_F} m \tag{2}$$

The roaster chooses an optimal contract subject to (2). Note that there is a continuum of potential coffee products, each indexed by "ethical quality" (i.e., by the profit π given to the farmer). Coffee(π) may or may not be produced depending on its price $P(\pi)$ in equilibrium. The producer

[17] One might imagine that the farmer and the roaster could collude to deceive the consumer into believing that the farmer has invested less, and thus gained more surplus than he actually has. However, if the roaster is paying the FT price to the farmer, the FT level of investment is the highest that will be incentive compatible (as shown in our model). As we have assumed that p is common knowledge, consumers will correctly infer the corresponding level of investment.

[18] The assumption of of zero payoffs forever is a simplification: if the farmer who defects has the option to sign a contract with another roaster, but with a sufficiently costly delay, the qualitative results are preserved.

chooses which coffee to produce given function $P(\pi)$ and which level of the farmer's investment m to implement:

$$\max_{(\pi,m)}[P(\pi)-(\pi+m)-c(m)] \text{ subject to } (2).$$

This optimization can be decomposed into two steps: the roaster chooses m for a given π, and then he chooses π. First, facing the incentive compatibility constraint, the optimal feasible investment for a given π is $m(\pi) = \text{argmax}_m\{P(\pi)-(\pi+m)-c(m) : \pi \geq \frac{1-\delta_F}{\delta_F}m\}$. Second, a roaster's objective is to choose π that maximizes his profit, i.e., the roasters' choice of π maximizes $\Pi_R(\pi) := [P(\pi)-(\pi+m(\pi))-c(m(\pi))]$.

Facing price $P(\pi)$, each consumer will chooses π (hence, choosing coffee(π)) to maximize her net utility. The following are the maximization problems: one for an altruistic consumer and the other for a non-altruistic consumer.[19]

$$\pi_A^C = \operatorname*{argmax}_\pi[v+a(\pi)-P(\pi)] \text{ and } \pi_0^C = \operatorname*{argmax}_\pi[v-P(\pi)].$$

The altruistic consumer purchases coffee(π_A^C), which we call "fair trade coffee". The non-altruistic consumer purchases coffee(π_0^C), which we call "regular coffee".

Because the roasters are perfectly competitive, profit will be driven down to zero. With only two consumers, no more than two roasters can sell a positive quantity. Thus in equilibrium there will be either two roasters, one serving the non-altruist and the other serving the altruist, or one roaster serving both of the consumers. We define π_A^R and π_0^R as the choices of the roaster serving the altruist and the non-altruist, respectively, i.e.,

$$\pi_A^R, \pi_0^R \in \operatorname*{argmax}_\pi \Pi_R(\pi).$$

A natural market clearing condition in our context is that the roasters' choices and the consumers' choices coincide. Our notion of equilibrium (where certain products are produced and the others are not) can be understood as an extremely simple case of Ostroy (1984).

$$\pi_A := \pi_A^C = \pi_A^R \text{ and } \pi_0 := \pi_0^C = \pi_0^R.$$

We summarize the equilibrium notion in the following definition.

[19] Although, it may seem unusual for the consumer to have a role in "setting" the input price, this simply represents the consumer's optimal choice over the "altruistic quality" of the coffee.

Definition 1. *A vector* $< (\pi_A^C, \pi_0^C), (\pi_A^R, \pi_0^R), (P(\pi))_{\pi \geq 0} >$ *is an* <u>*equilibrium*</u> *if and only if the following conditions hold.*

$$\textit{Consumers} : \pi_A^C \in \underset{\pi_A}{\operatorname{argmax}}[v + a(\pi_A) - P(\pi_A)] \ , \quad \pi_0^C \in \underset{\pi_0}{\operatorname{argmax}}[v - P(\pi_0)]$$

$$\textit{Roasters} : \pi_A^R, \pi_0^R \in \underset{\pi}{\operatorname{argmax}} \max_{m(\pi)} \Big\{ P(\pi) - (\pi + m(\pi)) - c(m(\pi)) : \pi \geq \frac{1 - \delta_F}{\delta_F} m(\pi) \Big\}$$

$$\textit{Market Clearance} : \pi_A^C = \pi_A^R, \pi_0^C = \pi_0^R.$$

Note that the Walrasian auctioneer sets prices for all coffee that may or may not be produced. These prices lead the consumers and the producers to choose the identical coffee products so that supply and demand meet.

The price-taking behavior of farmers is not incorporated in the definition of equilibrium. Instead, the farmer's role in the definition is only through a constraint on the roasters' achievable m for a given π. We will show that π_A and π_0 are positive under certain parameter values: farmers who have contracts with roasters (whether fair trade or not) receive strictly positive profit, while farmers without contracts get zero profit. Without the incentive compatibility constraint of farmers, this "rationing" would not have occurred: other farmers would have accepted a contract with lower π and the same m; such contracts are not feasible given the incentive compatibility constraint. This rationing prevents the incorporation of farmers' optimization problems into the definition of a Walrasian equilibrium.

Similar rationing is found in credit markets (Stiglitz and Weiss [1981]) and general equilibrium principal-agent problems (Bennardo and Chiappori [2003]). We discuss the welfare implications of this assumption in Section 2.3.

Let m_{EF} satisfy $1 = -c'(m_{EF})$: this defines the first best level of investment since the marginal cost of the investment is equivalent to the marginal benefit, i.e., the marginal reduction of processing cost. Additionally, let $\pi_{EF} := \frac{1-\delta_F}{\delta_F} m_{EF}$, the minimum level of farmer profit that makes the efficient investment incentive compatible.

Finally, we characterize an equilibrium (Proofs are in Appendix A.4).

Proposition 1. *(i) The price $P(\pi)$ that clears the market (i.e., $\pi_A^C = \pi_A^R, \pi_0^C = \pi_0^R$) is given by:*

$$P(\pi) = \begin{cases} \frac{\pi}{1-\delta_F} + c\left(\frac{\delta_F}{1-\delta_F}\pi\right) & \text{if } \pi < \pi_{EF}, \\ (\pi + m_{EF}) + c(m_{EF}) & \text{if } \pi \geq \pi_{EF}. \end{cases}$$

(ii) $\pi_A \geq 0$ and $\pi_0 \geq 0$ are determined by the following Kuhn-Tucker conditions:

$$\delta_F\Big(-c'\Big(\frac{\delta_F}{1-\delta_F}\pi_0\Big)\Big) \leq 1 \quad \textit{and equality holds if } \pi_0 > 0, \tag{3}$$

$$(1-\delta_F)a'(\pi_A) + \delta_F\Big(-c'\Big(\frac{\delta_F}{1-\delta_F}\pi_A\Big)\Big) \leq 1 \quad \textit{and equality holds if } \pi_A > 0. \tag{4}$$

As Proposition 1 illustrates, under perfect competition, the market-clearing price of a given type of coffee will equal the roaster's (marginal) cost producing this coffee. The roaster will choose to increase the farmer's profit (hence investment) as long as the unit marginal cost of the increase is less than the marginal cost-reducing value of the resulting investment, plus – for the FT coffee – the consumers' valuation of the farmer's profit.

We need the following conditions for an interior solution, i.e., $\pi_0 > 0$ and $\pi_A > 0$.

Condition 1. $-c'(0) > \frac{1}{\delta_F}$.

Condition 2. $\frac{1-\delta_F}{\delta_F}a'(0) + (-c'(0)) > \frac{1}{\delta_F}$.

Proposition 2. *The surpluses of farmers $\pi_A := \pi_A^R = \pi_A^C$ and $\pi_0 := \pi_0^R = \pi_0^C$ satisfy:*

(i) $\pi_0 > 0$ if and only if Condition 1 holds, and

(ii) $\pi_A > 0$ if and only if Condition 2 holds.

As the farmer becomes impatient, the potential for long-term cooperation declines.[20] In order to have positive investment without altruism, the first-dollar marginal benefit of investment ($-c'(0)$) must exceed the marginal cost of inducing the investment ($\frac{1}{\delta_F}$). This includes both the marginal (unit) cost of compensating the farmer for his investment and the marginal cost of providing the farmer an incentive ($\frac{1-\delta_F}{\delta_F}$, derived from (2)) not to deviate. With an altruistic consumer, the roaster gets an additional benefit from the first unit of investment, $\frac{1-\delta_F}{\delta_F}a'(0)$. However, since

[20] It is trivial for (i). For (ii), note that the condition is equivalent to $(1-\delta_F)a'(0) + \delta_F(-c'(0)) > 1$. $-c'(0)$ must be larger than $a'(0)$ to have $\pi_A > 0$. (If not, $(1-\delta_F)a'(0) + \delta_F(-c'(0)) \leq 1$ since $a'(0) \leq 1$.) Thus the result follows.

$a'(0) \leq 1$, consumer altruism alone will never be sufficient for positive investment; the investment must *also* be sufficiently cost-reducing.

We derive the following corollary which further characterizes the equilibrium.

Corollary 1. *Under Condition 2, (i)* $\pi_A > \pi_0$*, and (ii)* $P(\pi_A) > P(\pi_0)$*.*

Essentially, inducing higher investment is "cheaper" for FT coffee than for regular coffee, as payments to the farmer also benefit the altruistic consumer. Thus, as the corollary notes, *ceteris paribus*, farmers' investments are always higher for fair trade coffee. Those involved in fair trade directly make this claim of a higher level of investment (Rodney North of Equal Exchange [2007]).

In summary we have characterized the equilibrium contracts for four cases, as shown in the following table.

	Without Altruism	With Altruism
Short-term interaction	[1] $(\pi, m) = (0, 0)$	[2] $(\pi, m) = (0, 0)$
Long-term interaction	[3] $(\pi, m) = (\pi_0, m_0)$	[4] $(\pi, m) = (\pi_A, m_A)$

We argue that the institution of fair trade moves the equilibrium contract from [3] to [4]. However, if fair trade itself makes cooperation possible, (i.e., the transition from [1] to [4]), as some advocates claim, the benefits of fair trade are even greater. For example, the provision of advance credit may help alleviate credit constraints, essentially lowering farmers' discount rate, so Condition 1 and 2 become more likely to be satisfied.

2.3 Comparative statics and welfare analysis

The comparative statics with respect to δ_F are straightforward: as δ_F increases, the equilibrium investment m will increase, for either type of coffee. As the farmer grows more patient (and/or the delay between periods decreases) the farmer's incentive compatibility constraint is relaxed, and this lowers the net cost (to the roaster) of inducing additional investment. A formal proof is in A.5.

Next, we consider how an increase in altruism affects the economic agents' utilities/profits as well as the welfare of the economy. Government and NGO policies aiming to "raise awareness" of fair trade may succeed in increasing the altruism of consumers, or the number who consider

purchasing a fair trade product. As we show below, this will increase the efficiency of production (by increasing the chosen level of investment m). This is also relevant to a recent strain of literature (e.g., Casadesus-Masanell [2004], Fehr and Fischbacher [2002], Kaplow and Shavel [2007]) that hearkens back to Smith (1759) and examines the impact of "moral sentiments" such as as altruism on the behavior and efficiency of the economy. We consider a parametrized altruism function $\beta a(\pi)$ with $\beta \in [0,1]$. An increase in β implies an increase in the utility an altruistic consumer derives from the income passed to the farmer.[21] We restate Condition 2 for this parametrization:

Condition 2a $(1-\delta_F)\beta a'(0) + \delta_F(-c'(0)) > 1$.

Note that β is included in Condition 2a, as the new altruism function is $\beta a(\pi)$.

For certain parametric values, altruism makes a non-trivial contract possible when it was impossible otherwise. Suppose $a(\cdot)$ and $c(\cdot)$ fail to satisfy Condition 1, but satisfy Condition 2a. Proposition 1 implies that $\pi_0 = 0$ and $\pi_A > 0$; hence, $m_0 = 0$ and $m_A > 0$.

More generally, altruism increases the level of investment m and the profit of the farmer π.

Proposition 3. *Under Condition 2a,*

$$\frac{d\pi_A}{d\beta} > 0 \quad \textit{and} \quad \frac{dm_A}{d\beta} > 0.$$

Proof. With the re-defined altruism component of utility $\beta a(\pi)$, the first order condition for the altruistic consumer is

$$(1-\delta_F)\beta a'(\pi_A) + \delta_F\left(-c'\left(\frac{\delta_F}{1-\delta_F}\pi_A\right)\right) = 1.$$

Total-differentiating the constraint with respect to β and π_A, we derive

$$\frac{d\pi_A}{d\beta} = -\frac{a'}{\beta a'' - \left(\frac{\delta_F}{1-\delta_F}\right)^2 c''} > 0; \text{ hence, } \frac{dm_A}{d\beta} = \frac{\delta_F}{1-\delta_F}\frac{d\pi_A}{d\beta} > 0.$$

[21] An alternative parametrization would be through an increase in the proportion of altruistic consumers. In the previous section, we derived $\pi_A > \pi_0$ and $m_A > m_0$. These four values remain the same even if we increase the proportion of altruists. However, the average level of farmers' profit and investment will increase as more altruists means an increased demand for the fair trade product.

Thus, we show the result. □

Proposition 3 implies that as altruism increases, the marginal altruistic utility from giving more profit to the farmer increases. A greater profit for the farmer implies greater investment.

We also prove that the fair trade premium the farmer receives exceeds the premium the altruistic consumer pays, i.e., the altruistic consumer's willingness to pay a small additional amount results in an even larger rent to the farmer.

Proposition 4. *Under Condition 2 (and 2a),* $P(\pi_A) - P(\pi_0) < \pi_A - \pi_0$.

Proof. The fact that the altruistic consumer has chosen π_A over π_0 implies

$$v + \beta a(\pi_A) - P(\pi_A) \geq v + \beta a(\pi_0) - P(\pi_0).$$

Thus we derive $P(\pi_A) - P(\pi_0) \leq \beta a(\pi_A) - \beta a(\pi_0)$. We also derive $\beta a(\pi_A) - \beta a(\pi_0) < \pi_A - \pi_0$ from $\beta a'(\cdot) \leq 1$. The result follows. □

Since the altruistic consumer gains less from a dollar of farmer's profit than from a dollar of consumption, if she chooses to pay a premium for FT coffee, the roaster must be passing on an even larger premium to the farmer. This proposition can be tested empirically by estimating and comparing the consumer and producer premia; we leave this for future work.[22]

Finally we analyze the effect of the increased altruism on the welfare of the economy. We consider only the welfare of altruistic consumers, fair trade coffee roasters, and fair trade farmers,

[22]Both Maietta (2003) and Gallaraga and Markandya (2004) estimate the consumer premium with hedonic regressions using retail data, but these studies use data from small and nascent markets. Zehner (2002) presents a simple comparison of three pairs of coffee products and finds "the Fair Trade premium is an inefficient subsidy." However, his result depends on *which* coffee the FT product is compared to, and similar comparisons reverse these results, as do the (also simple) findings of Eshuis and Hansen (2003). Nicholls and Opal (2005) offer a range of evidence on the financial returns to FT labeling and administrative costs, and on the social returns to FT, broadly defined. Our own preliminary estimates using data from Amazon.com suggest that consumers are paying little or no more for FT than for non-FT coffee (although as de Janvry et al [2009] suggest, given the current high world price of coffee, the fair-trade premium itself may currently be small or zero). This limited evidence is summarized in our Essex working paper (2008). Overall, the evidence is neither consistent nor definitive; in the case of fair trade coffee this remains an open question.

since β has no effect on the other parties. Welfare is:

$$W(\pi, m) = [v + \beta a(\pi)] + [-(\pi + m) - c(m)] + [\pi] = v + \beta a(\pi) - m - c(m).$$

In contrast to the classical general equilibrium approach, we include the monetary transfer $p = \pi + m$ (hence, π as well) in our definition of welfare because the transfer affects the altruistic consumer's utility.

We also define *welfare net of altruism*:

$$W^{\pi}(\pi, m) := W(\pi, m) - \beta a(\pi) = v - m - c(m).$$

We examine welfare net of altruism as a benchmark; the welfare gain from the scaled-up utility function is itself trivial. Furthermore, some policy-makers may not consider the altruistic "warm glow" as an important component of social welfare.

The effect of increased altruism on welfare can be decomposed into three parts: (a), (b), and (c) in the equation below.

$$\frac{d}{d\beta}\left[v + \beta a(\pi_A) - m_A - c(m_A)\right] = \underbrace{\frac{\partial}{\partial\beta}[\beta a(\pi_A)]}_{(a)} + \underbrace{\beta a'(\pi_A)\frac{d\pi_A}{d\beta}}_{(b)} + \underbrace{\frac{d}{d\beta}\left[v - m_A - c(m_A)\right]}_{(c)}$$

We focus on the case satisfying Condition 2a, i.e., $\pi_A > 0$ and $m_A > 0$. Otherwise, an increase in altruism will have no effect on welfare, since the farmers receive zero surplus both before and after a small increase in β.

(a) measures the direct effect of the increase in β. The direct effect represents the obvious increase in surplus as the product takes on additional altruism value. (b) measures β's indirect effect through the increased π. As the consumer altruism increases, the roaster adapts the product to this change, which in turn increases welfare. (c) measures the indirect effect, as higher investment leads to a net reduction of costs:

$$\frac{d}{d\beta}\left[v - m_A - c(m_A)\right] = \frac{d}{d\beta}W^{\pi}(\pi, m) = -(1 + c'(m_A))\frac{dm_A}{d\beta} > 0 \quad \text{since} \quad 1 + c'(m_A) < 0.$$

We can think of the beneficial effect of altruism as being magnified through the investment of the farmer. Since the indirect effect (c) is positive, we see that not only will an increase in altruism increase welfare, it will also increase welfare net of altruism. Thus we prove our main proposition:

Proposition 5. *If Condition 2a holds, an increase in altruism increases welfare net of altruism. Otherwise, a small change in altruism has no effect on welfare.*

As roasters and consumers are largely in "Northern" countries, and coffee farmers in "Southern" countries, some Northern policy makers may be solely interested in the welfare of consumers and retailers. Thus, we alternatively consider *Northern welfare*, the welfare excluding farmers' utility:

$$W^D(\pi, m) = [v + \beta a(\pi)] + [-(\pi + m) - c(m)] = v + \beta a(\pi) - (\pi + m) - c(m).$$

The incentive-constrained efficient allocation (with respect to the Northern welfare) is defined as the choice of (π, m) that maximizes the Northern welfare subject to the incentive compatibility constraints of the farmers:

$$\max_{\pi,m}[v + \beta a(\pi) - (\pi + m) - c(m)] \text{ s.t. } \pi \geq \frac{1 - \delta_F}{\delta_F} m.$$

The first order condition for the maximization problem is identical to the first order condition of the altruistic consumer, equation (8). In other words, the equilibrium outcome is also the policy maker's most preferred outcome. Thus we have proved a welfare theorem.

Proposition 6 (Welfare Theorem)**.** *The equilibrium of Definition 1 is incentive-constrained efficient with respect to the Northern welfare. Also, a incentive-constrained efficient allocation in terms of the Northern welfare can be obtained as an equilibrium.*

Since the equilibrium with FT is incentive-constrained efficient, no better outcome for consumers and roasters can be achieved, hence FT can not be harmful to Northern welfare.

We modeled a competitive retailer both as a standard baseline case and as a reasonable approximation for major coffee markets. However, most of our results carry over to a model with a monopolistic roaster. Under the same condition (Condition 2), the roaster will choose to offer both a regular and a FT coffee, charging the consumer a premium for the latter, but also paying a correspondingly larger premium to the farmer, and inducing greater cost-saving investment. Scaling up the altruism component of utility leads to a more efficient outcome for FT coffee production. However, under certain parameters, greater altruism will decrease the efficiency of non-FT coffee

production, since the monopolist wants to reduce non-FT farmers' profit to discourage altruists from buying non-FT coffee. Thus, the welfare consequence becomes ambiguous. Further details are in Appendix A.6.

3 Conclusion

A typical economic argument for *laissez faire* is that prices signal economic agents to maximize their own welfare, and this leads to efficiency. This view criticizes the practice of fair trade by claiming that catering to consumers' altruism distorts prices, and thus reduces efficiency. However, we have shown that, in the presence of an information asymmetry problem (the moral hazard problem of farmers), what may seem to be a "distortion" of price (the higher premium for fair trade coffee) may actually represent the use of a concerned outsider (altruistic consumers) to increase efficiency (more efficient investment).

Our finding suggests a generalization that is applicable to contract theory. Parties involved in a bargaining situation may find it useful to involve an outsider who is concerned with the outcome. In turn, this could alleviate the inefficiency caused by the presence of information asymmetry.

As previously noted, our model is applicable not only to fair trade coffee but to any case in which a good or service is produced using inputs (with a market structure and information asymmetry resembling our model), and sold to a consumer (or business or government purchaser) who cares about the net income of the input producer. We provide a potential justification for "bundling" altruistic behavior and consumption decisions. Our model explains both why a rational altruist would prefer such products and how this improves the efficiency of production.

There are also implications for government policy. Governments may choose to purchase inputs from favored suppliers (from an altruistic or national interest perspective); our model provides an argument for the efficiency of doing so (rather than buying the cheapest input and offering a direct subsidy) under certain conditions. However, the simplest public policy implication is that governments may want to advocate policies that tend to favor fair trade industries. The European Union has pursued this, passing a handful of opinions, resolutions, and directives aimed

at promoting fair trade and encouraging the purchase of fair trade products by public authorities.[23] Our result that "welfare net of consumer surplus increases as consumers become more altruistic" implies that a campaign to make people aware of fair trade products could be welfare improving. Furthermore, governments often play a role in monitoring claims made by retailers to minimize problems of asymmetric information; in this context, government may want to regulate which products may label themselves as "fair trade."

Future empirical work will be able to more precisely test the relevance of our model to particular industries and markets. Our model implies that non-verifiable investment will be below the efficient level, even in repeated relationships, while consumer altruism can induce a more favorable long-term contract. A detailed examination of production data will reveal whether, *ceteris paribus*, suppliers getting a larger premium (e.g., fair trade farmers) invest more in quality and in reducing downstream costs. Our model predicts that the consumer premium for fair trade should not exceed the premium paid to farmers. This could be tested empirically by comparing the coefficient on a fair trade dummy in a hedonic regression at the consumer level (using, e.g., recent supermarket scanner data) to a similar coefficient in a regression at the farmer level.

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A Appendix

A.1 Price discrimination

Suppose the altruists value the unit of pure coffee at V_a and value donations D at $a(D) < D$ and the non-altruists value the coffee at $V > V_a$ and do not value donations. (Note that the altruists' residual willingness to pay for a donation can be no more than D, otherwise they would make the donations directly.) In such a case the retailer could price discriminate by selling the unbundled coffee product at a "premium" price $P = V$ to non-altruists, and selling the bundle of coffee and donation D at price $p+a(D)$ to the altruists, where $p < P < p+a(D)$. On the other hand, suppose altruists have a greater willingness to pay for the unit of coffee itself ($V_a > V$), and the firm tries to sell the unbundled coffee at price P and the bundled coffee at some higher price. Altruists will be willing to pay no more than $P+a(D) < P+D$ for the bundled product, as they could always choose to purchase the cheaper coffee at price P and make a direct donation. As (absent the efficiencies discussed in our own work) it will cost the retailer at least D to make such a donation, the retailer can not profit by offering the bundle.

A.2 Quality interpretation

Coffee is branded "coffee (π, q)", where π is the transfer to the farmer, and q is the quality of the coffee. Consumer's valuation of coffee is $v + q$. The quality of the coffee, q, depends upon the farmer's investment m, i.e., $q = q(m)$. We impose the same conditions on $-q(m)$ as we impose on c(m) in the main text. Since the characteristics of each coffee are represented by vector (π, q), the

price is also indexed by vector (π, q), i.e., $P(\pi, q)$. The consumers' problems are:

$$\max_{\pi,q}[v + q - P(\pi, q)] \text{ and } \max_{\pi,q}[v + q + a(\pi) - P(\pi, q)]$$

for the non-altruistic consumer and the altruistic consumer, respectively.

The producer's problem is

$$\max_{\pi,q}\Big\{P(\pi, q) - (\pi + m) : q = q(m) \text{ and } \pi \geq \frac{1 - \delta_F}{\delta_F} m\Big\}$$

From the assumption of perfectly competitive roasters, we derive

$$P(\pi, q) = \pi + m(q)$$

where $m(q)$ is an inverse function of $q(m)$.

We consider a pair of (π, q) satisfying the binding incentive compatibility constraint, i.e., $\pi = \frac{1-\delta_F}{\delta_F} m(q)$. A pair satisfying $\pi < \frac{1-\delta_F}{\delta_F} m(q)$ is not feasible, and a pair satisfying $\pi > \frac{1-\delta_F}{\delta_F} m(q)$ is not optimal. Hence, the price function is simplified into

$$\bar{P}(q) := P\Big(\frac{1 - \delta_F}{\delta_F} m(q), q\Big) = \frac{1 - \delta_F}{\delta_F} m(q) + m(q) = \frac{m(q)}{\delta_F}$$

where $\pi(q) := \frac{1-\delta_F}{\delta_F} m(q)$.

In summary, even though the price system seems more complex than the one in the cost reduction story (as it is indexed by a two-dimensional vector (π, q) rather than π only), the price system can be reduced to be one dimensional.

Finally we show that these two interpretations are identical by demonstrating that the first order conditions under the quality interpretation are identical to those derived from the cost reduction model. The consumers' maximization problems with the derived price function $\bar{P}(q)$ are:

$$\max_q[v + q - \bar{P}(q)] \quad \text{and} \quad \max_q[v + q + a\Big(\frac{1 - \delta_F}{\delta_F} m(q)\Big) - \bar{P}(q)].$$

The first order conditions are:

$$1 - \bar{P}'(q) = 0 \Leftrightarrow 1 = \frac{m'(q)}{\delta_F} \Leftrightarrow \delta_F = \frac{1}{q'(m)}$$

$$\text{and } 1 + \frac{1 - \delta_F}{\delta_F} a'(\pi) m'(q) - \frac{m'(q)}{\delta_F} = 0 \Leftrightarrow 1 + \frac{1 - \delta_F}{\delta_F} a'(\pi) \frac{1}{q'(m)} - \frac{1}{\delta_F q'(m)} = 0$$

Replacement of $q'(m)$ with $-c'(m)$ makes the above two equations identical to the first order conditions of altruistic and non-altruistic consumer, (8) and (9).

A.3 Altruism Component of Consumer's Utility

The assumption of $a'(\cdot) \leq 1$ is stringent; it requires us to build a model in which the altruistic consumer buys fair trade coffee, even though he would not make a direct donation to the farmer. Although the altruistic consumer may have a marginal utility of giving that is larger than unity ($a'(\cdot) > 1$), the assumption that $a'(\cdot) \leq 1$ is without loss of generality. We show this in two ways.

A.3.1 Residual willingness to donate

We define $u(z)$ as the value a consumer places on making a gift of z to the farmer. Assume $u' > 0$, $u'' < 0$, and $\lim_{z\to\infty} u'(z) < 1$: the marginal return to such gifts is positive, decreasing in the gifts, and less than the marginal cost of donation for large gifts.

We assume a "costless" technology (e.g., a charity) for transferring donations to farmers, so that a donor who wants to give z to the farmer can do so at cost $c(z) = z$.[24] Thus, $u'(z) = c'(z)$ determines the optimal donation amount. If no such positive z exists, $z = 0$ (no donation) is the optimal solution. Define $a(x) = u(x + z) - u(z)$. Function $a(x)$ is the "residual" willingness to pay for the fair trade attribute (assuming separability and no income effect).

In reality, the consumer will choose the optimal bundle of the donation, fair trade coffee, and other commodities simultaneously. However, the consumption of fair trade coffee will be only a small fraction of the entire bundle. Thus consideration of the consumer's residual altruism (i.e., assuming $a'(\cdot) \leq 1$) is a reasonable approximation.

A.3.2 Simultaneous decision

Again, $u(z)$ is the value a consumer places on making a gift of z to the farmer. We do not need to assume, as in the previous section, that the decision over direct donations precedes the decision whether to buy the fair trade product. Because the consumer can make a direct donation at unit price (i.e., a costless technology for transferring money to farmers), the consumer is willing to pay

[24] We could generalize this to a case where $c(z) = (1 - t)(1 + k)z$, where t is the consumers' marginal tax rate (if a consumer itemizes tax-deductions), and k represents the fees associated with transferring such a donation. Furthermore, we could imagine other charitable donations are close substitutes, perhaps valued more highly than gifts to farmers.

at most x to increase the farmer's income by x. Thus, the willingness to pay for x is

$$a(x) = \min(u(x), x).$$

Thus $a'(x) \leq 1$ is derived from the above.

This yields a very strong result. Because of the agency problem, passing money through FT is more efficient than giving directly to the farmers. This would imply that a very altruistic consumer (e.g., for an extreme example if $a'(\$10,000) = 1$) would channel all her generosity through FT, (buying a single very expensive bag of coffee). However, as the price the farmer receives increases, the marginal impact on the agency problem becomes minimal. Thus, if a highly altruistic consumer gets even slightly more utility from money going to a charitable cause (e.g., because this help those in the most dire poverty, rather than only coffee farmers) then she will buy FT coffee and also make a donation. Furthermore, it is unlikely that there are many consumers who care about coffee farmers to such an great extent to make such an extremely "generous" product commercially viable.

A.4 Characterization of an equilibrium

Let m_{EF} satisfy $1 = -c'(m_{EF})$; this defines the first best level of investment since the marginal cost of the investment is equivalent to the marginal benefit, i.e., the marginal reduction of processing cost. Let $\pi_{EF} := \frac{1-\delta_F}{\delta_F} m_{EF}$. For given π, if the incentive compatibility constraint (2) does not bind, the optimal investment is $m(\pi) = m_{EF}$. Since $1 + c'(m) < 0$ for an investment $m < m_{EF}$, we conclude

$$m(\pi) = \min\left\{m_{EF}, \frac{\delta_F}{1-\delta_F}\pi\right\}$$

Note the incentive compatibility constraint, $m \leq \frac{\delta_F}{1-\delta_F}\pi$. For a given farmer's profit π, if $\pi \leq \pi_{EF}$ then the roaster wants to increase investment m until the incentive compatibility constraint binds.

We derive the profit function of the roaster supplying coffee(π):

$$\Pi_R(\pi) = \begin{cases} P(\pi) - \frac{\pi}{1-\delta_F} - c\left(\frac{\delta_F}{1-\delta_F}\pi\right) & \text{if } \pi \text{ is such that } \ m(\pi) = \frac{\delta_F}{1-\delta_F}\pi, \ \text{ i.e., } \ \pi < \pi_{EF} \\ P(\pi) - (\pi + m_{EF}) - c(m_{EF}) & \text{if } \pi \text{ is such that } \ m(\pi) = m_{EF}, \ \text{ i.e., } \ \pi \geq \pi_{EF} \end{cases}$$

Since roasters are perfectly competitive each roaster earns zero profit, i.e.,

$$P(\pi) = \begin{cases} \frac{\pi}{1-\delta_F} + c\left(\frac{\delta_F}{1-\delta_F}\pi\right) & \text{if } \pi < \pi_{EF}, \\ (\pi + m_{EF}) + c(m_{EF}) & \text{if } \pi \geq \pi_{EF}. \end{cases} \tag{5}$$

Given the price in (5), the altruistic consumer's problem is:

$$\pi_A^C = \begin{cases} \underset{\pi}{\text{argmax}}[v + a(\pi) - \frac{\pi}{1-\delta_F} - c\big(\frac{\delta_F}{1-\delta_F}\pi\big)] & \text{if } \pi < \pi_{EF}, \\ \underset{\pi}{\text{argmax}}[v + a(\pi) - (\pi + m_{EF}) - c(m_{EF})] & \text{if } \pi \geq \pi_{EF}. \end{cases}$$

But note that $\frac{d}{d\pi}[v + a(\pi) - (\pi + m_{EF}) - c(m_{EF})] = a'(\pi) - 1 < 0$. In other words, $\pi \geq \pi_{EF}$ cannot be an optimum. I.e., coffee(π) is never produced in equilibrium for $\pi \geq \pi_{EF}$. Thus, it is enough to consider only the case of $\pi < \pi_{EF}$, i.e.,

$$\pi_A^C = \underset{\pi}{\text{argmax}}[v + a(\pi) - \frac{\pi}{1-\delta_F} - c\Big(\frac{\delta_F}{1-\delta_F}\pi\Big)]. \tag{6}$$

For the non-altruistic consumer, we can derive a similar result,

$$\pi_0^C = \underset{\pi}{\text{argmax}}[v - \frac{\pi}{1-\delta_F} - c\Big(\frac{\delta_F}{1-\delta_F}\pi\Big)]. \tag{7}$$

The first order conditions of (6) and (7) are:

$$(1-\delta_F)a'(\pi_A) + \delta_F\Big(-c'\Big(\frac{\delta_F}{1-\delta_F}\pi_A\Big)\Big) \leq 1 \text{ and equality holds if } \pi_A > 0, \tag{8}$$

$$\delta_F\Big(-c'\Big(\frac{\delta_F}{1-\delta_F}\pi_0\Big)\Big) \leq 1 \text{ and equality holds if } \pi_0 > 0, \tag{9}$$

For each of these to have an interior solution of $\pi_0 > 0$ and $\pi_A > 0$, the Condition 1 and Condition 2 are trivially required.

Proof of Corollary 1: Since $a'(\pi) > 0$, we trivially derive the first result from the two first order conditions. $P(\pi) = \frac{\pi}{1-\delta_F} + c\left(\frac{\delta_F}{1-\delta_F}\pi\right)$ within a relevant range of $\frac{\delta_F}{1-\delta_F}\pi < m_{EF}$. The first derivative of the price is $P'(\pi) = \frac{1}{1-\delta_F} + \frac{\delta_F}{1-\delta_F}c'\left(\frac{\delta_F}{1-\delta_F}\pi\right) > 0$. Thus the price increases in π. □

A.5 Comparative statics with respect to δ

We re-write the first order conditions (8) and (9) as:

$$(1-\delta)a'(\frac{1-\delta_F}{\delta_F}m_A) + \delta\left(-c'(m_A)\right) = 1\ , \quad \delta\left(-c'(m_0)\right) = 1.$$

The first equation is for FT coffee, and the second one is for non-FT coffee.

Totally differentiating them with respect to m_A, m_0, and δ_F, we get:

$$d\delta_F \left[a'(\cdot) + c'(\cdot) - (1-\delta_F)a''(\cdot) \left[-\frac{n_A}{\delta_F} + \frac{1-\delta_F}{\delta_F^2} m_A \right] \right] = dm_A \left[(1-\delta_F)\frac{1-\delta_F}{\delta_F} a''(\cdot) - \delta_F c''(\cdot) \right],$$

$$d\delta_F \left[-c'(\cdot) \left[-\frac{m_0}{\delta_F} + \frac{1-\delta_F}{\delta_F^2} m_0 \right] \right] + dm_0 \left[-\delta_F c''(\cdot) \right] = 0$$

Thus we get:

$$\frac{dm_A}{d\delta_F} = \frac{a'(\cdot) + c'(\cdot) + (1-\delta_F)a''(\cdot)\left[\frac{m_A}{\delta_F^2}\right]}{\frac{(1-\delta)_F^2}{\delta_F} a''(\cdot) - \delta_F c''(\cdot)}, \quad \frac{dm_A}{d\delta_F} = \frac{c'(\cdot)}{-\delta_F c''(\cdot)}.$$

Since $c(m) < -1$ for $m < m_{EF}$ and $a'(\cdot) \leq 1$, we derive $a'(\cdot) + c'(\cdot) < 0$. Thus both $\frac{dm_A}{d\delta_F}$ and $\frac{dm_0}{d\delta_F}$ are positive because $a''(\cdot) < 0$, $c'(\cdot) < 0$, and $c''(\cdot) > 0$.

A.6 Monopolistic retailer

In this section we assume that the roaster is a monopolist. The incentive compatibility condition for the farmer is identical, i.e., $m \leq \delta_F(\pi + m)$. For a given farmer's profit π, the monopolistic roaster wants to maximize investment m. Thus, the incentive compatibility constraint is binding. Note $\pi + m = \frac{m}{\delta_F}$ and $m = \frac{\delta_F}{1-\delta_F}\pi$ under the binding incentive compatibility constraint. Thus, the monopolist's objective function is:

$$\max_{P(\pi_A), P(\pi_0), m_0, m_A} \left[P(\pi_0) - \frac{m_0}{\delta_F} - c(m_0) \right] + \left[P(\pi_A) - \frac{m_A}{\delta_F} - c(m_A) \right]$$

In order to price-discriminate, the monopolist needs to make sure that altruistic consumers do not have an incentive to purchase non-fair trade coffee, and the non-altruistic consumer does not purchase fair trade coffee., i.e.,

$$v + a(\pi_A) - P(\pi_A) \geq v + a(\pi_0) - P(\pi_0), \tag{10}$$

$$v - P(\pi_0) \geq v - P(\pi_A). \tag{11}$$

We also need to impose individual rationality constraints:

$$v + a(\pi_A) - P(\pi_A) \geq 0, \tag{12}$$

$$v - P(\pi_0) \geq 0. \tag{13}$$

In other words, the monopolist must set prices low enough so that consumers actually purchase coffee. These constraints were not required in the previous model: all we had to assume was that the consumers' valuation of coffee was larger than the cost of production, and perfect competition among roasters drove the price down to the cost of production. However, when the monopolistic roaster has ability to set prices, the monopolist needs to explicitly consider these incentive compatibility and individual rationality constraints.

Note that constraint (10) implies constraint (12) as long as $\pi_A \geq \pi_0$. We will verify $\pi_A > \pi_0$ later, so that we can ignore constraint (12). In other words, the individual rationality constraint for the altruistic consumer is not binding.

We can write the three remaining constraints as follows:

$$[a(\pi_A) - a(\pi_0)] + v \geq [a(\pi_A) - a(\pi_0)] + P(\pi_0) \geq P(\pi_A) \geq P(\pi_0)$$

where the first inequality comes from constraint (13), the second from constraint (10), and the third from constraint (11). For given π_A and π_A, the monopolist wants to increase $P(\pi_A)$ and $P(\pi_0)$ as much as she can. From the first inequality, we derive $P(\pi_0) = v$. From the second inequality, we derive $P(\pi_0) = v + [a(\pi_A) - a(\pi_0)]$. In other words, the roaster extracts all the consumer surplus from the non-altruistic consumer, but leaves some consumer surplus for the altruistic consumer. This surplus is necessary to prevent the altruists from mimicking non-altruists.

As long as $\pi_A > \pi_0$ (which we will verify later), the last constraint does not bind. In other words, the incentive compatibility constraint for the non-altruistic consumer does not bind.

Plugging these optimal prices into the monopolist's objective function, we derive

$$\max_{m_0 \geq 0, m_A \geq 0} \left[v - \frac{m_0}{\delta_F} - c(m_0) \right] + \left[v + [a(\pi_A) - a(\pi_0)] - \frac{m_A}{\delta_F} - c(m_A) \right].$$

Kuhn-Tucker conditions for this maximization problem are:

$$(1-\delta_F)a'(\frac{1-\delta_F}{\delta_F}m_A^*) - \delta_F c'(m_A^*) \leq 1, \quad \text{equality if} \quad m_A^* > 0 \tag{14}$$

$$\text{and} \quad -(1-\delta_F)a'(\frac{1-\delta_F}{\delta_F}m_0^*) - \delta_F c'(m_0^*) \leq 1, \quad \text{equality if} \quad m_0^* > 0. \tag{15}$$

The second order conditions are:

$$\frac{(1-\delta_F)^2}{\delta_F}a''(\frac{1-\delta_F}{\delta_F}m_A^*) - \delta_F c''(m_A^*) < 0,$$

$$\det \begin{pmatrix} \frac{(1-\delta_F)^2}{\delta_F}a''(\frac{1-\delta_F}{\delta_F}m_A^*) - \delta_F c''(m_A^*) & 0 \\ 0 & -\frac{(1-\delta_F)^2}{\delta_F}a''(\frac{1-\delta_F}{\delta_F}m_0^*) - \delta_F c''(m_0^*) \end{pmatrix} > 0$$

Note $\frac{(1-\delta_F)^2}{\delta_F}a''(\frac{1-\delta_F}{\delta_F}m_A^*) - \delta_F c''(m_A^*) < 0$ by the assumption of $a'' < 0$ and $c'' > 0$. Thus, we only need the following condition for the second order conditions to hold:

$$-\frac{(1-\delta_F)^2}{\delta_F}a''(\frac{1-\delta_F}{\delta_F}m_0^*) - \delta_F c''(m_0^*) < 0. \tag{16}$$

This constraint means that as the farmer's profit and investment increase, the marginal value of farmer profit to the altruistic consumer declines more slowly (by a certain magnitude) than the marginal cost-saving value of the corresponding increase in investment. For global concavity of the monopolist's objective function, we assume the following.

Assumption 1.

$$-\frac{(1-\delta_F)^2}{\delta_F}a''(\frac{1-\delta_F}{\delta_F}m_0) - \delta_F c''(m_0) < 0, \forall m_0 \geq 0. \tag{17}$$

We discuss the case where Condition (17) is not satisfied at the end of this appendix.

We need additional conditions to have interior solutions for $m_0^* > 0$ and $m_A^* > 0$.

Condition 3. $-(1-\delta_F)a'(0) - \delta_F c'(0) > 1$.

We re-state Condition 2 for the sake of convenience.

Condition 2. $(1-\delta_F)a'(0) - \delta_F c'(0) > 1$.

We derive the following proposition trivially.

Proposition 7. *(i) $m_0^* > 0$ (hence, $\pi_0^* > 0$) if and only if Condition 3 holds.*

(ii) $m_A^* > 0$ (hence, $\pi_A^* > 0$) if and only if Condition 2 holds.

Proof. Proofs follow directly from Kuhn-Tucker conditions (14) and (15). □

Similarly to the previous model, we derive the following to verify $\pi_A^* > \pi_0^*$:

Corollary 2. *In general, we derive* $\pi_A \geq \pi_0$ *and* $P(\pi_A) = v + (a(\pi_A^*) - a(\pi_0^*)) > P(\pi_0) = v$. *Under Condition 2, (i)* $\pi_A^* > \pi_0^*$, $m_A^* > m_0^*$, *and* $P(\pi_A) > P(\pi_0)$.

Proof. Proofs follow directly from Kuhn-Tucker conditions (14) and (15). □

Corollary 3. *In general,* $P(\pi_A^*) - P(\pi_0^*) \leq \pi_A^* - \pi_0^*$. *Under Condition 2,* $P(\pi_A^*) - P(\pi_0^*) < \pi_A^* - \pi_0^*$.

Proof. $P(\pi_A^*) - P(\pi_0^*) = a(\pi_A^*) - a(\pi_0^*) < \pi_A^* - \pi_0^*$ by the strict concavity of $a(\cdot)$ and $a'(\cdot) \leq 1$. □

As in the comparative statics of Section 2.3, we can parameterize altruism through β by re-defining altruism component as $\beta a(\cdot)$.

Since the first order condition determining m_A^* (equation (14)) is identical to that in the previous model, we also derive the following proposition identical to Proposition 3.

Proposition 8. *Under Condition 1a,*

$$\frac{d\pi_A^*}{d\beta} > 0 \quad \textit{and} \quad \frac{dm_A^*}{d\beta} > 0.$$

However, there is a crucial difference between the previous model and the monopolistic model: m_0^* is also affected by altruism. The price discriminating monopolist has an incentive to reduce π_0 (implying a reduction in m_0^*) to discourage altruists from buying non-FT coffee. This is shown in equation (15), where the determination of m_0^* is influenced by altruism component $a(\cdot)$.

To be more specific, by total-differentiating equation (15) where $a(\cdot)$ was replaced with $\beta a(\cdot)$, we derive:

$$\frac{d\pi_0^*}{d\beta} = \frac{a'}{-\beta a'' - \left(\frac{\delta_F}{1-\delta_F}\right)^2 c''} \quad \text{and} \quad \frac{dm_0^*}{d\beta} = \frac{\delta_F}{1-\delta_F}\frac{d\pi_0^*}{d\beta}.$$

The sign of both is negative under Assumption 1. In summary, the increase in altruism decreases efficiency for the production of regular coffee. As a result of this, the investment for regular coffee will be reduced by the introduction of fair trade coffee, as shown below.

Proposition 9. $m_0^* < m^* < m_A^*$ *where* m^* *satisfies* $\frac{1}{\delta_F} = -c'(m^*)$.

Proof. Proofs follow directly from Kuhn-Tucker conditions (14) and (15). □

Regular coffee is produced at an inefficient level since $\frac{1}{\delta_F} < -c'(m_0^*)$. In other words, more efficient cost reduction (by investing more) is possible. However, this cost reduction is being deterred because the corresponding increase in farmer profit makes the regular coffee more attractive to altruists, tightening their incentive compatibility constraint and increasing the surplus they must be paid; i.e., limiting price discrimination.

A.6.1 Violation of Assumption 1

Suppose that Assumption 1 is violated and that inequality (17) is reversed, i.e.,

$$-\frac{(1-\delta_F)^2}{\delta_F}a''(\frac{1-\delta_F}{\delta_F}m_0) - \delta_F c''(m_0) > 0, \forall m_0 \geq 0. \tag{18}$$

In other words, we now suppose that the marginal altruism decreases faster in investment (by a certain magnitude) than the investment's marginal return on the cost reduction decreases in investment. In this case, as we have already mentioned, the second order conditions are not satisfied. More precisely, the first order condition for (m_0^*, m_A^*) is satisfied at a saddle point. Also note $\frac{(1-\delta_F)^2}{\delta_F}a''(\frac{1-\delta_F}{\delta_F}m_A^*) - \delta_F c''(m_A^*) < 0$ is still true. Thus, the optimal (corner-) solution is at $(m_0 = 0, m_A = m_A^*)$ or at $(m_0 = \infty, m_A = m_A^*)$.

Mathematically speaking, $(m_0 = \infty, m_A = m_A^*)$ is not an impossible solution under our assumption that $c'' > 0$ and $a'' < 0$. However, this is clearly not a sensible solution in that it implies that the roaster will pay an infinite amount of money to farmers. Under the reasonable assumption that the (altruistic and cost-reducing) benefit of the investment would be lower than the cost of the investment for such a large investment, this case can be ruled out.

Finally, for the optimal $(m_0 = 0, m_A = m_A^*)$, our results are still valid except that

$$\frac{\partial m_0^*}{\partial \beta} = \frac{\partial \pi_0^*}{\partial \beta} = 0.$$