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Fair Trade Contracts for Some, an Insurance for Others*

Claire Chambolle †‡§ and Sylvaine Poret †‡

Abstract

This article analyzes the impact of Fair Trade contracts between sub-groups of farmers and a Fair Trade organization on the spot market price. We analyze a three level vertical chain gathering perfectly competitive farmers upstream who offer their raw product on a spot market to manufacturers who then sell finished products to a downstream retailer. Absent Fair Trade, the entire raw product is sold on the spot market. When a Fair Trade organization offers a Fair Trade contract to a sub-group of farmers, it gathers a Guaranteed Minimum Price clause and a straight relationship between the sub-group of farmers and the retailer. This article highlights several conditions such that a snowball effect exists, i.e farmers outside of the Fair Trade contract also benefit from a higher spot market price.

Keywords: Guaranteed Minimum Price Contracts, Disintermediation, Fair Trade, Vertical Chain, Two-part Tariff Contracts.

JEL classification: D21, L11, O12.

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1 Introduction

Fair Trade is usually defined as an alternative to the traditional trade (Renard, 2003; Moore, 2004). Its purpose is to fight against poverty setting a trade channel enabling small producers from the South to have access to markets of the northern countries. To facilitate the entry of Fair Trade products into conventional markets, a label was created in 1988 in Netherlands, Max Havelaar, the current Fairtrade Labelling Organizations (FLO) system. Its specificity is that its criteria cover both production and trade conditions. Indeed, the FLO label gathers organizations who offer a Guaranteed Minimum Price (henceforth denoted GMP) contract to small farmers and attempts to reduce the intermediaries between producers and consumers (Raynolds, 2000). Today, most of the farmers involved in the Fair Trade market sell only a small part of their production through the Fair Trade channel, around 20% (Renard, 2005) ; the rest is sold on the traditional market at the spot market price.

A criticism against Fair Trade is that only some farmers can benefit of the concept and the GMP, perhaps at the expense of other small farmers. Potts (2007) argues that given attractive conditions offered to farmers on the Fair Trade channel, these latter can expand production to take advantage of Fair Trade and spot markets. This may induce an increase in global aggregate production and then a reduced spot market price (see also Booth and Whetstone (2007)).

However, Bowen (2001) notes that: "*Most producers only sell a small part of their total production to the Fair Trade market. The rest is sold under the usual conditions to the mainstream market. However, by paying a fair price for even a small part of production, there is often a snowball effect on prices paid for the rest of production. As Alternative Trading Organizations buy up part of production at a higher price, this reduces the availability of products to middlemen who are then forced to offer higher prices to obtain sufficient quantities. This effect has been experienced in the case of honey sales in Chiapas in Mexico, Brazil nuts in Peru, cocoa in Bolivia, tea in Zimbabwe etc. This means that not only is it possible for producers who are lucky enough to have made contact with Fair Trade outlets to sell all their production at better prices, but other producers in the region, often equally marginalized, benefit also.*" (Bowen, 2001, p.31). This paragraph of the European Fair Trade Association yearbook perfectly exposes the main insight of this article. The balance of power being unfavorable to small farmers, Fair Trade clearly appears as an insurance against the risk of overproduction threatening their revenue. Fair Trade contracts thus sustain the price level for small farmers of a Fair Trade organization, but by diverting part of the production from the traditional market and by the disintermediation effect, this insurance may also have side effects on the spot market equilibrium. The goal of this article is to bring theoretical grounds to the question: can Fair Trade contribute to improving the situation of all the small producers through a snowball effect?

This report was not clearly established in the coffee market case, where chronical overproduction exists. Spot market prices for coffee are regularly decreasing at the New-York stock exchange since the suppression of the International Coffee Organization (ICO) agreements on export quotas, apart from 1994 and 1997 when the harvest were unusually low because of the frost on Brazilian crops. In particular, between December 2000 and May 2004, the monthly averages of ICO indicator prices for a Colombian mild arabica varied from 58,10 to 78,25 US cents per lb, whereas costs of production were estimated between 60 and 80 US cents per lb (source: Web site of the ICO). Beside, there is a strong unbalance of power between a large number of small farmers and a few large roasters. Five biggest roasters of the market buy almost half of the green coffee beans world production: Kraft (13%), Nestlé (13%), Sara Lee (10%), Procter&Gamble (4%), Tchibo (4%) (Oxfam, 2002). We thus choose the coffee market as illustrative example for the market structure.

The GMP contracts were used in agricultural sector to guarantee the farmers some income security at a global or national level, for instance, the Australian Wheat Board's GMP scheme (Fraser, 1988). But our purpose is to study this kind of contract in another context, when it is offered in a parallel channel. In other words, in many sectors, both contract and spot markets co-exist in the sense that some of the market output is procured through contracts, while some is procured through conventional spot exchange. One reason to favor contract marketing is that the contract enables the buyer and seller to specify various attributes of the product and price.

Several articles of industrial organization theory study the influence of contracts between subgroups of producers and retailers on the spot market price and they highlight contracts by which buyers can exploit market power (Love and Burton, 1999; Xia and Sexton, 2004). These articles usually differ according to the type of contract considered or to the market structure at each level. In general, as these contracts affect both the offer and the demand, their effect on the spot market price is ambiguous. Xia and Sexton (2004) focus on the cattle market and show that Top-Of-the-Market-Pricing (TOMP) contracts between cattle sellers and packers may refrain buyers from competing aggressively. TOMP clauses specify that a cattle producer will deliver a given quantity to the buyer at a base price set at the highest spot market price paid for cattle during a comparison period. In their paper sellers are price-takers while buyers are competing imperfectly and behave strategically. However, buyers have no market power on the final market and sell at a given price. In their model, a group of sellers accepts the TOMP contracts from buyers and these clauses enable buyers to commit not to competing too aggressively with each other which relaxes competition, reduces quantities and finally lowers the spot market price.

There is also a large literature, mainly applied to electricity market, dealing with forward market contracts and their impact on the spot market. Contrary to our paper, this strand of literature focuses on oligopolistic market structure at the upstream level: sellers compete imperfectly and thus act strategically.[1] Other papers studies the right of first offer, a contract clause preventing a seller from selling his asset to subsequent buyers at a price below the price he offers to the contracted buyer. Once again this literature rather focuses on markets where both sellers and buyers have market power and act strategically (See Hua (2007)). Finally, Potts (2007) notes that there is little theoretical or empirical analysis to shed light on price impacts of private voluntary sustainability standards initiatives such as Fair Trade.

We focus on the coffee market, a key product for Fair Trade and analyze the effect of the development of a Fair Trade channel who offers both a GMP contract to part of the farmers and cuts out an intermediary.[2] We distinguish three main actors: Perfectly competitive farmers of green coffee at the upstream level, an oligopoly of roasters who transform and produce the finish coffee at the intermediary level, and a downstream monopsonist retailer who sells coffee to consumers.

This article first examines the case where manufacturers offer two-part tariff contracts to the retailer. In that framework, we first determine, as a benchmark, the spot market price among roasters and green coffee farmers taking into account the strategic interactions among the three levels of the channel. We then introduce a Fair Trade channel who offers small upstream farmers a GMP clause as an insurance in the bad state of nature, i.e, in case of overproduction. We then study the effects of the introduction of this channel on the spot market price. In this framework, the introduction of a Fair Trade channel boils down to a GMP clause offered to Fair Trade farmers and to the sale of an additional product by the retailer. We first show that there is a snowball effect

[1] In this framework, it has been argued that having a contract market before the spot market enhances competition on the latter market (Allaz and Vila, 1993).

[2] The coffee industry is more complex than the vertical industry analyzed by Xia and Sexton (2004).

which comes from a raise in the market size due to the sale of an additional product to consumers.

We then turn to a framework where manufacturers rather set linear contracts to the retailer. In that framework, the introduction of a Fair Trade channel is also a disintermediation process, as the green coffee is no more transformed by the powerful roasters but by non strategic roasters acknowledged by the Fair Trade label. Indeed, if manufacturers take their own margin when they set their unit price to the retailer, the Fair Trade Organization just transfers the GMP price from the retailer to the Fair Trade farmers. Again we show that there exists a snowball effect which comes from the disintermediation effect.

Our results confirm the report of Fair Trade Organizations (Bowen, 2001) thus showing that small farmers not directly involved in Fair Trade may also benefit from it, and our model suggests that the snowball effect may come from (i) the introduction of an additional product on the retailers' shelves which increases consumers' demand and (ii) the disintermediation process.

This paper proceeds as follows. In the next section, we lay down the assumptions of the model. In Section 3 we describe the equilibrium in our benchmark game, absent Fair Trade. Section 4 derives the equilibrium with Fair Trade and compare our results to the benchmark game. In Section 5, we analyze a model where manufacturers set linear tariff contracts to the retailer. Section 6 concludes.

2 The Model

2.1 The market structure

We analyze a three level vertical chain gathering farmers, manufacturers and a retailer. At the upstream level, farmers are perfectly competitive and offer their raw product to manufacturers. We normalize their production cost to zero. In the processing industry, manufacturers constitute an oligopoly of size n (with $n \geq 2$) and they sell their finished product to a downstream monopsonist retailer who sells the goods to consumers. Their cost is limited to their supply in input in the spot market, all other production costs being normalized to zero. We consider that the retailer is a monopsonist in order to reflect the high concentration in the retail sector. Again retail costs are normalized to zero.[3] In the Fair Trade channel, farmers sell directly to the retailer, who can sell the Fair Trade product, as well as the n national brands, if profitable. This framework aims at stylizing the main characteristics of the coffee industry. Upstream farmers are then coffee green beans producers, manufacturers who hold the national brands are those who transform beans into ready-to-drink beverage for consumers (in general roast, instant or decaffeinated coffee). An oligopoly is also a good representation of manufacturers in the coffee processing industry.

2.2 The demand

The consumers may differ in their product preferences.

Let assume that there are $n + 1$ potential coffee brands offered in the market, among which $i = 1, ..., n$ are national brands and $i = n + 1 = f$ is a Fair Trade product. When all the potential products are offered by the retailer to the representative consumer, the latter's utility function is:

$$U(q_1, \dots, q_i, \dots, q_n, q_f) = v \sum_{i=1}^{n+1} q_i - \frac{(n+1)}{2} \left((1-\beta) \sum_{i=1}^{n+1} q_i^2 + \frac{\beta}{(n+1)} \left(\sum_{i=1}^{n+1} q_i \right)^2 \right), \qquad (1)$$

where $v > 0$ is a measure of the market size and q_i is the quantity of product i sold by the retailer. The parameter $\beta \in [0, 1]$ is a measure for product differentiation: The higher β, the closer the products are substitutes. We do not introduce any specific difference between consumers' preferences about the possible Fair Trade characteristic of the product.[4]

This formulation due to Shubik-Levitan (1980) ensures that the parameter β only captures product differentiation and has no effect on aggregate demand. Thus, the merit of using this particular utility function is that the size of the market does not vary with β.[5]

In (1), we assumed that the retailer offers all the existing products to the consumers. However, the retailer may choose to offer only part of the existing varieties of products to the consumers. Then, following the note by Höffler (2008) the representative consumer's utility function is as follows:

[3] A recent paper analyzed a similar vertical industry framework, see Bontems and Bouamra-Mechemache (2005). They mention that empirically, this framework is consistent with available studies of market structure in the food industry both in Europe and US.

[4] See Poret and Chambolle (2007) for an analysis of this question.

[5] See Vives (2001) and Motta (2004) for details.

- If products $i = m+1, \ldots, n+1$ are not sold by the retailer, which means the retailer does not sell the Fair Trade product nor the $i = m+1, \ldots, n$ national coffee brands, the representative consumer utility function is:

$$U(q_1, \ldots, q_i, \ldots, q_m) = v \sum_{i=1}^{m} q_i - \frac{(n+1)}{2} \left((1-\beta) \sum_{i=1}^{m} q_i^2 + \frac{\beta}{(n+1)} \left(\sum_{i=1}^{m} q_i \right)^2 \right), \quad (2)$$

- If products $i = m+1, \ldots, n$ are not sold by the retailer, which means the retailer does not sell the $i = m+1, \ldots, n$ national coffee brands, the representative consumer utility function is:

$$U(q_1, \ldots, q_m, q_f) = v \left(\sum_{i=1}^{m} q_i + q_f \right) - \frac{(n+1)}{2} \left((1-\beta) \left(\sum_{i=1}^{m} q_i^2 + q_f^2 \right) + \frac{\beta}{(n+1)} \left(\sum_{i=1}^{m} q_i + q_f \right)^2 \right), \quad (3)$$

Let p_k be the price charged by the retailer for the product k. In the general case when only $i = 1, \ldots, m$ brands are offered by the retailer,we solve $\partial U / \partial q_k = p_k$ for $k = 1, \ldots, m$, and obtain the following demand function:

$$q_k = \frac{v(n+1)(1-\beta) - \gamma p_k + \beta \sum_{i=1}^{m} p_i}{\gamma(n+1)(1-\beta)} \quad (4)$$

with $\gamma = (n+1)(1-\beta) + m\beta$. When only m products are offered among the $n+1$ existing products, the aggregated demand now depends on the differentiation parameter β. Indeed, the stronger the differentiation among products, the stronger the drop on total consumers' demand when one product is missing. Moreover, the lower the number m of products offered relatively to the $n+1$ existing products, the lower the total aggregated demand.

2.3 The Game

We analyze successively two cases: absent and with the Fair Trade channel. Absent Fair Trade channel the game is the following:

- Stage 1: Farmers incur their production cost (normalized to zero) and then the level of the harvest is revealed. $\widetilde{R}$ is a uniform distributed random variable: $\widetilde{R} \rightsquigarrow U_{[0,\frac{v}{2}]}$. We assume that the range of potential values for the harvest is $R \in [0, \frac{v}{2}]$, thus the average harvest is $\overline{R} = \frac{v}{4}$.[6]

[6]This assumption is justified further, in the resolution of the game with Fair Trade.

- Stage 2: Offer and demand determine the spot market price for the raw product c.
- Stage 3: The n brand manufacturers set their two-part tariff contract (w_k, T_k), with $k \in [1, ..., n]$, maximizing their profit.
- Stage 4: The retailer accepts or refuses each manufacturer's contract and sets her price p_k for each selected brand k on the final market.

We will then analyze the case where there is a Fair Trade product proposed by a Fair Trade organization, a non-profit organization. This Fair Trade product can be carried by the retailer in addition to the previous n coffee brands.[7]

The "Fair Trade game" is identical to the previous game except that we add the following stage "0":

- Stage 0: The Fair Trade certifier sets his price contract P.

We assume the Fair Trade certifier chooses the guaranteed minimum price G that maximizes the revenue of the farmers involved in the Fair Trade and that the Fair Trade price P can not be lower than the spot market price.[8] Thus, the Fair Trade wholesale price is defined as follows:

$$P = Max\{G, c^f\}, \tag{5}$$

where c^f is the spot market price when there is a Fair Trade channel and G is the GMP. We solve the two games in the next sections.

3 Absent Fair Trade

In stage 4, we assume that the retailer pays w_k per unit of product k bought to manufacturer k and a fix fee T_k. The monopsonist multi-product retailer chooses her prices p_k for the $k \in [1, \ldots, n]$

[7]The alternative would be to assume that the Fair Trade product must replace one of the previous n coffee brands sold by the retailer. However, this boils down to assume that the retailer has a capacity constraint which would dramatically change the balance of power in favor of the retailer: the latter being able to threaten credibly each manufacturer of exclusion, wholesale prices would be driven to the marginal cost of production and the manufacturers would get zero profits.

[8]More details on the certifier objectives are developed in subsection 3.2.

brand products maximizing her profit function:

$$\pi^D = \sum_{k=1}^{n} (p_k - w_k)\, q_k(p_1, \ldots, p_n) - T_k. \tag{6}$$

With the first order conditions, we obtain $p_k(w_k) = \frac{v+w_k}{2} \quad \forall k = 1, \ldots, n$. Let q_k^n denote retailer's demand for product k when she sells the n products given the wholesale prices vector $(w_1, ..., w_n)$.

In the third stage, the k brand manufacturers make their two-part tariff (w_k, T_k) take-it or-leave-it offer to the retailer in order to maximize their profit under the constraint that the retailer prefers to accept the contract k rather than to refuse it. The manufacturer k's profit is equal to

$$\pi_k = (w_k - c)\, q_k^n(w_1, \ldots, w_n) + T_k \tag{7}$$

where c is the price of raw product on the spot market. The retailer participation constraint is:

$$\sum_{i=1}^{n} (p_i(w_i) - w_i)\, q_i^n(w_1, \ldots, w_n) - \sum_{i=1}^{n} T_i \geq \sum_{j \neq k} (p_j(w_j) - w_j)\, q_j^{n-1}(w_1, \ldots, w_n) - \sum_{j \neq k} T_j \tag{8}$$

Binding this constraint allows to obtain the following fix fee:

$$T_k = (p_k(w_k) - w_k)\, q_k^n(w_1, ..., w_n) + \sum_{j \neq k} (p_j(w_j) - w_j)\, q_j^n(w_1, ..., w_n) - \sum_{j \neq k} (p_j(w_j) - w_j)\, q_j^{n-1}(w_1, .., w_n) \tag{9}$$

Replacing (9) into (7), the maximization program boils down to maximize the profit of a retailer vertically integrated with the manufacturer k and thus leads to the equilibrium wholesale price $w_k = c$. By symmetry, we obtain $w_i = c$ for all products $i = 1, \ldots, n$. Replacing into (9), the equilibrium tariff is equal to

$$T_k = \frac{(1-\beta)(n+1)(v-c)^2}{4((n+1)^2 - 3\beta(n+1) + 2\beta^2)} \tag{10}$$

Here the positive rent each manufacturer gets despite of the upstream competition is due to the fact that with this demand, total retailer's profit increases with the number of different brand products in the shelves. A consequence is that the monopolistic retailer always chooses to supply from the greater number of brand suppliers. By assumption there is an oligopoly of n brand manufacturers and they thus all enter the market. Total quantity equilibrium of product bought to the manufacturers is

$$Q = \frac{n(v-c)}{2(n+1-\beta)}. \tag{11}$$

Equalizing total demand to the harvest R, we obtain the following lemma.

Lemma 1. *On a market absent Fair Trade channel with two-part tariff contracts between the* n *manufacturers and the retailer, the equilibrium spot market price is*

$$c^*(R) = v - \frac{2(n+1-\beta)R}{n}. \tag{12}$$

We thus obtain a maximum level for R, $R^{max} = \frac{vn}{2(n+1-\beta)}$ such that if $R \geq R^{max}$ the spot market price is negative $c^*(R) < 0$ and thus there is no market. The equilibrium spot market price absent the Fair Trade channel is increasing in the differentiation parameter, because the total market demand is increasing in β. As we mentioned in section 2.2, if all the $n+1$ products are offered to consumers, total demand would be independent on β. However, here only n products are offered by the retailer and since the Fair Trade product is missing the lower its differentiation with the brand products, the lower the decrease in total consumers demand. Equilibrium outcomes (profits, surplus and welfare) are given in appendix.

4 With Fair Trade

A Fair Trade channel is developed. The retailer can sell the Fair Trade product in addition to the n national brands. This naturally enables her to extend market demand, which increases the total industry profit. However, this Fair Trade product is sold at the unit wholesale price P. The retailer thus has to compare the profit she gets from selling the Fair Trade product to her cost. The resolution of the game is similar to the benchmark case. All the details are given in appendix (A.1). Let denote $q^f(c,P)$ and $q_k^f(c,P)$ the respective equilibrium quantities of Fair Trade product and of a brand product sold to consumers when the spot market price is c and the Fair Trade price is P. The superscript f stands for "Fair Trade" case. Let also define the spot market price when the Fair Trade product is paid at the same level as the brands, c_0^f, which is uniquely defined by the following equality.[9]

$$R - q^f(c_0^f, P)|_{P=c_0^f} = nq_k^f(c_0^f, P)|_{P=c_0^f} \tag{13}$$

Let now turn to the Stage 0 where the Fair Trade certifier chooses the equilibrium GMP, G^*, before the nature chooses R. The Fair Trade certifier may have different objectives.[10] We assume

[9]Note that c_0^f is unique as $q^f(c,P) + nq_k^f(c,P)$ strictly decreases both in P and c.

[10]See Poret and Chambolle (2007) for a discussion about the Fair Trade certifier's objectives.

here that the certifier chooses the GMP in order to maximize the farmers' expected profits under the retailer's participation constraint.

In this case, the Fair Trade certifier's program is the following:

$$\begin{array}{ll} \max\limits_{G} & Gq^f(G,\overline{R}) = \frac{G((2-\beta)v-2G)}{4(n+1)(1-\beta)} \\ \text{s.t.} & \pi^{Df}(G,\overline{R}) \geq \pi^D(\overline{R}) \Leftrightarrow G \leq v - 2\beta\overline{R}. \end{array} \tag{14}$$

There is always an interior solution, $G_1^* = \frac{v(2-\beta)}{4}$. However, as we have assumed that the retailer's participation condition (14) had to be true at the average harvest $\overline{R}$, if R is such that $G_1^* > v - 2\beta R$, i.e. $R > R^{\lim} = \frac{v(2+\beta)}{8\beta}$, with $R^{\lim} < \frac{v}{2}$ when $\beta > \frac{2}{3}$, the retailer does not sell the Fair Trade product. In other words, when $\beta > \frac{2}{3}$ and $R > R^{\lim}$, the quantity of Fair Trade product sold is null and the retailer only sells the brand products offered by the n manufacturers, that is, one is back in the benchmark case.

To guarantee a minimum revenue to farmers involved in Fair Trade channel, the Fair Trade certifier can offer a positive income guarantee clause in addition in the Fair Trade contract, when the parameter of product differentiation is relatively high $\left(\beta > \frac{2}{3}\right)$. In other words, he sets the GMP G such that the participation condition (14) is guaranteed in the worst case of over-production. In that case, let define $G_2^* = (1-\beta)v$ as the GMP binding the participation condition (14) when $R = \frac{v}{2}$.

Thus, we obtain the following lemma:

Lemma 2. *On a market with a Fair Trade channel, with two-part tariff contracts between the n manufacturers and the retailer,*

(i). the equilibrium spot market price is equal to:

$$c^f(R) = \begin{cases} c_0^f(R) = v - 2R & \textit{when } R < R_{0i} \\ c_i^f(R) & \textit{when } R \geq R_{0i}. \end{cases} \tag{15}$$[11]

(ii). the equilibrium GMP G^* is:

$$\begin{cases} G_1^* = \frac{(2-\beta)v}{4} & \textit{when the Fair Trade certifier's objective is the objective 1} \\ G_2^* = (1-\beta)v & \textit{when the Fair Trade certifier's objective is the objective 2} \end{cases}$$

(iii). the equilibrium Fair Trade price is $P^* = Max\{G^*, c_0^f\}$.

Note here that the maximum level of the harvest such that a market exists is $R = \frac{v}{2}$ as it is the condition such that $c_0^f(R) \geq 0$. To focus on the range of values for the harvest in the interval $[0, \frac{v}{2}]$ thus enables to consider the most interesting cases.

We illustrate the comparison of the spot market price equilibrium with and absent Fair Trade on the following figure 1. In the map (R, c), the black line in this figure depicts the spot market price in a market absent Fair Trade c^* and the red curve shows the spot market price when there is a Fair Trade channel c^f. The dashed curve represents the Fair Trade price P^*, the wholesale price paid to producers involved in the Fair Trade certification system.

[Include Figure 1: Spot market prices and Fair Trade price]

Analytical comparison gives the following proposition:

Proposition 1. *With two-part tariff contracts between the manufacturers and the retailer,*

- *when the Fair Trade certifier's objective is to maximize the expected fair tarde farmers profit, the snowball effect appears when $R < R^{lim}$;*
- *when the Fair Trade certifier's objective is to guarantee a positive revenue in the worst state of nature, the snowball effect always appears: the spot market price with a Fair Trade channel is strictly higher than the one absent Fair Trade.*

Proof. See Appendix A.2. □

The general insight for this proposition is as follows.

The introduction of the Fair Trade channel boils down to introduce a new product which increases the global market size. This "market size" effect, by raising global demand on the final market, also raises demand for raw product on the intermediate market and thus raises the equilibrium spot market price. This effect is captured by the difference between c^* and c_0^f. This first effect is not "Fair Trade specific". We would obtain this snowball effect considering any new manufacturer who would enter the market and offer his product to the retailer. Considering that the new product is a Fair Trade product manufactured at a higher unit cost than the spot market price, the unit price for the retailer is thus higher for the Fair Trade good than for the brand products. Thus,

[11] Refer to the Appendix A.2 for the exact values of R_{0i} and c_i^f.

the relative increase of total demand following the introduction of a Fair Trade product is lower than if it was a symmetric manufacturer entering the market and this tends to decrease the snowball effect, $c_i^f \leq c_0^f$ when $R > R_{0i}$. However, this effect still does exist as long as the overproduction is not too strong ($R < R^{\lim}$). Indeed, in that case, the GMP can be too high compared with the spot market price, and thus the Fair Trade product would not be sold by the retailer. Comparing welfare with and absent Fair Trade we obtain the following corollary:

Corollary 1. *The introduction of a Fair Trade channel always improves total welfare.*

Proof. See Appendix A.3. □

The insight for the above corollary is fully explained by the positive "market size" effect we have just described. Comparing profits at each level of the vertical chain, we obtain that farmers and the retailer capture the whole benefit of the introduction of the Fair Trade product to the detriment of manufacturers and consumers. The following table sums up these results.

Effects of introduction of Fair Trade	0 ——— $R^{\lim}$ or $R^{\max}$
Farmers	+
Manufacturers	-
Distributor	+
Consumers	-
Total Welfare	+

Note that manufacturers' profit decreases since the retailer now has one more bargaining alternative with the Fair Trade channel. The existence of the Fair Trade channel thus reduces the weight of each manufacturers in the retailer's profit and thus the equilibrium tariff T_k they are able to extract. As the spot market price for raw product is raised, thanks to the snowball effect, final prices also increase which lowers consumers surplus. However, due to the snowball effect, farmers sell their harvest at a strictly higher spot market price which raises their profit.

To conclude, note that, as mentioned in the introduction, an often put forward benefit from the introduction of a fair-trade channel is the disintermediation. The effect of disintermediation cannot be highlighted in the framework of this model because manufacturers set two-part tariff contracts. Indeed, all the manufacturers set the unit price of their product at the spot market price and thus, on the contrary when the Fair Trade channel realizes a positive margin, setting a GMP higher than the spot market price, it rather looks like a re-intermediation process which tends to reduce the snowball effect. If, on the contrary manufacturers would set wholesale unit price to retailers, the introduction of a Fair Trade channel would naturally create a disintermediation effect, by suppressing the manufacturer level and thus the double-margin effect, and we are then able to exhibit the effect of the disintermediation on the snowball effect. We study this case in the following section.

5 The Linear Contracts Case

In this section, we just replace "two-part tariff" contracts among manufacturers and the retailer by linear tariff contracts. The games absent and with Fair Trade are exactly the same as those previously described. Only one assumption is changed: in Stage 3, the manufacturers now offer take-it or leave-it linear tariff contracts w_k for $k = 1, \dots, n$, where w_k is the unit price as previously. Let now solve the two games absent and with Fair Trade.

In this section, for reading simplicity, we use the same notation than previously.

Whatever the number of varieties m the monopsonist multi-product retailer chooses to sell, i.e. $\forall m \in [1, \dots, n]$, her final prices p_k for the m brand products are set by maximizing her profit function $\pi^D = \sum_{k=1}^{m} (p_k - w_k)\, q_k(p_1, \dots, p_m)$, which gives the following equilibrium prices:

$$p_k(w_k) = \frac{v + w_k}{2}, \quad \forall k = 1, \dots, m. \tag{16}$$

Replacing (16) in (4), we obtain the following quantity sold $q_k(w_1, \dots, w_m) = \frac{1}{2(n+1)(1-\beta)\gamma} \left[(n+1)(1-\beta)v - \gamma w_k + \beta \sum_{i=1}^{m} w_i \right]$ for the k brand products, with $\gamma = (n+1)(1-\beta) + m\beta$. For any symmetric wholesale prices ($w_i = w_j = w$), the retailer's profit is increasing in m, and therefore the retailer is strictly better off in stocking $m = n$ products in her shelves.[12]

Going backward to stage 3, manufacturers set their wholesale price w_k in order to maximize their profit, that is, $\pi_k = (w_k - c)\, q_k(w_1, \dots, w_n)$, where c is the price of raw product on the spot

[12] Retailer's profit is $\pi^D = \frac{m(v-w)^2}{4\gamma}$ which is increasing in m.

market. We obtain the following symmetric equilibrium wholesale price:

$$w_k(c) = \frac{(n+1)(1-\beta)v + (n+1-2\beta)c}{2(n+1) - \beta(n+3)}. \tag{17}$$

We are thus able to determine the total demand on the input market absent Fair Trade:

$$D(c) = \frac{(n+1-2\beta)n(v-c)}{2(n+1-\beta)(2(n+1)-\beta(n+3))}. \tag{18}$$

From stage 1, the level of the harvest is R and thus offer and demand determine the spot market price for raw product. The equilibrium absent Fair Trade is summarized in the following lemma.

Lemma 3. *On a market absent a Fair Trade channel, the equilibrium spot market price for raw product is*

$$c^*(R) = v - \frac{2(n+1-\beta)(2(n+1)-\beta(n+3))R}{n(n+1-2\beta)}. \tag{19}$$

We can note that c^* can be negative for high level of the harvest. However, at the average harvest $\overline{R}$, farmers have a strictly positive expected profit $\left(\overline{R}c^*\left(\overline{R}\right)\right)$, since $c^*\left(\overline{R}\right) > 0$.

With a Fair Trade channel, the resolution of the game is similar to the previous one and is given in Appendix (A.4). Results are presented in the following lemma.

Lemma 4. *On a market with a Fair Trade channel, with linear tariff contracts between the* n *manufacturers and the retailer,*

- *the equilibrium spot market price is then*

$$c^{f*}(R) = \begin{cases} c_0^f(R) & \textit{when } R < R_{0i} \\ c_i^f(R) \quad \textit{for } i = 1 \textit{ or } 2 & \textit{when } R \geq R_{0i}{}^{13} \end{cases} \tag{20}$$

- *the equilibrium guaranteed minimum price* G^* *is*

$$\begin{cases} G_1^* = \frac{(2-\beta)v}{4} & \textit{when the Fair Trade certifier's objective is the objective 1} \\ G_2^* = (1-\beta)v & \textit{when the Fair Trade certifier's objective is the objective 2} \end{cases}$$

- *The equilibrium Fair Trade price is* $P^* = Max\{G^*, c_0^f\}$.

Proof. See Appendix A.4. □

We here compare results obtained when there is a Fair Trade channel with the ones of the benchmark model, in terms of spot market price and farmers' surplus.

[13]The exact values of $c_0^f(R)$, $c_i^f(R)$ and R_{0i} are available in Appendix A.4.

Proposition 2. *With linear tariff contracts between the manufacturers and the retailer, the spot market price with a Fair Trade channel is equal or higher than the one absent Fair Trade.*

Proof. See Appendix A.5. □

[Include Figure 2: Spot market prices and Fair Trade price]

This result means that all farmers' profits are higher with than absent the Fair Trade channel. Figure 2 illustrates this result. We introduce in this figure the spot market price when the product $n+1$ is offered by a new manufacturer, c_{n+1}. The figure 2 shows well that a first snowball effect $c_{n+1} - c^*$ is due to a market size effect just as in the previous model, but a second snowball effect $c^{f*} - c_{n+1}$ called the "disintermediation" effect appears which is due to the disintermediation. The insight is as follows: with Fair Trade, the wholesale price paid by the retailer for the Fair Trade product when $R < R_{0i}$, $P^* = c_0^f$, is lower than the wholesale price paid to manufacturers, w_k^f. Moreover, the final price of the Fair Trade product, p^f, is lower than the final price of each brand product, p_k^f. This increases the demand for the Fair Trade product and reduces the supply in the spot market $(R - q^f(R))$. Thus, the spot market price increases. This "disintermediation" effect disappears when the level of harvest becomes higher than $B_i v$, because the Fair Trade wholesale price P^* is then equal to the GMP and becomes higher than the brand final price p_k^f.

In this case also, we show that the introduction of a Fair Trade channel always improves total welfare. But, comparing surpluses of each type of agents, we obtain here that farmers capture the whole benefit of the introduction of the Fair Trade product to the detriment of manufacturers, the retailer, and consumers. The following table sums up these results.

Effects of introduction of Fair Trade	0 —————— $R^{\lim}$ or $R^{\max}$
Farmers	+
Manufacturers	-
Distributor	-
Consumers	-
Total Welfare	+

Contrary to the previous section, the distributor also looses some profit from the introduction of the fair trade channel. The reason is that manufacturers transfer part of the rise in the spot market price on their wholesale prices. The retailer thus has to face increased cost which lowers his profit.

6 Conclusion

This article is a theoretical contribution to a question surrounding the existence of a Fair Trade channel in the supply chain of a good. A general critics against Fair Trade is that only a few farmers may benefit from a better situation, and, that it is likely that it will also be to the detriment of other small farmers who are excluded from this channel. Some Fair Trade organizations claim that by paying a higher price for a part of the harvest, there is a snowball effect on spot market price paid for the rest of the production in the mainstream market. We have developed two different frameworks where there are positive snowball effects from the introduction of a Fair Trade channel on the spot market price. We proved that the snowball effect may be caused by (i) a market size effect also as (ii) a disintermediation effect. Our conclusions is that all farmers may benefit from the introduction of the Fair Trade product to the detriment of the coffee brand manufacturers and the consumers. This conclusion clearly supports the argument underlined by Bowen (2001).

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A Appendixes

A.1 Results with Two-part Tariff Contracts

In the last stage, equilibrium prices are:

$$\begin{cases} p_k^f &= \frac{v+w_k^f}{2} \quad \forall k = 1, \dots, n \\ p^f &= \frac{v+P}{2} \end{cases} \tag{A1}$$

In the second stage, manufacturer's profit maximization leads to $w_k^f = c$ and

$$T_k^f = (p_k - c)(Q_f^n - q_f^n - Q_f^{n-1} + q_f^{n-1}) + (p_f - P)(q_f^n - q_f^{n-1}), \tag{A2}$$

where Q_f^n denote the total quantity of products sold when there are n brands and a Fair Trade product on the market and q_f^n denote the Fair Trade product quantity when there are also n brands offered by the retailer. We obtain:

$$T_k^f = \frac{(v(n+1) + \beta(P - (n+1)v) - c(1 + n(1-\beta)))^2}{4(1-\beta)(1+n)^2(n+1-\beta)} \tag{A3}$$

This equilibrium tariff is clearly increasing with P. We check that the retailer never has any incentive to sell only the Fair Trade product. Total demand of raw product on the input market is then

$$Q^f = \frac{v(n+1) - P - cn}{2(n+1)}. \tag{A4}$$

The equality between supply and demand determines the following results.

On a market with a Fair Trade channel, the sub-game equilibrium spot market price for raw products c^f depends on the Fair Trade price P.

(i). If $P \leq v - 2\beta R$, the retailer sells the Fair Trade product and the n brands, $c^f(P) = \frac{(v-2R)(n+1)-P}{n}$

$\pi^{Df}(P) = \frac{(v-P)(v-P-2\beta R)}{4(1-\beta)} + \frac{\beta(P-v+2(1+(1-\beta)n)R)(2(n^2+1)R+v-P)}{4n(1-\beta)(n+1-\beta)(n+1)}$.

(ii). If $v - 2\beta R < P$, the retailer sells only all the brand products, $c^f(P, R) = c^*(R)$ and $\pi^{Df} = \pi^D(R)$.

A.2 Proof of Proposition 1

The equilibrium spot market price is thus equal to:

$$c^f(R) = \begin{cases} c_0^f(R) = v - 2R & \text{when } R < R_{0i} \\ c_i^f(R) & \text{when } R \geq R_{0i} \end{cases} \tag{A5}$$

with

- R_0 such that $G^* = c_0^f(R_0) = c_i^f(R_0), \ \forall i = 1, 2.$

$$R_{0i} = B_i v. \tag{A6}$$

  $B_1 = \frac{2+\beta}{8}$ and $\beta < \frac{2}{3}$ and $B_2 = \frac{\beta}{2}$.

- $c_1^f(R) = \begin{cases} c^*(R) & \text{if } \beta > \frac{2}{3} \text{ and } R > R^{\text{lim}} \\ \frac{(4n+2+\beta)v-8(1+n)R}{4n} & \text{otherwise} \end{cases}$

- $c_2^f(R) = \frac{(n+\beta)v-2(1+n)R}{n}$.

It is easy to show that

$$c_0^f(R) \quad > \quad c^*(R) \ \forall R; \tag{A7}$$

$$c_1^f(R) \quad > \quad c^*(R) \quad \text{when } R < R^{\text{lim}}; \tag{A8}$$

$$c_2^f(R) \quad > \quad c^*(R) \quad \text{when } R < \frac{v}{2} \tag{A9}$$

A.3 Results summary with two-part tariff contracts

Absent Fair Trade	0 ——— $R^{\max}$
Farmers	$R(v - \frac{2(n+1-\beta)}{n})$
Manufacturers	$\frac{(n+1)(n+1-\beta)(n+1)R^2}{n(n+1-2\beta)}$
Distributor	$\frac{\beta R^2(n^2-1-\beta(n-1)))}{n(n+1-2\beta)}$
Consumers	$\frac{R^2(n+1-\beta)}{2n}$
Total Welfare	$\frac{R(2nv-(n+1-\beta)R)}{2n}$

With Fair Trade Objective 1	0 ——— R_{01}	——— $\frac{v}{2}$
Farmers	$R(v-2R)$	$\frac{-64R^2(1+(1-\beta)n)+16(2(n+1)-\beta(2n-1))Rv-(2+\beta)^2v^2}{32(1-\beta)n}$
Manufacturers	$\frac{(1-\beta)nR^2}{n+1-\beta}$	$\frac{((2+b)^2v^2-8(1+(1-\beta)n)R)^2}{64(1-\beta)n(n+1-\beta)}$
Distributor	$\frac{(n\beta+1-\beta)R^2}{n+1-\beta}$	$\frac{4nv^2+4\beta(n-1)(16(n+1)R^2-8Rv+v^2)-\beta^2(64n^2R^2-n(v-8R)^2+4v(v-4R))-\beta^3v^3}{64(1-\beta)n(n+1-\beta)}$
Consumers	$\frac{R^2}{2}$	$\frac{64(1+(1-\beta)n)R^2-16(2+\beta)Rv+(2+\beta)^2v^2}{128(1-\beta)n}$
Total Welfare	$\frac{R(2v-R)}{2}$	$\frac{16(2+8n-\beta(8n-1))Rv-(2+\beta)^2v^2-64(1+(1-\beta)n)R^2}{128(1-\beta)n}$

With Fair Trade Objective 2	0 ——— R_{02}	——— $\frac{v}{2}$
Farmers	$R(v-2R)$	$\frac{(2(n-\beta(n-2))-4(1+(1-\beta)n)R^2-b^2v^2)}{2(1-\beta)n}$
Manufacturers	$\frac{(1-\beta)nR^2}{n+1-\beta}$	$\frac{(\beta v-2(1+(1-\beta)n)R)^2}{4(1-\beta)n(n+1-\beta)}$
Distributor	$\frac{(n\beta+1-\beta)R^2}{n+1-\beta}$	$\frac{(v^2\beta(n-\beta)+4\beta(n-1)Rv-4(n-1)(1+(1-\beta)n)R^2)\beta}{4(1-\beta)n(n+1-\beta)}$
Consumers	$\frac{R^2}{2}$	$\frac{\beta^2v^2-4\beta Rv+4(1+(1-\beta)n)R^2}{8(1-\beta)n}$
Total Welfare	$\frac{R(2v-R)}{2}$	$\frac{-\beta^2v^2+4(2n-\beta(2n-1))Rv-4(1+(1-\beta)n)R^2}{8(1-\beta)n}$

A.4 Equilibrium with Fair Trade in case of linear tariff

The global quantity bought by consumers is:

$$Q^f(p_1^f,\ldots,p_n^f,p^f)=\sum_{k=1}^{n}q_k^f+q^f=v-\frac{\sum\limits_{k=1}^{n}p_k^f+p^f}{n+1}, \tag{A10}$$

with $q_k^f(p_1^f,\ldots,p_n^f,p^f)=\frac{1}{n+1}\left(v-\frac{p_k^f}{1-\beta}+\frac{\beta}{1-\beta}\frac{1}{n+1}\left(\sum\limits_{k=1}^{n}p_k^f+p^f\right)\right)$ the quantity sold by the brand k when there is a Fair Trade channel and

$q^f(p_1^f,\ldots,p_n^f,p^f)=\frac{1}{n+1}\left(v-\frac{p^f}{1-\beta}+\frac{\beta}{1-\beta}\frac{1}{n+1}\left(\sum\limits_{k=1}^{n}p_k^f+p^f\right)\right)$ the quantity of Fair Trade product sold.

In Stage 4, the retailer maximizes her profit by choosing the retail prices of all products. Her programme is the following:

$$\max_{p_1^f,\ldots,p_n^f,p^f}\pi^D=\sum_{k=1}^{n}\left(p_k^f-w_k^f\right)q_k^f(p_1^f,\ldots,p_n^f,p^f)+(p^f-P)q^f(p_1^f,\ldots,p_n^f,p^f). \tag{A11}$$

Solutions are:

$$p^f(P) = \frac{v+P}{2} \quad \text{and} \quad p_k^f(w_k^f) = \frac{v+w_k^f}{2} \quad \forall k = 1, \dots, n. \tag{A12}$$

Replacing (A12) into the individual quantities above, the n brand manufacturers set their wholesale price maximizing their individual profit and considering the level of Fair Trade price P as given:

$$\max_{w_k^f} \pi_k = (w_k^f - c^f) q_k^f(w_1^f, \dots, w_n^f, P). \tag{A13}$$

Considering the fact that the retailer is free to list the Fair Trade product or not and the n brands or not, that is, under the constraint $\pi^{Df}(w^f, P) > \pi^D(w)$ with w and w^f the vectors of manufacturers' wholesale prices absent and with Fair Trade, we obtain

$$w_k^f(P,c) = \begin{cases} \min\{w_k(c), \underline{w}\} & \text{if} \quad c < \underline{c}_f(P). \\ \min\{w_k^f(c,P), \overline{w}\} & \text{if} \quad c > \underline{c}_f(P). \end{cases} \tag{A14}$$

with $w_k(c)$ defined in the benchmark case, Equation (17) and

$$\begin{array}{rcl} \underline{c}_f(P) & = & \frac{[2(n+1)^2-(n+1)(n+3)\beta+\beta^2]P-(1-\beta)(n+1)(2(n+1)-\beta)v}{n\beta(n+1-\beta)} \\ w_k^f(c,P) & = & \frac{(1-\beta)(n+1)v+\beta P+(n+1-\beta)c}{(2-\beta)(n+1)} \\ \underline{w} & = & \frac{(n+1-\beta)P-(n+1)(1-\beta)v}{n\beta} \\ \overline{w} & = & \frac{(n+1)(1-\beta)v+\beta P}{n-n\beta+1} \end{array}$$

In the Stage 2, demand on the input market may arise both from brand manufacturers, $nq_k^f(c,P)$ and from the Fair Trade channel $q^f(c,P)$. The level of the harvest is R, so that supply and demand determine the spot market price for raw product c^f, which depends on the Fair Trade price P.

(i). If $P < v - 2\beta R$, the retailer sells all the products, the spot market price is $c^f(P) = \frac{(n+1)(n+2-\beta)v-(2(n+1)-\beta)P-2(n+1)^2(2-\beta)R}{n(n+1-\beta)}$ and $\pi^{Df}(P) = R^2 + \frac{(v-P-2R)^2}{4n(1-\beta)}$.

(ii). If $P \geq v - 2\beta R$, the retailer sells only the n brand products, the spot market is equal to $c^*(R)$ and $\pi^D(R) = \frac{(n+1-\beta)R^2}{n}$.

Let now turn to the Stage 0 where the Fair Trade certifier chooses the equilibrium GMP, G^*, before the nature chooses R. We obtain the same equilibrium GMP than in the section 2, according the certifier's objective: $G_1^* = \frac{v(2-\beta)}{4}$ and $G_2^* = (1-\beta)v$.

We define the spot market price when the Fair Trade product is paid at the same level as the brands, c_0^f, which is uniquely defined by the following equality

$$R - q^f(c_0^f, P)|_{P=c_0^f} = nq_k^f(c_0^f, P)|_{P=c_0^f} \tag{A15}$$
$$c_0^f(R) = v - \frac{2(n+1)(2-\beta)R}{n+2-\beta} \tag{A16}$$

Let $c_i^f(R)$ be defined as the spot market price when $G_i^* > c_0^f$. We thus obtain $c_1^f(R) = \begin{cases} c^*(R) & \text{if } \beta > \frac{2}{3} \text{ and } R > R^{\lim} \\ \frac{(4(n+1)^2-2n\beta-\beta^2)v-8(n+1)^2(2-\beta)R}{4n(n+1-\beta)} & \text{otherwise} \end{cases}$ and $c_2^f(R) = \frac{(n^2+(1+\beta)n+(2-\beta)\beta)v-2(n+1)^2(2-\beta)R}{n(n+1-\beta)}$.

Let R_{0i} be defined such that $G_i^* = c_0^f(R_0) = c_i^f(R_0),\ \forall i = 1, 2.$

$$R_{0i} = B_i v \frac{(n+2-\beta)}{(n+1)(2-\beta)} < B_i v, \tag{A17}$$

with $B_1 = \frac{2+\beta}{8}$ and $B_2 = \frac{\beta}{2}$.

A.5 Proof of Proposition 2

From equilibria spot market prices absent Fair Trade and with Fair Trade, when $R < R_{0i}$, we obtain that

$$\begin{aligned} c_0^f(R) &> c^*(R), \quad \forall R \\ \Leftrightarrow \quad v - \tfrac{2(n+1)(2-\beta)R}{n+2-\beta} &> v - \tfrac{2(2n-\beta-n\beta)R}{n-\beta} \\ \Leftrightarrow \quad 2n(1-\beta) &> 0 \end{aligned} \tag{A18}$$

When $R < R_{0i}$, we obtain that

$$\begin{aligned} c^{f*}(R) &> c^*(R) \\ \Leftrightarrow \quad c_i^f &> v - \tfrac{2(2n-\beta-n\beta)R}{n-\beta}, \quad i = 1,\ 2. \\ \Leftrightarrow \quad R &< R_i^* \end{aligned} \tag{A19}$$

with $R_i^* = B_i v \frac{(2(n+1)-\beta)(n+1-2\beta)}{\beta[2(n+1)^2-6(n+1)\beta+(n+3)\beta^2]}$.

But $R_1^* \geq R^{\lim}$ and $R_2^* \geq \frac{v}{2}$.

Thus, $c^{f*}(R) \geq c^*(R), \quad \forall R$.