

Fair Trade Goods Versus Conventional Goods: Some Theoretical Considerations

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We formulate a duopoly model involving a firm producing a fair-trade product in competition against a conventional firm producing a standard product. We make use of the concept of "economic identity" introduced by Akerlof and Kranton. We show how, in the short run, the parameters of the identity function can impact the equilibrium prices, and in the medium run, how they impact the conventional firm's choice of its position in the product space. In the long run, however, the fair-trade firm may be able to influence the parameters of the identity function, for its own advantage.

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1. Introduction

Fair trade products are becoming more and more popular, especially in OECD countries. In addition to specialized shops (SS) offering fair trade products exclusively, fair trade goods are also available in over 55,000 supermarkets across Europe (Krier, 2005). The Fair Trade Federation (FTF) reported a total fair trade sale of \$2.6 billion in 2006. Although this represents a small share of the total world trade volume, the sale growth rates of several fair trade products are impressive. For example, in 2006, the Fair Trade Labeling Organizations International (FLO) reported a 93% growth in the global fair trade cocoa sector, while coffee had grown by 53%, tea by 41% and banana by 31%. The range of fair trade products has also been widened considerably over the past decade to include flowers, coffee, tea, banana, honey, wine, handicrafts, sport balls, cosmetics among others.

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Although fair trade is not a new concept¹, there is still no widely accepted definition of fair trade in the academic world. According to FINE², fair trade is defined as: “a trading partnership, based on dialogue, transparency and respect, which seeks greater equity in international trade. It contributes to sustainable development by offering better trading conditions to, and securing the rights of, marginalized producers and workers, especially in the South” (FINE, 2001). While it appears to be simple that the primary goal of fair trade initiatives, as suggested by this definition, is to foster “equity” or “fairness” in international trade, matters are much more complex when one tries to understand consumers’ motives for purchasing a particular fair trade product. Ferran and Grunert (2007) outline a number of heterogeneous motives and values of fair trade coffee consumers. These include (i) a desire for equality between humans and in human relationships through participation in the alternative economy; (ii) a desire for hedonism by the consumption of high-quality products; and (iii) a wish to protect oneself and the environment. In addition to these motives, Shaw et al. (2000) suggest that “self-identity” and ethical obligation play an important role in socially responsible consumer decision-making. In reference to fair trade, they stress that “while many consumers acting in a rational self-motivated manner may select coffee on the basis of factors such as price and taste, those concerned about ethical issues may be guided by a sense of obligation to others and identification with ethical issues, where concerns such as providing a fair price for fair trade producers take priority” (p. 889). Identity, therefore, was suggested to be an important motive for the consumption of fair trade products.

While there are plenty of general discussion materials on fair trade, the academic economic modeling of fair trade has been scarce. Two prominent exceptions are the papers by Becchetti and Andriani (2004) and Richardson and Stähler (2007). The former paper considers a good produced in the South where the conventional firm acts as a monopsonist, and the emergence of a fair trade (FT) firm forces the monopsonist to increase the wages to Southern workers. The latter paper offers a formal model of rivalry between two firms: a fair trade firm, which obtains the raw material (coffee beans) from cooperative producers (fair trade growers of coffee beans), and a conventional profit-maximizing firm that buys coffee beans from a competitive spot market. It analyzes how the FT firm’s gain from offering a higher wage (as consumers value the FT product more, the higher is the wage it pays to Southern workers) is partly offset by the moral hazard problems associated with cooperative farming.

In this paper, we propose an alternative approach to modeling the attractiveness of FT products and the rivalry between a FT firm and a conventional firm. We use the concept of “economic identity” introduced by Akerlof and Kranton (2000, 2002, 2005), and apply it to the analysis of competition between a FT firm and a conventional firm. In our model,

¹ The concept of fair trade can be traced back to 1860 with Multatuli’s (1987) book that reports injustices in the coffee trade between Indonesia and the Netherlands.

² FINE is an informal umbrella group of the four main international fair trade networks: (F) Fairtrade Labeling Organizations International; (I) International Federation for Alternative Trade; (N) Network of European Shops; and (E) European Fair Trade Association.

products are differentiated on the basis of their “ethical” or “social responsibility” attributes. In particular, we assume that consumers have special valuation of a FT product in contrast to its ordinary counterpart. We argue that the consumption of FT product would distinguish the FT consumers from the rest of the population, therefore giving them a special economic identity. By incorporating this economic identity into the utility functions, we can assess the incentives of firms to be different in their choice of product attributes and prices.

Our analysis is based on the perceptive remark made by Akerlof and Kranton, namely, “our desires are fundamentally affected not just by who we are, but also by who we feel we ought to be”. We introduce the economic identity function into our model, and show how the parameters of this function impact the equilibrium prices of the FT product and of the conventional counterpart. We also show how the conventional firm may react by positioning itself at a point in the product space. Finally, we formulate a dynamic model where the FT firm can manipulate the identity function by dissemination of information.

2. The Basic Model

2.1 The social responsibility standard space and the utility functions

Let us consider two firms, denoted by A and B , selling two horizontally differentiated products z_a and z_b respectively. The two products z_a and z_b are identical in quality, except for their “social responsibility” attributes. While z_a has zero or low “social responsibility” standard (e.g. ordinary coffee), z_b is assumed to have a high standard (e.g. FT coffee).

The potential market for both firms is assumed to be a line segment with the length of 1. In traditional horizontal product differentiation models, the line segment is sometimes interpreted as the physical space within which firms are located. As firms deliver products to consumers, they incur transportation costs, which are determined by the distances between the firms and the consumers. Transportation costs are assumed to be symmetric, i.e. the costs are the same for the same distances, and are independent of the relative positions of firms and consumers (i.e. it does not matter whether consumers are located to the left or to the right of the firms).

In our model, we provide a different interpretation for the line segment. It represents the space of “social responsibility” standards. Firms having zero or low “social responsibility” standard, such as firm A , would position themselves on the left end of the segment. On the other hand, firms with high standards, such as firm B , would take positions on the right end of the segment. Let a and b denote the positions of firm A and firm B on the market segment respectively, then the values of a and b determine the firms’ “social responsibility” standards. In what follows, for simplicity, we assume that while firm A is located at a point a near zero, firm B is located at point $b = 1$.

We assume there is a continuum of consumers uniformly distributed on the same market segment previously described. Let x_i be the position of consumer i on the line. Then

$x_i \in [0,1]$ represents consumer i 's "social responsibility" standard regarding the consumption of FT products. For simplicity, we assume each consumer demands only one unit of the product: hence she either buys one unit of z_a , or one unit of z_b (or, if the prices are too high, she does not purchase the product.)

If consumer x_i chooses to consume z_b , she belongs to a "select group", which yields an added utility. We assume this added utility depends on the size (denoted by $1 - \gamma$) of the select group. A consumers' net surplus of consuming a product z (either z_a or z_b) is equal to the excess of her individual valuation of the product over the paid price. Therefore, for any consumer i , having social responsibility standard x_i , her net surplus is represented by

$$U_i = V^a(x_i) - p_a \text{ if she chooses to consume } z_a \quad (1)$$

$$U_i = V^b(x_i, \gamma) - p_b \text{ if she chooses to consume } z_b \quad (2)$$

where $V_i(\cdot)$ is the gross valuation of a product z , and p_a and p_b are prices of z_a and z_b respectively.

To sharpen our analysis, we assume the following specific functional forms. For good z_a , consumers value its physical attributes (e.g. taste, texture) at V . In addition, however, since z_a exhibits a low level of social responsibility standard, its consumption would cause a loss in consumers' utility. This utility loss accrues to any consumer i who has a higher social responsibility standard than the standard of the product z_a , i.e. $x_i > a$. The gross valuation of z_a , therefore, can be represented by

$$V^a(x_i) = \begin{cases} V - (x_i - a)L_s & \text{if } a \leq x_i \leq 1 \\ V & \text{if } 0 \leq x_i \leq a \end{cases} \quad (3)$$

Here $L_s > 0$ is a parameter that represents the loss of utility if consumer i buys a good with a standard that falls short her personal standard x_i . (The subscript s in L_s stands for "self" because the loss is caused by the consumer's own action). For consumers whose personal standards are lower than a , there is no utility loss. This assumption reflects the asymmetric aspect of our model, as in contrast to the symmetric transportation costs assumed in traditional product differentiation models. We also assume that $V - L_s > 0$. This implies that, if $p_a = 0$, any consumer would prefer buying a unit of z_a for any $a \in (0,1)$ when z_b is not available.

Suppose for the moment that good z_b is not available, so that firm A is the monopolist. Then, if $p_a \leq V - (1-a)L_s$, all consumers will buy a unit of good z_a , i.e., the market size for this product is $x = 1$. If $p_a = V$, then the market size for this good is $x = a$. If $p_a > V$, no one will buy the product. Thus firm A 's inverse demand function is $p_a = P(x)$ where $P = V$ for all $x \in [0, a]$, $P(x) = V - (x-a)L_s$ for $a < x < 1$. For $x = 1$, $P(x) \leq V - (1-a)L_s$. The marginal revenue at $x=1$ is $MR(1) = P'(1) + P(1) = V - (2-a)L_s$. We assume that

$MR(1) > c_a$, where c_a is the marginal cost. When $c_a = 0$ and $a = 0$, this assumption is simply $V > 2L_s$. Under this assumption, the monopolist will serve the whole market, i.e., $x = 1$, and charge the monopoly price $P(1) = V - (1 - a)L_s$. We now introduce competition from a FT firm.

The valuation of the FT product, z_b , includes several components. First, we assume that consumers also value the physical attributes of z_b at V . This is because, except for the FT feature, z_a and z_b are assumed to be identical (e.g. FT coffees are very much the same as conventional coffees, in terms of taste and texture).

Second, the consumption of the FT product can have several psychological effects. Some authors argued that consumers are willing to pay a premium for FT product because of a "warm glow" effect. That is, consumers feel that they pay a "fair" price and that the premium on final FT products will be passed down the vertical supply chain to ensure the living standards of FT workers such as FT coffee bean growers. This "warm glow" effect has been discussed in Richardson and Stähler (2007). In our model, we look at psychological effects from a different perspective. We assume that the consumption of FT products gives consumers a sense of pride for belonging to a select "socially responsible" group of FT advocates. The membership of this group gives consumers an unique economic "identity", which increases their utility from consuming FT products. This utility enhancement results from the fact that "our desires and personal satisfactions are fundamentally affected not just by who we are, but also by who we feel we ought to be" (Akerlof and Kranton, 2000).

Identity was first introduced into consumers' utility function by Akerlof and Kranton (2000). In their model, consumers associate themselves with different social categories, each with its own prescriptions (or norms) regarding members' appropriate behaviors. Consumers gain utilities by conforming to the prescribed standards of the group or category to which they belong. Any deviation from such standards by the consumers themselves or by other members of the society would cause a fall in utility levels.

Adapting the general framework developed by Akerlof and Kranton (2000), we assume that consumers in our model obtain a value I for their economic identity when consuming FT products. This value is in addition to V which represents satisfaction derived from physical characteristics of the products. Moreover, we also assume that individuals care about other individuals' choices, which affect an individual's identity function. In particular, since the consumption of FT product is a "norm" for FT advocates, they would suffer from "identity loss" if other consumers deviate from the norm. We assume that each non-FT consumer would cause the gross valuation of a FT consumer to fall by an amount $L_o > 0$. (The subscript o in L_o stands for "others" since the loss is not caused by a consumer's own action, but by actions of others). Then, if γ is the market share of the non-FT product (and therefore $1 - \gamma$ is the size of the FT consumer group), the utility of a consumer of the FT product is

$$V^b(x_i, \gamma) = V + [I - \gamma L_o] \quad (4)$$

The term inside the square brackets represent the added utility of belonging to the select group of FT consumers. The smaller is γ , the larger is this added utility. Thus $-\gamma L_o$ reflects the "identity loss" mentioned above. The expression $[I - \gamma L_o]$ will be referred to as the "identity function". If practically everyone consumes the non-FT good, i.e. $\gamma = 1$, the "lone consumer" of the FT good will get a gross utility of $V + [I - L_o]$. We assume that $I - L_o + L_s > 0$, so that the consumer with $x = 1$ will strictly prefer the FT product if the two prices are equal. In fact it would be reasonable to assume $I - L_o > 0$.

2.2 The pivotal consumer

We assume that firms cannot practise discriminatory pricing. Each firm sets the price for its product, regardless of who is buying it. In what follows, we will focus on the case where, in equilibrium, each of the two rival products is consumed by a positive proportion of the population.

We define the pivotal consumer as the one who is indifferent between consuming the FT product and the non-FT product. The consumers who are on the left of the pivotal consumer choose to consume the non-FT product z_a , while those on the right opt for the FT product z_b . Let x^* be position of the pivotal consumer. Since this pivotal consumer is indifferent between consuming z_a and z_b , her net surplus must be the same for both products:

$$V^a(x^*) - p_a = V^b(x^*, \gamma) - p_b \quad (5)$$

In equilibrium it must be the case that $x^* = \gamma$. The solution to equation (5) with $\gamma = x^*$ would determine x^* and therefore determine the market shares for firm A and firm B . Both firms will supply some positive quantity if x^* falls in the $(0,1)$ interval. In such a case, the market share for A is x^* and for B is $1 - x^*$. When $x^* \leq 0$, firm B supplies the entire market. Conversely, firm A supplies the whole market when $x^* \geq 1$.

2.3 Price competition in the absence of the identity function

Let us first consider a benchmark scenario, where the identity function is identically zero. In this scenario, consumers only incur utility losses for consuming a product that has a social responsibility standard below their own standards, as represented in equation (3). They, however, do not gain from consuming FT products that exceed their social responsibility standards. Assume the positions of firm A and firm B are fixed at $a = 0$ and $b = 1$ respectively. It is also assumed that firms have constant marginal costs, denoted by c_a and c_b , and firm B incurs a higher cost due to its commitment to maintain high social responsibility standards. Let us normalize $c_a = 0$. We assume the firms compete in prices (Bertrand rivalry), and prices are never set above the value V .

In the space (p_a, p_b) , where p_b is measured along the horizontal axis, and p_a on the vertical axis, we consider the box, denoted by D , with four corners described by the coordinates $(0,0)$, $(V + I, 0)$, $(V + I, V)$ and $(0, V)$. We will restrict attention to prices within this box,

because no one will buy good z_b at a price above $V + I$, nor good z_a at a price above V . As before, we assume $V > 2L_s$.

When consideration for identity is not taken into account, the pivotal consumer is identified by the condition

$$\begin{aligned} V - x^*L_s - p_a &= V - p_b \\ x^* &= \frac{p_b - p_a}{L_s} \end{aligned} \quad (6)$$

It follows that if

$$0 < p_b - p_a < L_s \quad (7)$$

then both firms have a positive market share. Within the box D , if $p_b - p_a > L_s$, then no one will buy the fair trade product. Conversely, if $p_a > p_b$ then no one will buy the conventional product.

Equation (6) can be used to determine the market share m_a for firm A and the market share m_b for firm B , as follows. For any real number y , we define

$$\text{mid}\{0, y, 1\} = \begin{cases} 0 & \text{if } y \leq 0 \\ y & \text{if } 0 < y < 1 \\ 1 & \text{if } y \geq 1 \end{cases} \quad (8)$$

Then the market share of firm A is

$$m_a(p_a, p_b) \equiv \text{mid}\left\{0, \frac{p_b - p_a}{L_s}, 1\right\}$$

and that of firm B is

$$m_b(p_a, p_b) \equiv \text{mid}\left\{0, 1 - \frac{p_b - p_a}{L_s}, 1\right\}$$

Within the box D , the market share of A is $m_a = 1$ along the line $p_a = p_b - L_s$, and $m_a = 0$ along the line $p_a = p_b$. Hence the reaction functions must be within the band S defined by these two lines. Above the line $p_a = p_b$, the FT product is cheaper, and everyone will prefer it to the conventional product. Below the line $p_a = p_b - L_s$, even the consumer with the highest standard of social responsibility will prefer to buy the conventional product. The intersection of the band S and the box D is the set of all relevant prices.

Given price $p_b \geq 0$ set by the FT firm B , firm A chooses $p_a \geq 0$ to solve its profit maximization problem:

$$\max_{p_a} \Pi_a = p_a m_a(p_a, p_b)$$

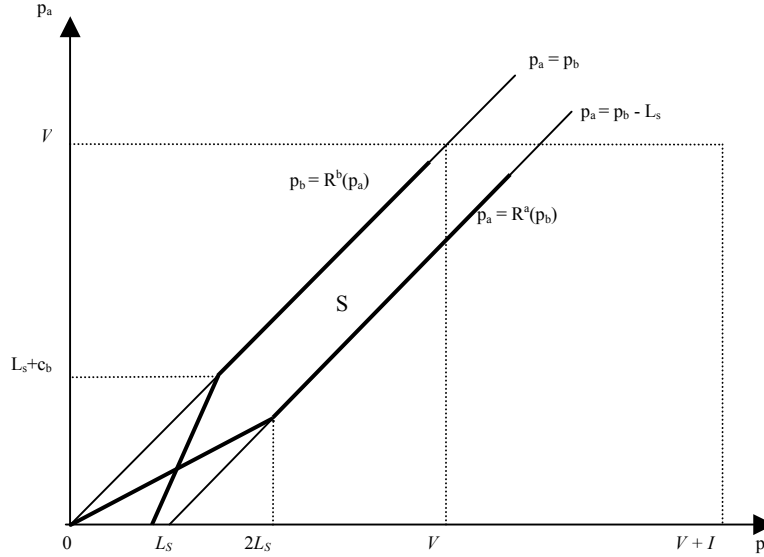


Figure 1: Box D with Two Reaction Functions Intersecting in the Interior of Band S

The solution to this maximization problem determines firm A 's reaction function

$$p_a = R^a(p_b) = \begin{cases} 0 & \text{if } p_b = 0 \\ \frac{1}{2} p_b & \text{if } 0 < p_b < 2L_s \\ p_b - L_s & \text{if } p_b \geq 2L_s \end{cases} \quad (9)$$

Similarly, firm B chooses its price p_b to maximize its profit, given p_a :

$$\max_{p_b} \Pi_b = (p_b - c_b) m_b(p_a, p_b)$$

The reaction function of firm B is

$$p_b = R^b(p_a) = \begin{cases} \frac{1}{2}(L_s + c_b) & \text{if } p_a = 0 \\ \frac{1}{2}(p_a + c_b + L_s) & \text{if } 0 < p_a < L_s + c_b \\ p_a & \text{if } p_a \geq L_s + c_b \end{cases} \quad (10)$$

If the two reaction functions (9) and (10) intersect in the interior of the band S , the equilibrium prices for z_a and z_b are

$$\begin{aligned} p_a^* &= \frac{1}{3}(c_b + L_s) \\ p_b^* &= \frac{2}{3}(c_b + L_s) \end{aligned} \quad (11)$$

The market share of each firm is positive if and only if

$$L_s > \frac{1}{2}c_b \quad (12)$$

This condition is necessary and sufficient for the two reaction functions to intersect each other in the interior of the band S .

Remarks: (i) When the personal value loss, L_s , is sufficiently large, both firm A and firm B supply positive quantities with prices above their respective marginal costs, and therefore earn positive profits.

(ii) When L_s is relatively small ($0 < L_s < \frac{1}{2}c_b$), firm A (selling conventional products) takes over the entire market.

2.4 Price competition when consumers' economic identity matters

Now consider the case where identity matters. Let us assume $V > 2L_s$ as before. In addition, we assume that $V + I - L_o > V - L_s$, so that the consumer with $x=1$ will prefer the FT product to the non-FT product, if the prices are equal. When consumers' economic identity matters, to determine the position of the pivotal consumer, we use:

$$V - (x^* - a)L_s - p_a = V + I - x^*L_o - p_b \quad (13)$$

$$x^* = \frac{(p_b - p_a) - I + aL_s}{L_s - L_o} \quad (14)$$

To focus on the effects of price competition between two firms, we assume their positions are fixed at $a=0$ and $b=1$. Then

$$x^* = \frac{(p_b - p_a) - I}{L_s - L_o} \quad (15)$$

Thus if $x^* \in (0,1)$, the market share for the FT firm B equals to $1 - x^*$. For x^* to fall within the $(0,1)$ interval, we impose a number of restrictions such that the following inequalities hold:

$$p_b - p_a > I > 0 \quad (16)$$

$$L_s - L_o > 0 \quad (17)$$

$$(p_b - p_a) - I < L_s - L_o \quad (18)$$

Interpretations of the three conditions are straight-forward. We require the price of z_b to be larger than the price of z_a . This is because the specialty of FT-products makes it more expensive than the normal products. We assume in condition (17) that the personal "self" utility loss from consuming a product with low social responsibility standard is larger than utility loss to a FT product consumer, caused by a "marginal defection" of others to the camp of consumers of non-FT products.

Again, in the space (p_b, p_a) , where p_b is measured along the horizontal axis, and p_a on the vertical axis, we consider the box, denoted by D^* , with four corners described by the coordinates $(0,0)$, $(V+I,0)$, $(V+I,V)$ and $(0,V)$. Within the box D^* , if $(p_b - I) - p_a > L_s - L_o$, then no one will buy the FT product. Conversely, if $p_a > (p_b - I)$ then no one will buy the conventional product. Within the box D^* , the market share of A is $m_a = 1$ along the line $p_a = (p_b - I) - (L_s - L_o)$, and $m_a = 0$ along the line $p_a = p_b - I$. These two lines define a band S^* within which the reaction functions must lie if both firms are to supply some positive quantity. The intersection of the band S^* and the box D^* is the set of all relevant prices.

Generally, the market share of firm A is

$$m_a(p_a, p_b) = \text{mid} \left\{ 0, \frac{(p_b - p_a) - I}{L_s - L_o}, 1 \right\}$$

and that of firm B is

$$m_b(p_a, p_b) = \text{mid} \left\{ 0, 1 - \frac{(p_b - p_a) - I}{L_s - L_o}, 1 \right\}$$

As in the previous section, we assume firm A and firm B have constant marginal costs of c_a and c_b respectively, where $c_b > c_a = 0$. Under Bertrand competition, given the price p_b set by firm B , firm A chooses $p_a \geq 0$ to solve its profit maximization problem

$$\max_{p_a} \Pi_a = p_a m_a(p_a, p_b)$$

The first order condition gives us firm A 's reaction function

$$p_a = R^a(p_b) = \begin{cases} 0 & \text{if } p_b \leq I \\ \frac{1}{2}(p_b - I) & \text{if } I < p_b < I + 2(L_s - L_o) \\ p_b - (L_s + I - L_o) & \text{if } p_b \geq I + 2(L_s - L_o) \end{cases} \quad (19)$$

The intersection of the line $p_a = \frac{1}{2}(p_b - I)$ with the line $m_a = 1$ of the set S^* yields the point $(p_b, p_a) = (2L_s - 2L_o + I, L_s - L_o)$ at which the reaction function $p_a = R^a(p_b)$ has a kink. Compared with the case without the identity function [equation (9)], we see that the function $p_a = R^a(p_b)$ is shifted to the right by a distance which equals $\frac{1}{2}I$. Similarly, given p_a , firm B solves

$$\max_{p_b} \Pi_b = (p_b - c_b)m_b(p_a, p_b)$$

The solution to this problem gives a price reaction function for firm B :

$$p_b = R^b(p_a) = \begin{cases} \frac{1}{2}[(L_s - L_o) + I + c_b] & \text{if } p_a = 0 \\ \frac{1}{2}[(L_s - L_o) + I + c_b + p_a] & \text{if } 0 < p_a < I + c_b + L_s - L_o \\ p_a + I & \text{if } p_a \geq I + c_b + L_s - L_o \end{cases} \quad (20)$$

The intersection of the line $p_b = \frac{1}{2}[(L_s - L_o) + I + c_b + p_a]$ with the line $m_b = 1$ (i.e., the line $p_a = p_b - I$ of the set S^*) yields the point $(p_b, p_a) = (2I + c_b + L_s - L_o, I + c_b + L_s - L_o)$ at which the reaction function $p_b = R^b(p_a)$ has a kink. Compared with the case without the identity function [equation (10)], we see that the function $p_b = R^b(p_a)$ is shifted to the right by a distance which equals $\frac{1}{2}(I - L_o)$. Since this horizontal displacement is less than the horizontal displacement of the reaction function $p_a = R^a(p_b)$, the equilibrium price p_a must fall (relative to the case without the identity function).

From (19) and (20), assuming both firms have a positive market share, we derive equilibrium prices:

$$\begin{aligned} p_a^* &= \frac{1}{3}[(L_s - L_o) + c_b - I] \\ p_b^* &= \frac{2}{3}[(L_s - L_o) + c_b + \frac{1}{2}I] \end{aligned} \quad (21)$$

These equilibrium prices satisfy the conditions (16), (17) and (18) if and only if

$$c_b > I - (L_s - L_o) \quad (22)$$

$$c_b < I + 2(L_s - L_o) \quad (23)$$

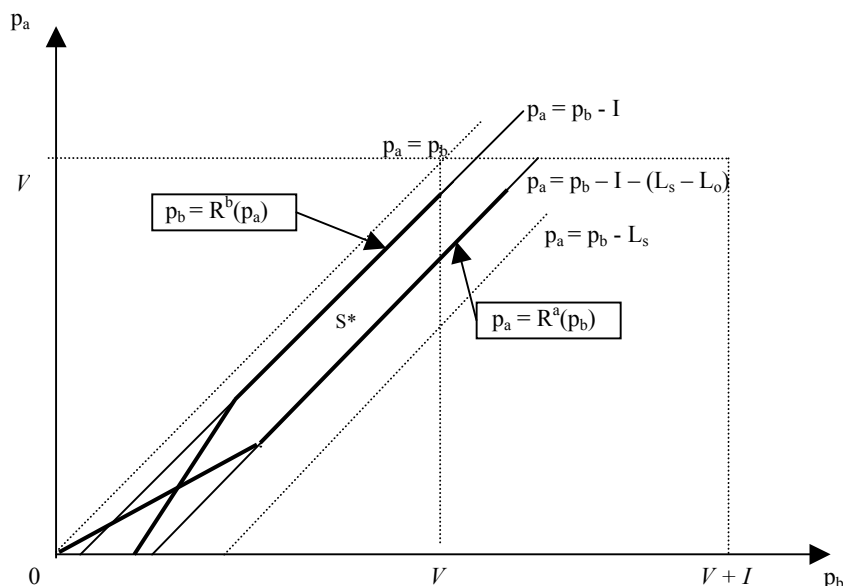


Figure 2: Box D^* with Two Reaction Functions Intersecting in the Interior of Band S^*

Under the conditions (22) and (23), optimal profits for firm A and B are

$$\begin{aligned} \Pi_a^* &= p_a^* x^*(p_a^*, p_b^*) = \frac{1}{9} \frac{[(L_s - L_o) + c_b - I]^2}{L_s - L_o} \\ \Pi_b^* &= p_b^* [1 - x^*(p_a^*, p_b^*)] = \frac{1}{9} \frac{[2(L_s - L_o) - c_b + I]^2}{L_s - L_o} \end{aligned} \quad (24)$$

Proposition 1: (i) Both firms have positive productions and earn positive profit if and only if the marginal cost of the FT firm, c_b , falls within the interval $(I - L_s + L_o, I + 2L_s - 2L_o)$. Firm A 's market share is zero (respectively, one) if c_b equals the lower (respectively, upper) bound of the interval.
(ii) If consumers do not care for their economic identity, i.e., $L_o = 0$ and $I = 0$, then equilibrium prices in (21) are exactly the same as prices in (11).
(iii) Compare to the case where economic identity does not matter, the conventional firm charges a lower price, while the price of the FT product might be lower or higher depending on whether $I < 2L_o$ or $I > 2L_o$ respectively.

The intuition behind the above proposition is as follows. Consumers are heterogeneous with respect to their valuation of the conventional product. The valuation schedule for this product is a downward sloping line, beginning at the value V for the consumer with index $x_i = 0$, and ending at the value $V - L_s > 0$ for the consumer with index $x_i = 1$. On the other hand, all consumers have the same valuation of the FT product, and their valuation depends on the market size of this product. If $c_b = I - L_s + L_o$ (which is smaller than I), then, even if $p_a = 0$, firm B can charge a price $p_b = I$ and take over the whole market. Its profit would then be

$$\Pi_b^* = (L_s - L_o)$$

In this low cost case, the reaction function of firm B coincides with the line $m_b = 1$.

Now consider the other extreme case. If $c_b = I + 2L_s - 2L_o$, firm A will charge a price $p_a = L_s - L_o$, and firm B will go out of business. The intuition is as follows. At any given p_b , the identity awareness of FT consumers causes firm A to cut its price (i.e., firm A 's reaction function shifts downward, by $\frac{1}{2}I$). At the same time, for any given p_a , firm B can afford to raise its price as a result of the identity awareness [i.e. firm B 's reaction function shifts downward, by a smaller amount $\frac{1}{2}(I - L_o)$]. Thus the equilibrium price p_a necessarily falls when the identity function is introduced. On the other hand, p_b would rise only if the identity gain I is sufficiently greater than marginal identity loss L_o .

3. Strategic choice of social responsibility standard

We now turn our attention to firms' strategic choice of social responsibility standards. In the previous section, we assume that firm A maintains the zero standard and B maintains the highest one. On the product social responsibility standard space, this assumption implies that firm A is positioned at $a = 0$ and B is positioned at $b = 1$. We will now relax this assumption. We continue to assume that B is still positioned at $b = 1$, but now allow A to choose its position in the product space, i.e. $a > 0$.

The two firms engage in a two-stage game. In the first stage, given that firm B 's position is fixed at $b = 1$, firm A chooses its position $a > 0$. In the second stage, given their positions, firm compete in price to maximize their profits. We solve the game backwards.

Suppose firm A has chosen to set its social responsibility standard at $a > 0$. We must find the position of the pivotal consumer, x^* . Suppose she is in the interval $[a, 1]$. With B fixed at $b = 1$, the position of this consumer is determined by (14):

$$x^* = \frac{(p_b - p_a) - I + aL_s}{L_s - L_o} \quad (25)$$

Again, we will specify a number of conditions to ensure x^* falls within the $[a, 1]$ interval:

$$p_b - p_a - I + aL_s < L_s - L_o \quad (26)$$

$$p_b - p_a - I + aL_s > a(L_s - L_o) \quad (27)$$

When firm A chooses to move away from its zero social responsibility standard, its cost will increase from zero to some positive level, $c_a > 0$. We assume this cost depends on firm A 's choice of social responsibility standard and is given by

$$c_a = ka^2$$

where $k > 0$. Given positions of both firms and price of z_b , firm A chooses its price to maximize profit

$$\max_{p_a} \Pi_a = (p_a - ka^2) \frac{(p_b - p_a) - I + aL_s}{L_s - L_o}$$

The solution to the maximization problem gives firm A 's price reaction function:

$$p_a = \frac{1}{2}(p_b - I + aL_s + ka^2) \quad (28)$$

Similarly, firm B solves its profit maximization problem

$$\max_{p_b} \Pi_b = (p_b - c_b) \left(1 - \frac{(p_b - p_a) - I + aL_s}{L_s - L_o} \right)$$

This gives firm B 's price reaction function:

$$p_a = \frac{1}{2}[(L_s - L_o) + I + c_b + p_a - aL_s] \quad (29)$$

From (28) and (29), we derive equilibrium prices and profits for firm A and firm B :

$$p_a = \frac{1}{3}[(L_s - L_o) - I + c_b + aL_s + 2ka^2] \quad (30)$$

$$p_b = \frac{1}{3}[2(L_s - L_o) + I + 2c_b - aL_s + ka^2] \quad (31)$$

$$\Pi_a = \frac{1}{9} \frac{\left[(L_s - L_o) - I + c_b + aL_s - ka^2 \right]^2}{L_s - L_o} \quad (32)$$

$$\Pi_b = \frac{1}{9} \frac{\left[2(L_s - L_o) + I - c_b - aL_s + ka^2 \right]^2}{L_s - L_o} \quad (33)$$

$$x^* = \frac{1}{3} \frac{\left[(L_s - L_o) - I + c_b + aL_s - ka^2 \right]}{L_s - L_o} \quad (34)$$

In the first stage of the game, firm *A* strategically chooses its social responsibility standards. For any given position *a* of firm *A*, its optimal profit level is specified in (32). Firm *A*'s problem is to choose *a* to maximize (32). The first order condition is

$$\frac{\partial \Pi_a}{\partial a} = \frac{2}{9(L_s - L_o)} \left[(L_s - L_o) - I + c_b + aL_s - ka^2 \right] [L_s - 2ka] = 0 \quad (35)$$

Since we require the pivotal consumer to be located within the (0,1) interval, it is necessary

that $x^* = \frac{1}{3} \frac{\left[(L_s - L_o) - I + c_b + aL_s - ka^2 \right]}{L_s - L_o} > 0$. We have previously assumed that $L_s > L_o$. Therefore the

numerator of x^* must be non negative, i.e., $\left[(L_s - L_o) - I + c_b + aL_s - ka^2 \right] > 0$. The first order condition (35) is thus reduced to

$$L_s - 2ka = 0 \quad (36)$$

$$a^* = \frac{L_s}{2k} \quad (37)$$

For a^* to be in the (0,1) interval, it is necessary that $0 < L_s < 2k$.

Let $h(a) = \frac{\partial \Pi_a}{\partial a}$. The sufficient conditions for Π_a to reach its maximum at $a^* = \frac{L_s}{2k}$ are (i) $h(a)$ is continuous in the interval $a = [0,1]$; (ii) $h(0) > 0$ for $0 \leq a < \frac{L_s}{2k}$; and (iii) $h(1) < 0$ for $\frac{L_s}{2k} < a \leq 1$. Since $h(a)$ is continuously differentiable in $[0,1]$, these sufficient conditions are also satisfied when $0 < L_s < 2k$.

When $a^* = \frac{L_s}{2k}$, the corresponding prices and profits for firm *A* and firm *B* are

$$p_a = \frac{1}{3} \left[(L_s - L_o) - I + c_b + \frac{L_s^2}{k} \right]$$

$$p_b = \frac{1}{3} \left[2(L_s - L_o) + I + 2c_b - \frac{L_s^2}{4k} \right]$$

$$\Pi_a = \frac{1}{9} \frac{\left[(L_s - L_o) - I + c_b + \frac{L_s^2}{4k} \right]^2}{L_s - L_o}$$

$$\Pi_b = \frac{1}{9} \frac{\left[2(L_s - L_o) + I - c_b - \frac{L_s^2}{4k} \right]^2}{L_s - L_o}$$

$$x^* = \frac{1}{3} \frac{\left[(L_s - L_o) - I + c_b + \frac{L_s^2}{4k} \right]}{L_s - L_o}$$

These prices and corresponding profits and market shares satisfy conditions (26) and (27) when

$$c_b^L < c_b < c_b^H$$

$$c_b^L = \left(3 \frac{L_s}{2k} - 1 \right) (L_s - L_o) + I - \frac{L_s^2}{4k}$$

$$c_b^H = 2(L_s - L_o) + I - \frac{L_s^2}{4k}$$

Proposition 2: *If $k > \frac{L_s}{2}$ and the cost of FT-firm c_b falls within the (c_b^L, c_b^H) interval, it is beneficial for non-FT firm to deviate from its zero social responsibility standard. The optimal social responsibility standard for non-FT firm is $a^* = \frac{L_s}{2k}$. It is however not optimal for non-FT firm to comply with the FT standard (i.e. choosing $a = 1$) and therefore minimum product differentiation does not occur.*

Remarks: (i) Our result is different from those obtained from traditional horizontal product differentiation models. This is because in traditional models, firms can move costlessly within the product space. Since improving products' standard is costly $k > 0$, it is never optimal for firm A to completely comply with the FT standards. (ii) Both firms earn positive profits in equilibrium.

4. Dynamic Manipulation of the Identity Function

In the preceding analysis, we have assumed that the identity function $I - \gamma L_o$ has I and L_o as exogenous parameters. In reality, it is possible for FT firms to manipulate these parameters by creating consumer awareness. In this section, we assume that I changes over time. Suppose its rate of change is given by

$$\frac{dI(t)}{dt} = J(t) - \frac{\delta}{2} I(t)^2 \quad (38)$$

where $J(t)$ is information dissemination (called advertising intensity for short), and $\delta > 0$ is an indicator of the depreciation of the stock I . The FT firm now faces the problem of optimal advertising intensity. It chooses the time path of $J(t)$ to maximize the value of the discounted stream of profit, net of advertising costs $\frac{\omega}{2} J(t)^2$, where ω is a positive constant. (Here we assume that $a = 0$ and $b = 1$ for simplicity). The objective function is then:

$$\int_0^{\infty} e^{-rt} \left\{ \frac{1}{9} \frac{[2(L_s - L_o) - c_b + I(t)]^2}{L_s - L_o} - \frac{\omega}{2} J(t)^2 \right\} dt$$

The Hamiltonian for this problem is

$$H = \frac{1}{9} \frac{[2(L_s - L_o) - c_b + I(t)]^2}{L_s - L_o} - \frac{\omega}{2} J(t)^2 + \psi(t) \left[J(t) - \frac{\delta}{2} I(t)^2 \right]$$

where ψ is the shadow price of the stock $I(t)$.

The necessary conditions are

$$\frac{\partial H}{\partial J} = -\omega J + \psi = 0 \quad (39)$$

$$\dot{\psi} = r\psi - \frac{\partial H}{\partial I} = \psi(r + \delta I) - \frac{2[2(L_s - L_o) - c_b + I]}{9(L_s - L_o)} \quad (40)$$

and (38). The transversality condition is

$$\lim_{t \rightarrow \infty} e^{-rt} \psi(t) \geq 0 \text{ and } \lim_{t \rightarrow \infty} e^{-rt} \psi(t) I(t) = 0$$

Let us focus on an interior steady state with $(I_{\infty}, \psi_{\infty}) > (0, 0)$. The corresponding steady state advertising intensity is $J_{\infty} = \frac{\delta}{2} I_{\infty} = \frac{1}{\omega} \psi_{\infty}$.

At the steady state, setting $\dot{\psi} = 0$ in equation (40), we get

$$\psi_{\infty} = \frac{2[2(L_s - L_o) - c_b + I_{\infty}]}{9(L_s - L_o)(r + \delta I_{\infty})} \quad (41)$$

On the other hand, equation (39) gives

$$\psi_{\infty} = \omega J_{\infty} = \omega \frac{\delta}{2} I_{\infty}^2 \quad (42)$$

Using (41) and (42) we get a cubic equation in I_{∞}

$$(r + \delta I_{\infty}) I_{\infty}^2 = \frac{4}{9\delta\omega(L_s - L_o)} [2(L_s - L_o) - c_b + I_{\infty}]$$

Hence

$$\delta I_{\infty}^3 + r I_{\infty}^2 - \frac{4}{9\delta\omega(L_s - L_o)} I_{\infty} = \frac{4[2(L_s - L_o) - c_b]}{9\delta\omega(L_s - L_o)} \equiv \phi \quad (43)$$

Let us assume that c_b is small, so that ϕ is positive. Now consider the left-hand side of (43).

Let $y \equiv I_{\infty}$ and $\frac{4}{9\delta\omega(L_s - L_o)} \equiv \mu > 0$. Consider the polynomial

$$f(y) \equiv \delta y^3 + r y^2 - \mu y$$

Obviously, 0 is a root of this polynomial, and $f'(0) < 0$, so that $f(0^-) > 0$ and $f(0^+) < 0$. Observe that $f(-\infty) = -\infty$ and $f(\infty) = \infty$. Hence we conclude that this polynomial has a three roots, $y_1 < 0$, $y_2 = 0$ and $y_3 > 0$. It follows that the equation (43) has exactly one (and only one) positive solution I_{∞} and it is greater than y_3 . This is then the steady state of our optimal control problem.

The above analysis leads to the following proposition

Proposition 3: *There exists a unique steady state. The lower is c_b , the higher is the steady state I_{∞} . Similarly, the higher is δ or ω , or r , the lower is the steady state. If $c_b = 0$, then the higher is L_s the lower is the steady state.*

5. Concluding Remarks

We have formulated a duopoly model involving a firm producing a fair-trade product in competition against a conventional firm producing a standard product. We made use of the concept of "economic identity" introduced by Akerlof and Kranton. We show how, in the short run, the parameters of the identity function can impact the equilibrium prices, and in the medium run, how they impact the conventional firm's choice of its position in the

product space. In the long run, however, the fair-trade firm may be able to influence the parameters of the identity function, for its own advantage.

There are several directions along which the model can be extended. First, there might be a proliferation of different brand names of fair trade products, and perhaps a model of monopolistic competition among fair-trade firms as well as conventional firms may better capture some salient features of fair trade products. Second, the parameters of the identity function may be affected by market shares. If this is the case, firms would choose prices not to maximize current profits, but the long-run profits.

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