

On ethical product differentiation[♦]

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In our model of ethical product differentiation two duopolists compete over prices and (costly) “socially and environmentally responsible” features of their products. We show that the incumbent finds it optimal to reduce the price after the ethical producer's entry when his (non ethical) location is fixed. His optimal price is halfway between his zero profit price and the zero profit price of the ethical producer.

By removing the fixed location hypothesis we find that the ethical producer's entry has positive indirect effects on aggregate social and environmental responsibility since the incumbent finds it optimal to imitate him when consumers' perception of ethical costs is sufficiently high.

In the paper we also show that the solution of the three-stage game - in which location and prices are simultaneously chosen and the profit maximising producer is Stackelberg leader in location – has three main features: minimum price differentiation, ethical imitation and non minimal ethical differentiation.

We explain the differences between these findings and those from a traditional Hotelling game as depending from three main features: i) the different goals of the two (profit maximising and zero profit) competitors; ii) the asymmetric costs of "ethical" distance and iii) the lack of independence between ethical location and prices.

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“In recent years we saw many times government and corporations forced to reconsider and change their policies for the bottom up pressure from grassroots movements and civil societies... This is the kind of pressure we need in order to achieve the Millennium Development Goals”¹

*Kofi Annan
UN General Secretary*

1. Introduction

The pathbreaking paper of Hotelling (1929) and the following critique of D’Aspremont-Gabszewich and Thisse (1979) opened a new strand in the industrial economics literature called horizontal product differentiation. Since then many other authors provided additional results in the field (Dasgupta-Maskin, 1986; Economides, 1986). In their papers localisation was usually referred to as physical location.

Nonetheless, marketing textbooks tell us that location competition among firms may occur on many other dimensions different from physical space. One of these dimensions which is becoming increasingly relevant nowadays is social and environmental responsibility.

One of the reasons why this is occurring is that the ongoing process of globalisation and economic integration generated by the integration of electronics and telecommunications has reduced distances among different cultures.² This phenomenon has

¹ Quote from “La Repubblica” 18 December 2002.

² Some interesting (non strictly economic) definitions of globalisation are “death of distance” (Cairncross, 1997) “intensification of social relationships linking distant places in the world so that what happens locally is affected by what happens thousands of kilometers away” Giddens (2000), “intensification of the conscience of the world as a whole” (Robertson, 1992). It is also well known that the process of global integration is not new, was intense at the

increased interdependence among countries and enhanced issues related to the provision of global public goods. As a consequence, the sensitiveness of the public opinion toward ethical issues such as the preservation of the environment and the fight to poverty in less developed countries is getting higher than before.

This increased awareness has generated a series of “grassroot” welfare initiatives which focus on socially responsible (or socially concerned) saving and consumption.

One of the most important is promoted by zero profit importers, distributors and retailers (called *fair traders*) of food and textile products which have been partially or wholly manufactured by poor rural communities in developing countries. To be labelled as such fair trade products need to respect a series of social and environmental criteria.

These criteria, defined by the Fair Trade Federation (FTF), are: i) paying a fair wage in the local context; ii) offering employees opportunities for advancement (including investment in local public goods); iii) providing equal employment opportunities for all people, particularly the most disadvantaged; iv) engaging in environmentally sustainable practices; v) being open to public accountability; vi) building long-term trade relationships; vii) providing healthy and safe working conditions within the local context; viii) providing technical and financial assistance (price stabilisation insurance services and prefinancing arrangements which reduce financial constraints) to producers whenever possible.

Adriani-Becchetti (2002) have recently shown how most of these criteria may be seen as bottom-up solutions to specific market failures. The fair wage/price criterion states that, in the price paid to producers in the South, a much higher share of the value of the product must be transferred to them than what usually happens in the traditional trade channels. If we assume, as it often is, that raw

beginning of the 20th century, experienced a sudden inversion between the two world wars and had a sudden acceleration in the last thirty years (**Debenedictis-Helg, 2002**).

or intermediate material producers in the South are in a monopsonistic market, the fair trade price may be ideally viewed as the market price which would prevail if the two counterparts would have equal bargaining power and may therefore be considered as a non governmental minimum wage provided by private citizens in developed countries.³ Adriani-Becchetti (2002) also show that using prices as a policy instrument to transfer resources to the South cannot be considered as a market distortion. It is instead a market creation since fair traders open in the North a new market in which “contingent ethical” products (combining physical products and values) are sold.⁴

Fair trade is just a small part of the market for socially responsible consumption (and savings) which is considerably growing. Fair trade products (one of the most known socially responsible initiatives) are beginning to achieve non negligible market shares. They captured around 2.5% of the tea market in Germany, 2.7% of the coffee market in the Netherlands and about 15% of the banana market in Switzerland in the year 2000. The existence of positive market shares for these products whose price is often higher than that of traditional products is a revealed preference argument for the relevance of ethically concerned

³Minimum wage under perfect competition may have perverse welfare effects reducing labour demand and increasing unemployment (Basu, 2000). This is obviously not the case in a monopsonistic labour market when the wage rises from its equilibrium level to the perfect competition level. Recent empirical papers confirm that, when workers are unskilled and easily replaceable, labor markets tend to be monopsonistic or oligopsonistic. Card and Krueger (2000) find that minimum wage introduction has positive impact on output and employment in the fast-food market in New Jersey and Pennsylvania. Ross (2000) interprets this result as being the typical effect of the introduction of a minimum wage measure in a monopsonist labour market.

⁴ We do not consider explicitly here another indirect but fundamental role of the fair trade. The creation of a pressure group of consumers which advocate, with their behaviour, a change in trade rules such as US and EEC import duties and export subsidies. Under this perspective we may view fair trade as an alternative channel which tries to reduce the negative consequences of those agricultural policies on developing countries.

consumption and for the existence of ethical or fairness arguments in consumers' utility function.⁵

The diffusion of forms of socially responsible consumption such as fair trade is accompanied by a wide range of imitation strategies enacted by traditional producers. Many more companies are starting advertising not only price and quality but also the ethical features of their products.⁶ Social labelling and corporate responsibility is gradually becoming an important competitive feature in real and financial markets.⁷

⁵ There is a growing interest for socially responsible savings and consumption also in the institutions. In 1999 the United Nations launched the Global Compact, a coalition of large businesses, trade unions and environmental and human rights groups, brought together to share a dialogue on corporate social responsibility. In the same year the European Commission issued a document on Fair Trade (29.11.1999 COM(1999) 619. In its introduction it is stated that *"Fair trade" is an example of development occurring through trading relationships and improved commercial opportunities to bridge the gap between developed and developing countries and to facilitate the better integration of developing countries in the world economy. "Fair trade" initiatives give consumers the opportunity to contribute towards sustainable economic and social development in developing countries through their purchasing preferences.* The Commission provided financial support for research and education on *fair trade* to NGOs within the EU (3,7 millions of Euros in 1998). More recently, in July 2001, the Commission issued a Green Book COM(2001) 366 to promote firm social responsibility in the European framework. Large part of the Green Book deals with fair trade.

⁶ Corporate perception by consumers (90 percent of respondents) is by far the most selected item (against ethical values of managers, tax incentives and relationship with stakeholders) when a sample of interviewed socially responsible companies is asked about reasons for their socially responsible behaviour in the "2003 Corporate social responsibility monitor". This finding is consistent with our hypothesis that ethical imitation is today a relevant competitive feature in product markets.

⁷ In a recent survey the "2003 Corporate social responsibility monitor" finds that the amount of consumers looking at social responsibility in their choices jumped from 36 percent in 1999 to 62 percent in 2001 in Europe. In addition, more than one in five consumers reported having either rewarded or punished companies based on their perceived social performance and more than a quarter of share-owning Americans took into account ethical considerations when buying and selling stocks. The Social Investment Forum reports that in the US in 1999, there was

The aim of this paper is to provide a theoretical background for this emerging kind of competition. We do so by adopting a horizontal differentiation approach and by reinterpreting the well known Hotelling line segment in terms of ethical instead of geographical space.

The paper is divided into six sections (including introduction and conclusions). In the second section we analyse the fixed location game and show that the entry of an ethically concerned producer leads to a reduction of the price of the monopolist incumbent. Ex post, the optimal price of the latter is halfway between his zero profit price and the zero profit fair trader price. In the third section we remove the assumption of incumbent fixed location. We demonstrate that his optimal behaviour does not change when his marginal costs of ethical imitation are lower than consumers marginal costs of ethical distance. This maximum (ethical) differentiation result is crucially affected by three differences between the traditional Hotelling game and the ethical differentiation game: i) the presence of a zero profit entrant; ii) the asymmetry in costs of ethical distance; iii) the lack of independence between ethical location and prices under the reasonable assumption that there are no “free lunches” in ethical responsibility.

In the fourth section we analyse the simultaneous price-ethical location choice of the incumbent. This choice leads to maximum ethical differentiation (and therefore coincides with the equilibrium of the fixed location game) if (consumers) marginal costs of ethical distance are smaller than (incumbent) marginal costs of ethical mimicking. When the opposite occurs, we obtain a nice result of minimum price differentiation together with ethical imitation.

In the fifth section we devise a three-stage game in which the profit maximising producer is Stackelberg leader in location by choosing it in the first stage. The ethical entrant chooses location

more than \$2 trillion worth of assets invested in portfolios that used screens linked to the environment and social responsibility.

in the second stage by maximising transfers to the South, while the profit maximising producer chooses prices in the last stage of the game.

We solve the game by backward induction and find that the equilibrium behaviour of the profit maximising producer has three features: i) minimum price differentiation; ii) ethical imitation; iii) non minimal ethical differentiation. Differently from the previous case this result does not depend from the relationship between costs of ethical imitation and costs of ethical distance. The reason is that Stackelberg leadership in location creates an additional incentive to ethical imitation since the profit maximising producer anticipates that his ethical position will positively affect ethical stance and prices of the FT and will therefore allow him to raise prices as well.

This last result changes in the game in which the FT becomes Stackelberg leader. In this case ethical imitation depends again from the relationship between costs of ethical distance and costs of ethical imitation. Furthermore, the FT strategically chooses his location conditional to the expected imitating/non imitating behaviour of the profit maximising producer. If he anticipates that the PMP is not going to imitate him he will reduce his ethical position not to lose too much market share because of the PMP stronger price competition.

2.1 The model

Most of the hypotheses in the model which follows are standard assumptions in the horizontal differentiation literature. Some of them are original and are given by the specific nature of ethical competition.

We consider the existence of a monopolist not concerned with ethical issues selling a good to consumers with inelastic, unit demands uniformly distributed across the line segment $[0,1]$. The monopolist activity consists of transforming raw materials received from unskilled producers in the South paid with a

monopsony wage (w). The final product is sold to consumers in the North. The monopolist also pays a duty (d), has operating costs (g) proportional to the wage paid and finally maximizes profits by fixing a price P_A for his product. In this first version of the model we assume, for simplicity, and without lack of generality, that the incumbent is set at the extreme of the ethical segment (or that he takes a position $a=0$).

In this first simple version of the model a “socially responsible” producer enters the market and places himself at the right end of the line segment (taking a position $b=1$). This producer, exactly as the fair traders described in the introduction (this is the reason why we call him also FT), is zero profit and his goal is to maximise transfers to raw material producers in the South to raise their wage from monopsony to competitive levels⁸ and to transfer resources which can be invested in local public goods to improve future market opportunities for these producers.⁹

After FT's entry consumers may choose between two products which differ in prices and ethical features.

The difference with respect to the traditional horizontal differentiation models is that a different position in the interval for consumers does not imply differences in physical distance but in the psychological perception of the ethical value of the good.¹⁰

⁸ We take the fair trader as an example of socially responsible producer and identify social responsibility in the resources transferred to producers in the South. Our model may be generalised and applied also to biological producers by assuming that the adoption of environmentally responsible production processes increases costs exactly as in our fair trader's example

⁹ The diffusion of producers which create private and social value without being profit maximisers is confirmed by the fact that fair trade producers exist and are growing. In the year 2000 there were 97 fair trade importers from 18 countries and 2740 no profit retailers of fair trade products only in Europe according to the Fair Trade Association. In 2000, in the U.S. and Canada, 600 outlets wholesaled Fair Trade products, while at least 2575 offered retail. In 2001, at least 7000 provided retail.

¹⁰ In this model we abstract from considerations of asymmetric information and divergences between consumers' and sellers' perception of the ethical value of

The consideration of ethical instead of physical distance makes a difference in at least two ways. First, consistently with our concept of ethical distance, the cost of moving along the line segment is positive only for those going from a more ethical to a less ethical point (Figure 1). As a consequence, by considering the extreme right of the segment as the most ethical position, consumers move without costs to the right, while they incur in costs proportional to the “ethical” distance anytime they move to the left.¹¹

We assume that consumers utilities are decreasing in product price and also in the distance between consumer's ethical stance and the ethical value incorporated in the purchased product.¹² The psychological cost of buying a product which is below one's own ethical standards is t times the ethical distance so that consumer's welfare is

$$Wc = Rp - \Pi - t(x-a) \text{ if } x-a \geq 0^{13}$$

the good by assuming that they coincide. To reduce distance from reality it may be interesting in an extension of this model, to analyse market equilibria under asymmetric information and considering the role of ethical labelling.

¹¹ The rationale for these assumptions is that moving to the left implies choosing a product below one's own ethical standards (which is psychologically costly), while moving to the right implies choosing a product above one's own ethical standards (and therefore we assume it does not give any psychological cost to the buyer).

¹² We do not enter here in the debate on the misrepresentation of altruism. The “self-centered” approach to altruism, on the one side, argues that it is enough to represent it by introducing the utility of other individuals in one's own utility function (Becker, 1974). The relational approach to altruism, replies saying that this is insufficient since altruistic people should be modelled as taking their decisions also on the basis of their impact on the network of relationship in which they are involved (Zamagni, 2002). We just analyse the effects of altruistic preferences on the choice of goods incorporating social values. In this case the two approaches are observationally equivalent since both the self-centered and the relational altruist would prefer, *coeteris paribus*, a more socially responsible product. Therefore our analysis is compatible with both perspectives.

¹³ The way we design consumers preferences is consistent with empirical evidence and consumers surveys in which values are shown to be a determinant

or

$$W_c = R_p - P_i \text{ if } x - a < 0$$

where (P_i) is the price of product sold by the i -th seller, (R_p) is the common consumers' reservation price and x denotes generic consumer location.

2.2 The entry of the ethical producer in the fixed location game

Consider now in a fixed location game the effects on the incumbent strategy of the entry of an ethically concerned producer which generically takes a position b and fixes a price P_B for his product. The ethical features of the entrant (exactly as the "fair trader" does) consist of selling his product at zero profit and transferring a "free margin" s (obtained after paying the monopsony wage, the duty and operating costs) to finance investment in public goods and education in the South. The zero profit condition of the entrant is: $P_B = w(1 + g + d + s)$

Since we assumed that ethical responsibility has costs (being related to the transfer s), the position on the segment depends on the amount s transferred to the South.¹⁴ In this first example we

of choices together with prices (see footnote 6 on 2003 Corporate social responsibility monitor). From a theoretical point of view this point has been remarkably analysed, among others, by Sen (1993) showing that people choose also on the basis of their values and, for this reason, they do not always choose what they would strictly prefer on the basis of prices. Lexicographic preferences are ruled out here but may be considered a limit case of our model when costs of ethical distance go to infinity.

¹⁴ Consider again that, since environmental responsibility is one of the main features of fair trade products, the reasoning of our model also applies in case we replace the socially responsible (transfer to the South) with the environmentally responsible (adoption of a more environmental product) feature of the ethical entrant. In this case we should assume a trade-off between environmental sustainability and production costs assuming that the producer chooses a technique with an added marginal cost s for any unit sold generated by the adoption of environmentally sustainable practices.

assume for simplicity that the location of the fair trader is determined by his ethical concerns and exogenously set at $b=1$. After the FT's entry the consumer's indifference condition is equal to $-P_A - t(x-a) = -P_B$ if $x-a \geq 0$ and $-P_A = -P_B$ if $x-a < 0$. It is therefore clear that the condition for a nonzero market share for the FT is that, for some x , $t(x-a) > P_B - P_A$. Since in this first simple example we set $a=0$, we obtain the following share for the incumbent: $x^* = (P_B - P_A)/t$.

The new entry therefore shrinks the incumbent market share the higher the costs of ethical distance (t) perceived by consumers.

Proposition 1. When the incumbent location is fixed he finds it optimal to reduce his price after the fair trader entry. His optimal price is halfway between his zero profit price and the zero profit fair trader price

After the fair trader entry the incumbent maximises:

$$\text{Max } \pi_A = [P_A - w(1+g+d)] \left[\frac{P_B - P_A}{t+a} \right] \quad (1)$$

Solving his first order condition and substituting for the fair trader's zero profit condition we obtain, under $a=0$, $P_A^* = w(1+g+d) + sw/2$.

The incumbent price is obviously increasing in the duty and in operating costs, but also in the fair trader transfer to the South. To understand the price strategy of the incumbent after the fair trader's entry we observe that his optimal price is halfway between his zero profit price and the zero profit fair trader price. This means that the incumbent divides the distance between these two prices in two halves. One of them is his margin and the other is the extent of the price cut (see fig.2). ■

The FT's entry determines these effects on prices by introducing a new element of competition. Given that in this fixed location

game the incumbent cannot react on location he must use prices to compete with the entrant and to defend his market share.

Solving for the incumbent market share we get: $x^* = sw/2t$ when $sw/2t \leq 1$ and $x^* = 1$ when $sw/2t \geq 1$.¹⁵ The share is increasing in the fair trader transfer, in the monopsony wage paid to producers in the South and decreasing in the perceived costs of buying below one's own ethical standard.

More specifically, if, without loss of generality, we normalize wage in the South ($w=1$) and assume a transfer equal to that wage ($s=1$), we obtain that $x^* = 1/2t$. This implies that, with consumers' marginal costs of ethical distance equal to one ($t=1$), the incumbent's share shrinks exactly to one half of his previous monopolistic size.¹⁶ It shrinks more if ethical costs are more than proportional to the ethical distance, with $\lim_{t \rightarrow \infty} x^* = 0$. The residual share $1-x^*$ is for the entrant.

3.1 Ethical imitation: the indirect effect of the fair trader entry on the incumbent location.

We now relax the hypothesis that the incumbent is unable to change his location after the fair trader's entry. The first steps of the game are the same as in section 2.1. The incumbent is originally a monopolist located at the extreme left of the line segment ($a=0$), the entrant places himself at the opposite extreme ($b=1$). The incumbent reacts by choosing a new price to maximize profits in the duopolistic market. We assume here that, after this move, the incumbent optimally chooses a new location at given prices. The assumption that the location choice comes after the price choice relies on the higher adjustment costs in changing

¹⁵ This means that the FT has a nonzero market share only if marginal costs of ethical distance (t) are more than half the marginal costs of transfer to the South (sw).

¹⁶ To relate these parameter values to reality consider that fair traders' transfer to producers in the South usually varies from 1 to 3 times the amount of market wages.

ethical location (i.e. moving to a more environmentally compatible production process, organizing a transfer to producers in the South) with respect to varying prices.¹⁷

In principle we could argue that it is possible for the incumbent to move costlessly to the right. In reality, if the move is real and not mimicked, it is hard to find a change toward social and environmental responsibility which does not imply any cost. Therefore we reasonably assume that there are no “free lunches” in ethical responsibility and, in order to move right in the ethical location, the incumbent must transfer a positive sum to producers in the South in the same way as the fair trader does. Since $a \in [0,1]$ we argue that (as) is the total incumbent transfer, where (s) is the fair trader transfer and (a) the incumbent’s locational choice. This parametric choice ensures that, if the incumbent chooses an ethical location identical to that of the fair trader ($a=b=1$), he transfers exactly the same amount to the South.

A second crucial difference between ethical and traditional horizontal differentiation here clearly emerges. Ethical location and price are not two independent variables. This difference adds to the two already mentioned: distance costs apply only in one direction (movements to the right in the ethical segment) and one of the duopolists (the fair trader) does not maximize profits.¹⁸

¹⁷ The assumptions of this game may be seen as more realistic in the case in which the incumbent is conceived as a cartel of incumbents which collude in prices. This may make easier for the incumbent(s) to respond with changes in location than with changes in price. This model is also a useful benchmark to analyse the different behaviour of the incumbent in more realistic games in the rest of the paper

¹⁸ The specific nature of the two players in our game, the relationship between the (ethical) space and price variables and the asymmetry in the costs of ethical distance are all features which differentiate our game from the traditional horizontal differentiation game in which equilibria may be found only when price and location are chosen sequentially and not simultaneously (Anderson, 1987; Lambertini, 1997).

Proposition 2. When the incumbent, after choosing his optimal price strategy, is free to compete in ethical location with the entrant he chooses maximum ethical differentiation (no imitation) unless marginal ethical costs perceived by consumers are higher than incumbent's marginal costs of imitation.

Before solving the location problem of the incumbent we intuitively realize that the minimum differentiation principle does not apply to the ethical differentiation game as it is not convenient for the incumbent to move too much to the left. As we explained before, any move on the line segment implies that, for a given location (a), the incumbent must transfer a share (a) of the total transfer (s) to producers in the South.

Since the equilibrium prices in the fixed location game were $P_A = w(1+g+d)+sw/2$ and $P_B = w(1+g+d+s)$, it is clear that the incumbent can, in principle, place himself at $1/2$ of the line segment. In this case his price P_A^* would be equal to his costs $w(1+g+d+s/2)$ leading him to a zero profit condition. Since he is a profit maximiser it is also clear that this is not an optimal choice for him.

He will therefore prefer to move leftward from that point by paying a lower (s) and maintaining all consumers at his left with a price lower than that of the entrant.

More formally, the ethical imitation problem implies the solution of the following maximand

Max

$\pi_A =$

$$\int_a^{x^*} [P_A^* - w(1 + g + d + as)] dx + \int_0^a [P_A^* - w(1 + g + d + as)] dx \mid P_A \leq P_B$$

(2)

(a)

We immediately see that the condition for the second part of the maximand is always respected (otherwise the market share of the incumbent goes to zero). Therefore the problem reduces to:

$$\max [P_A^* - w(1 + g + d + as)]x^* \quad (2')$$

(a)

which yields $a^* = 1/4 - ws/4t$ with $\partial a/\partial t = ws/4t^2 > 0$.¹⁹

Considering the convenient parametrisation of $w=1$ and $s=1$, we find that the incumbent does not move at all when consumers marginal costs of ethical distance are lower than his marginal costs of ethical imitation, while he moves to $1/8$ of the segment if consumers marginal costs are twice as much his costs of ethical imitation.

The minimum differentiation principle does not apply here because of the different nature of the two competitors (a profit maximizing and a transfer maximizing firm). More specifically, the incumbent by moving right faces a trade-off in which benefits from a larger market share (crucially depending on consumers costs of ethical distance) are offset by higher production costs. When marginal producer costs of imitation are higher than marginal consumers costs of ethical distance ($ws > t$) we hit the nonnegativity ethical location constraint and $a^* = 0$.

By substituting we find the new market share of the incumbent. For $t > sw$ we get $x^{**} = (ws + t)/4t$. Again with $w=1$ and $s=1$ and with ethical costs which are equiproportional to the ethical distance ($t=1$), the market share is still $1/2$ as in the fixed location game, while it becomes smaller, for instance, when ethical costs are twice as much the ethical distance $x^{**} = 3/8$ if $t=2$. On the contrary, if $t < sw$, the incumbent does not move and we revert to the $x^* = sw/2t$ result of the fixed location game.

The existence of an indirect effect on the incumbent, generated by the entry of the ethical producer, crucially depends on the ethical costs perceived by consumers. In any case the distance between the two producers remains strong (much larger than in the minimum differentiation principle) given their different goals (profit and transfers maximisation) and the costly nature of ethical imitation. A graphical intuition of why is so costly to imitate the

¹⁹ To verify that this point is a maximum consider that $\partial^2 \pi / \partial a^2 = -2sw < 0$.

ethical producer is presented in Figure 3. Part of these costs depend on the fact that we assume that ethical imitation occurs after choosing the optimal price strategy. In the sections which follow we will remove this assumption.

4. The simultaneous price-ethical location choice of the incumbent

In the two previous games we analysed the price reaction (fixed location game) and the location reaction (location game) of an incumbent assuming that he could use only one of his two instruments at the same stage of the game. In this game we want to analyse his reaction by removing this restrictive assumption and by letting him operate simultaneously on both instruments. The solution of this game leads us to formulate the following proposition.

Proposition 3. If the incumbent jointly maximizes price and ethical location after the ethical producer's entry, the market moves from an equilibrium with maximum ethical differentiation with no imitation to an equilibrium with ethical imitation and minimum price differentiation when consumers marginal costs of ethical distance switch from a lower to a higher value than producer costs of ethical imitation

In the simultaneous price-location game the incumbent maximizes:

$$\text{Max } \pi_A = [P_A - w(1+g+d+as)] [(P_B - P_A)/t+a] \quad (3)$$

(a, P_A)

under

- i) the nonnegative location constraint $a \geq 0$;

- ii) the positive mark-up constraint ²⁰
- iii) the nonzero sales price constraint $P_B > P_A$.

This last constraint is justified by the fact that, to be competitive, the PMP must have a price at least slightly lower than the entrant in order to conquer all consumers located at his left.

The first order condition gives the following optimal price as a function of: i) the location strategy of the entrant and ii) the consequences of the incumbent location strategy on his price.

$$P_A^* = w(1+g+d) + (sw+asw+at)/2 \quad (4)$$

The first order condition with respect to (a) yields

$$-ws[(P_B - P_A)/t+a] + [P_A - w(1+g+d+as)] = 0 \quad (5)$$

by substituting the price reaction function and solving for (a) we find that there are no internal optimal points.²¹

We therefore look for a solution along the border of the *feasible set* (which is a rectangle delimited by the constraints rewritten as i) $1 \geq a \geq 0$ and ii) $P_B > P_A > w(1+g+d+as)$). We find only two feasible solutions: $a^* = 0$ and $a^{**} = 1/2 - \varepsilon(1+sw/t)$. These values give the following pair of equilibria $E_1[P_A^*, a^*]$ $E_2[P_A^{**}, a^{**}]$ with $E_1 = [w(1+g+d) + (sw+aw+at)/2, 0]$ and $E_2 = [P_B - \varepsilon, 1/2 - \varepsilon(1+sw/t) * (1/2sw)]$

To find the highest between the two we must replace them into the profit function, which becomes respectively:

$$\pi(E_1) = (1/4t)[sw]^2 \quad \text{and} \quad \pi(E_2) = sw/4$$

It is clear that, for ε small enough, when $t < sw$ the solution E_1 (which hits the constraint $a^* = 0$) has the highest value since

²⁰ This constraint is added to rule out positive values generated by the product of negative margins and negative market shares

²¹ We in fact obtain $a^* = \frac{-sW}{t - sW}$ which is negative for $t > sw$ while, when $t < sw$ the determinant of the Hessian does not meet conditions for a maximum.

ethical imitation reduces profits. On the contrary, when $t > sw$, ethical imitation is convenient up to the satisfaction of the nonzero sales price constraint and, therefore, the solution E_2 yields the highest value. By comparison with profits in the other extreme points of the feasible set of values it is clear that these two solutions are also the absolute maxima under the two different cases (E_1 when $t < sw$ and E_2 when $t > sw$).²²

The equilibrium of the simultaneous price-ethical location choice therefore yields maximum differentiation if marginal (consumers) costs of ethical distance are smaller than marginal (incumbent) costs of ethical imitation. When the opposite occurs we obtain a nice result of ethical imitation and minimum price differentiation (remember that, in this case, $P_B = P_A + \varepsilon$). ■

From this solution we can notice again the positive effect of (t) , the consumers marginal cost of ethical distance, on ethical imitation, which is obviously related to the fact that the incumbent gains more market share by increasing the ethical features of his product.

5.1 The three-stage price-location game when the profit maximising producer is the Stackelberg leader.

We analysed so far different versions of the ethical differentiation game. Each of them considered the profit maximising producer (henceforth also PMP) as already being in the market when the FT comes in. In this section we analyse the solution of the game when the profit maximising producer may choose his original location already knowing that the FT is going to enter the market. We devise a three-stage game in which the profit maximising producer is Stackelberg leader in location and chooses location in the first stage. The FT chooses location in the second stage by

²² Additional details on the comparison of these solution is available from the authors upon request

maximising transfers to the South, while the PMP chooses price in the last stage of the game maximising profits.²³

We solve the model by backward induction. We start from the solution of the third stage (price of the PMP as a function of location of both producers). We then pass to the solution of the second stage (location of the FT as a function of the PMP's location) and, finally, we solve in the first stage for the PMP's location.

Proposition 4. The equilibrium of three stage game in prices and ethical location in which the incumbent is Stackelberg leader in location always yields minimum price differentiation, ethical imitation and non minimal ethical differentiation

In the third stage of the game the PMP maximises the following profit function by choosing his optimal price:

Max

$\pi_A =$

$$\int_a^{x^*} [P_A - w(1 + g + d + as)] dx + \int_0^a [P_A - w(1 + g + d + as)] dx \mid P_A \leq P_B$$

(6)

(P_A)

Again, since the condition for the second part of the maximand is always respected (otherwise the market share of the profit maximising producer goes to zero), the problem reduces to:

$$\text{Max } \pi_A = [P_A - w(1 + g + d + as)] [(P_B - P_A) / (t + a)]$$

(P_A)

By solving first order condition we find that the PMP optimal price as a function of the location of both players is:

$$P_A^* = w(1 + g + d) + (sw + asw + at) / 2 \quad (7)$$

²³ Given the structure of the game we believe it is more accurate to call the two players profit maximising producer and fair trader (instead of incumbent and entrant) in this section and in those which follows.

and may be rewritten as:

$$P_A^* = P_B - sw/2 + (asw + at)/2 \quad (7')$$

Remember that $-sw/2$ is the typical component of the solution of the fixed location game in which the PMP chooses to stay halfway between the price of the FT and his zero profit solution (see Fig. 1). Therefore the PMP's optimal price is his fixed location optimal price plus an additional part, $(aw + at)/2$. This component shows that added costs of the PMP, in case he decides to mimic the FT, must be partially incorporated into higher prices. Consider also that these added cost components are increasing in consumers costs of ethical distance. If they are higher, the incumbent will have to concede more to obtain new consumers. As a consequence, the PMP market share is:

$$x^* = (P_B - P_A)/t + a = [sw + a(t - sw)]/2t. \quad (8)$$

This result shows that a decision to mimic the FT has positive effects on his market share, on the one side, but also negative effects which are proportional to the marginal cost of raising transfers to the South (which must be partially transferred into prices) and to the cost of ethical distance on the other side.

In the second stage game the FT chooses location by maximising transfers to the South

$$\text{Max } T = s[1 - x^*] = s[1 - (sw - at - asw)/2t - a].^{24} \quad (9)$$

His solution is

$$s^* = [t(2 - a)/2w(1 - a)]. \quad (10)$$

²⁴ Consider that, if the FT chooses $s < 1$, all consumers placed at his right will have positive costs of ethical distance. They nonetheless will remain his customers.

Consider that, under $a=0$ and $t=w$, the FT finds it optimal to locate himself at the extreme of the segment ($s^*=1$). Therefore our exogenous assumption of the fixed location game is rationally supported in this parameters' space. This occurs because the FT takes into account that his location and the PMP price are strategic complements ($\partial^2\pi\partial P_A\partial s>0$). By moving far he will leave room for a price increase for the PMP and this will reduce the potential costs of reduced market share generated by his location choice.²⁵

In the first stage of the game the PMP solves

$$\text{Max } \pi_A = [P_A^* - w(1+g+d+as)][x^*] \quad (11)$$

(a)

or

$$\text{Max } \pi_A = (1/4t)[s^*w + a(t-s^*w)]^2 \quad (11')$$

(a)

where s^* is given by (10) under

- i) the nonnegative locational constraint $a \geq 0$
- ii) the positive mark-up constraint
- iii) the nonzero sales price constraint $P_B > P_A$.

The unconstrained solution of the maximisation is $a^* = -2$. This solution does not satisfy the nonnegative mark-up constraint as it is the product of a negative mark-up and a negative market share. We therefore evaluate the profit function in the two points where constraints i) and iii) respectively are satisfied with equality.

The highest profit is in the point in which $P_B = P_A + \varepsilon$ and yields:

$$a^{**} = 2/3 - 4\varepsilon/3t \quad (12)$$

since the profit function is increasing in a , for any value of $a > 0$ a^{**} is our maximum point.

Looking at (11') and considering an exogenous s we would get exactly the same result as in the game presented in section 4 with $a^* = 0$ with $t < sw$. In this case though $s^*(a)$ with $\partial s / \partial a > 0$. Therefore the incentive for the PMP to ethical imitation (or we should say preemption in this case) is higher than before.

The equilibrium behaviour of the PMP has three features: i) minimum price differentiation; ii) ethical imitation; iii) absence of minimum location differentiation.

By solving backward we therefore find that the optimal location of the FT for $t = w = 1$ would be $s = 1$ if $a = 0$ but gets higher than one since we know that the incumbent's ethically imitates the entrant and $a > 0$. With $a > 0$ and $t = w = 1$ $s^* > 1$.

What is the relationship between the first stage price solution (minimal price differentiation of the PMP with respect to the FT) and the third stage price solution? If both conditions hold we replace the third stage price in the first stage price solution and obtain

$$w(1 + g + d) + \frac{sw + at + asw}{2} = w(1 + g + d) + sw - \varepsilon$$

which yields $a^* = \frac{2}{3} - \frac{4\varepsilon}{3t}$ which is exactly the solution for the

location of the PMP in the third stage. By replacing in the FT optimal location we get $s^* > 1$. The condition for ε to be compatible with these solutions is $\varepsilon < t/2$. ■

An interesting property of this solution is that the propensity to imitate is much higher than in the ethical imitation game (remember that, if $t = sw$, $a = 0$ in the ethical imitation game of section 3). The rationale is that, if the PMP fixes his optimal price without considering the possibility of a change in location, he is stacked into a too low price to make ethical imitation profitable.

Another related crucial point is that here, differently from what happens in the joint price-ethical location game of section 5.1, we

always have ethical imitation even if $t < sw$. This is because the PMP knows that his location choice in the first period is strategic and will affect that of the follower. More specifically, by moving left he has the advantage of making more ethical also the FT location. This will allow the PMP to raise price (remember that FT location and PMP price are strategic complements).

5.2 The three-stage price-location game when the FT is the Stackelberg leader

We are now interested to see whether our results change if we assume that the FT is Stackelberg leader in location. We will demonstrate here that the solution is similar to the one presented above with a slight but important difference when the traditional producer marginal costs of imitation are lower than consumers marginal costs of ethical distance

Proposition 5. The equilibrium of three stage game in prices and ethical location in which the FT is Stackelberg leader in location yields minimum price differentiation, ethical imitation and non minimal ethical differentiation only when consumers marginal costs of ethical distance are higher than producer costs of ethical imitation. When consumers costs of ethical distance are lower than traditional producer's transfer costs per unit sold, the optimal location of the FT will be relatively less ethical than in the case in which he is Stackelberg follower

The solution of the third stage game in which the profit maximising producer chooses prices is the same as before and yields the following function of the PMP's optimal price given the locations chosen by the two players:

$$P_A^* = w(1 + g + d + s) - sw/2 + (aw + at)/2 \quad (13)$$

and, consequently, the following equilibrium market share

$$x^*=(sw+at-asw)/2t \quad (14)$$

In the second stage the PMP now optimally chooses his location

$$\text{Max } \pi_A=[P_A^*-w(1+g+d+a)][x^*] \quad (15)$$

s.t

- i) the nonnegative locational constraint $a \geq 0$
- ii) the positive mark-up constraint
- iii) the nonzero sales price constraint $P_B > P_A$.

By solving this maximisation we find the two following optimal solutions: $a^*=0$ when consumers marginal costs of ethical distance are lower than PMP marginal costs of ethical imitation ($t < sw$) and $a^*=(sw-2\varepsilon)/(sw+t)$ if $t > sw$.

In the first stage the FT solves his location problem

$$\text{Max } T=s[1-x^*]=s[1-(sw+at-aw)/2t] \quad (16)$$

for $a^*=0$ the maximand turns into

$$\text{Max } T=s[1-sw/2t] \quad (17)$$

Therefore, in this case, the equilibrium triple is characterised by the relationship between consumers marginal costs of ethical distance and the PMP marginal costs of ethical imitation. More specifically, if $t < sw$, $a^*=0$, $s^*=t/w < 1$ and $P_A^*=w(1+g+d)-sw/2$.

If $t > sw$, $a^*=(sw-2\varepsilon)/(sw+t)$,²⁶ $P_a^*=P_b-\varepsilon$ and

$$x^* = \frac{swt - \varepsilon(t - sw)}{t(t + sw)}.$$

²⁶ Consider that PMP ethical imitation is lower than in the sequential game in which the PMP is Stackelberg leader. This is because in the game presented in this section the PMP with his ethical imitation cannot condition strategically the FT to move more to the right.

As a consequence, the optimal location of the FT will be

$$s^* = \frac{t}{w} \left[\sqrt{2 + \frac{t}{\varepsilon}} - 1 \right] \quad (18)$$

which is higher than 1 under the $t > sw$ condition and, possibly, increasing in the consumers perceived costs of buying below their ethical stance.²⁷ ■

When marginal costs of imitation are higher than consumers perceived marginal costs of ethical distance we have a significant difference with the previous case in which the FT was Stackelberg follower (remember that, in that case, $s^* = [t(2-a)/2w(1-a)]$). This time, the FT anticipates that the PMP is not doing ethical imitation and is strengthening price competition. Therefore, in order to maximise transfers, it is better for the FT to reduce his ethical position (and to reduce prices) not to loose too much market share from the price competition of the profit maximising producer.

This implies that the FT, when he is Stackelberg leader, conditions his location to the expected imitating/no imitating choice of the PMP. If the PMP does not imitate him, he will reduce his ethical position not to loose too much market share from the PMP price competition.

6. Conclusions

Globalisation is the leading symbol of our times (Waters, 2001). Globalisation has intensified the perception of world inequalities and of the costs of insufficient provision of global public goods and global governance.

²⁷ Note that, for ε small enough, FT's optimal location is higher here than when he is Stackelberg follower. Consider also that when ε tends to zero the rightward shift of FT's ethical location is limited by the condition that $P_B \leq R_p$.

This increased sensitivity has led to the diffusion of various forms of socially responsible consumption and has transformed ethical responsibility in an additional crucial competitive factor in the market.

In this paper we formalize this new form of competition by devising a duopolistic model *à la Hotelling* in which physical distance is reinterpreted as ethical distance. The differences with the traditional horizontal differentiation literature are mainly three: i) the presence of a zero profit entrant; ii) the asymmetry of distance costs; iii) the lack of independence between ethical location and prices under the reasonable assumption that there are no “free lunches” in ethical responsibility.

Our analysis of competition in a simple duopoly with horizontal ethical differentiation shows that increased price competition is the outcome of the fixed location game in which the incumbent is assumed not to move toward social responsibility. When we let him free to imitate we find that the socially responsible entrant generates significant "ethical" indirect effects by inducing the incumbent to imitate him when consumers costs of ethical distance are sufficiently high. The extent of imitation is limited though by the different nature of the two (profit maximising and zero profit transfer maximising) competitors.

We finally show that the three-stage game in which location and prices are simultaneously chosen and the traditional producer is Stackelberg leader in location has three main features: minimum price differentiation, ethical imitation and non minimal ethical differentiation. Moreover the entrant will choose to be at the extreme of the ethical segment unless costs of ethical imitation are higher than consumers perceived costs of ethical distance.

The difference with the case in which the FT is Stackelberg leader or with the case in which the profit maximising incumbent jointly chooses price and location under the fixed location choice of the ethical entrant is that the ethical imitation choice of the entrant does not depend on the condition of sufficiently high costs of perceived ethical distance by consumers. This is because FT's

location and profit maximising producer prices are strategic complements and the PMP, by choosing to imitate in any case, may push further to the right the FT and thereby raise his prices.

A nice result of the game in which the FT is Stackelberg leader in location is that he will be relatively more ethical when he anticipates ethical imitation by the PMP and relatively less ethical when he anticipates no ethical imitation from the profit maximising producer. In this way he will "strategically" maximise his transfers conditionally to the imitating/no imitating behaviour of the competitor.

A conclusion in the comparison of these last three games is that ethical imitation is higher when the PMP incorporates the future entry of the FT and has the first move, so that he can push the FT more to the right and raise his prices.

Another relevant conclusion is that ethical imitation is enhanced when consumers marginal costs of ethical distance become higher than producer marginal cost of imitation (see Figures 4a and 4b).

Our results support the intermediate point of view between the two extreme opinions on this new type of competition. The first considers it completely marginal arguing that the behaviour of a socially concerned producer has no effects on ethical responsibility of traditional producers. This perspective is contradicted by the large diffusion of ethically oriented advertising which is consistent with our theoretical results documenting the existence of ethical imitation. The second argues that traditional producers with their larger scale may easily replicate the behaviour of ethically concerned producers eliminating them from the market. We show that this extreme point of view is also incorrect. We never get in our model a result of minimal ethical differentiation and we show that ethical imitation from traditional producers is extremely costly and limited.

We believe that, after this first exploration, additional research effort should be exerted in the future in different directions (asymmetric information, joint consideration of geographical and

ethical distance) to evaluate the robustness of our conclusions to changes in the assumptions of the model.

References

Adriani, F., Becchetti, L., 2002, Fair trade: a “third generation welfare” mechanism to make globalisation sustainable ,CEIS working paper n. 170.

Anderson, S., 1987, Spatial competition and price leadership, *International Journal of Industrial Organization*, 5(4), pp. 369-98

Basu, K.; 2000, The intriguing relation between mimum adult wage and child labour, *Economic Journal*, March, v. 110, iss. 462, pp. 50-61.

Cairncross, F, 1997, *The death of distance*, Londra, Orion.

Card, D., Krueger, A. B., 2000, Minimum wages and employment. A case study of the fast food industry in West virginia and in Pennsylvania *American Economic Review*, 90(5), pp. 1397-1420

D’aspromont, C., J.J.Gabsewicz , J.F., Thisse, 1979, On Hotelling’s stability in competition, *Econometrica*, 47, 114-1150.

Hotelling, H., 1929, Stability in competition, *Economic Journal*, 39,41-57.

Dasgupta, P. Maskin, E., 1986, The existence of equilibrium in discontinuous economic games II. Application, *Review of Economic Studies*, 53, 27-41.

Economides, N., 1986, Minimal and maximal product differentiation in Hotelling’s duopoly, *Economic Letters*, 21, 67-71

Envionics Research International, 2003 2003 Corporate social responsibility monitor.

Giddens, A., 2000, Runaway world: how globalisation is reshaping our lives, London, Routledge.

Lambertini, L., 1997, Unicity of equilibrium in the unconstrained Hotelling model, *Regional Science and Urban Economics*, 27 (6), pp. 785-98

Robertson, R., 1992, Globalisation, Londra, Sage.

Ross S.A., 2000, Minimum wages and the Card-Krueger paradox, *Southern Economic Journal*, v. 67(2), pp. 469-78

Sen, 1993, Internal consistency of choice, *Econometrica*, 61, pp. 495-521.

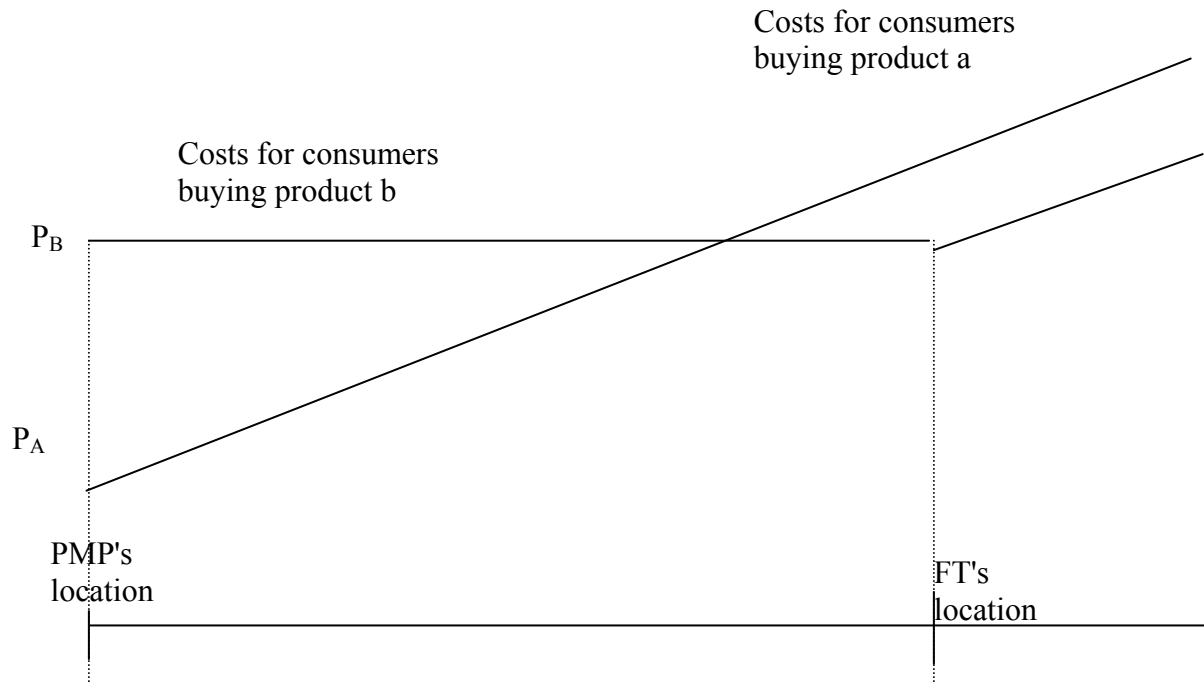
Waters, M., 2001, Globalisation, New York, Rutgers.

Zamagni, S., 2002, Complessità relazionale e comportamento economico, materiali per un nuovo paradigma della relazionalità, Il Mulino, Bologna

Zhou, D. I. Vertinsky, 2001, Strategic location decisions in a growing market, *Regional Science and Urban Economics*, 31, 523-533.

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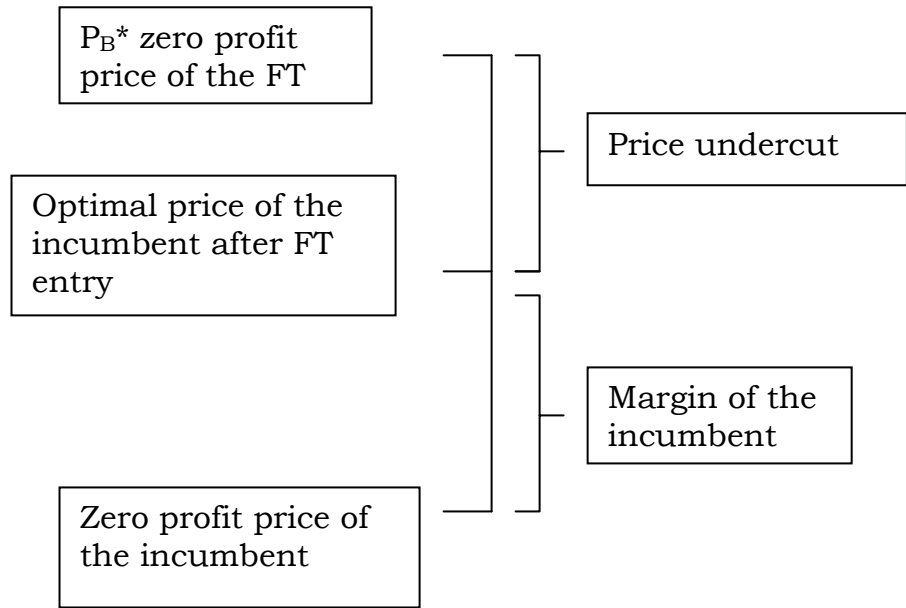
Figure 1. The Hotelling game of ethical imitation and the asymmetric costs of ethical distances



Legend: moving to the left implies choosing a product below one's own ethical standards (and therefore is costly) while moving to right implies choosing a product above one's own

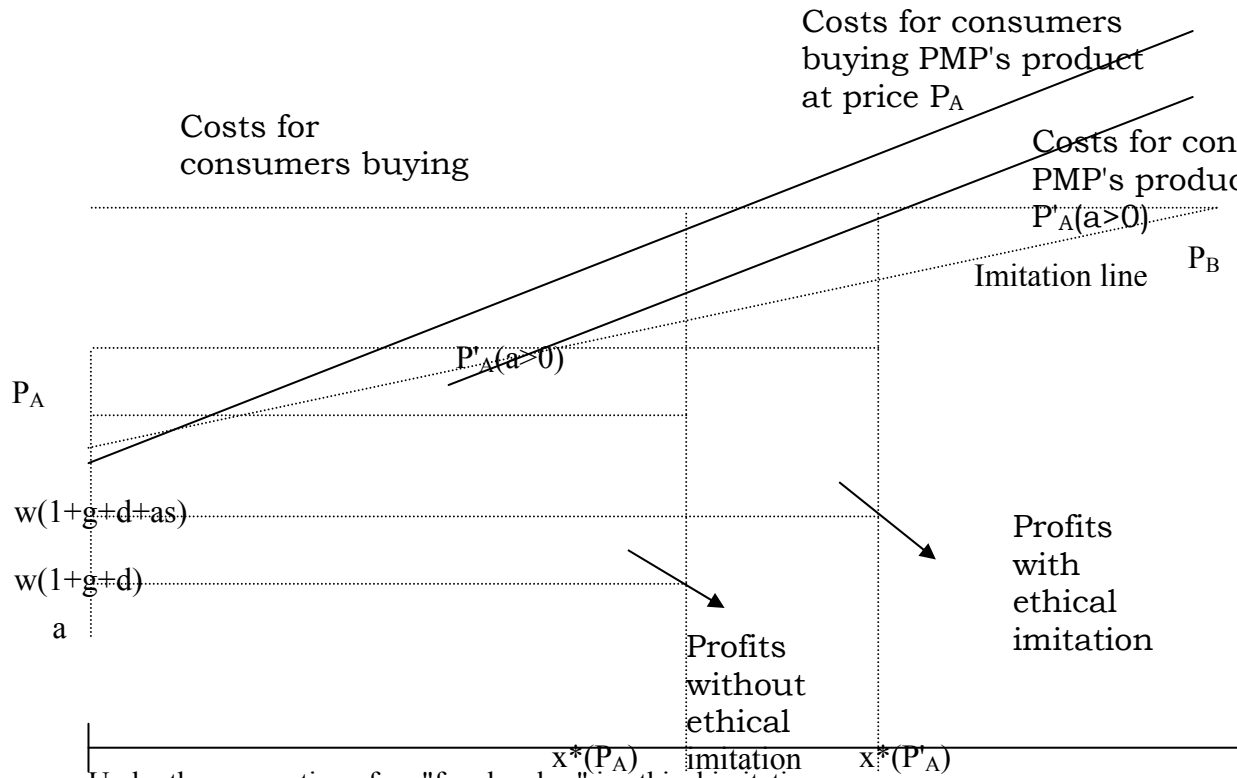
ethical standards (and therefore does not give any added psychological benefit or cost to the buyer).

Figure 2. The optimal price of the incumbent in the fixed location game



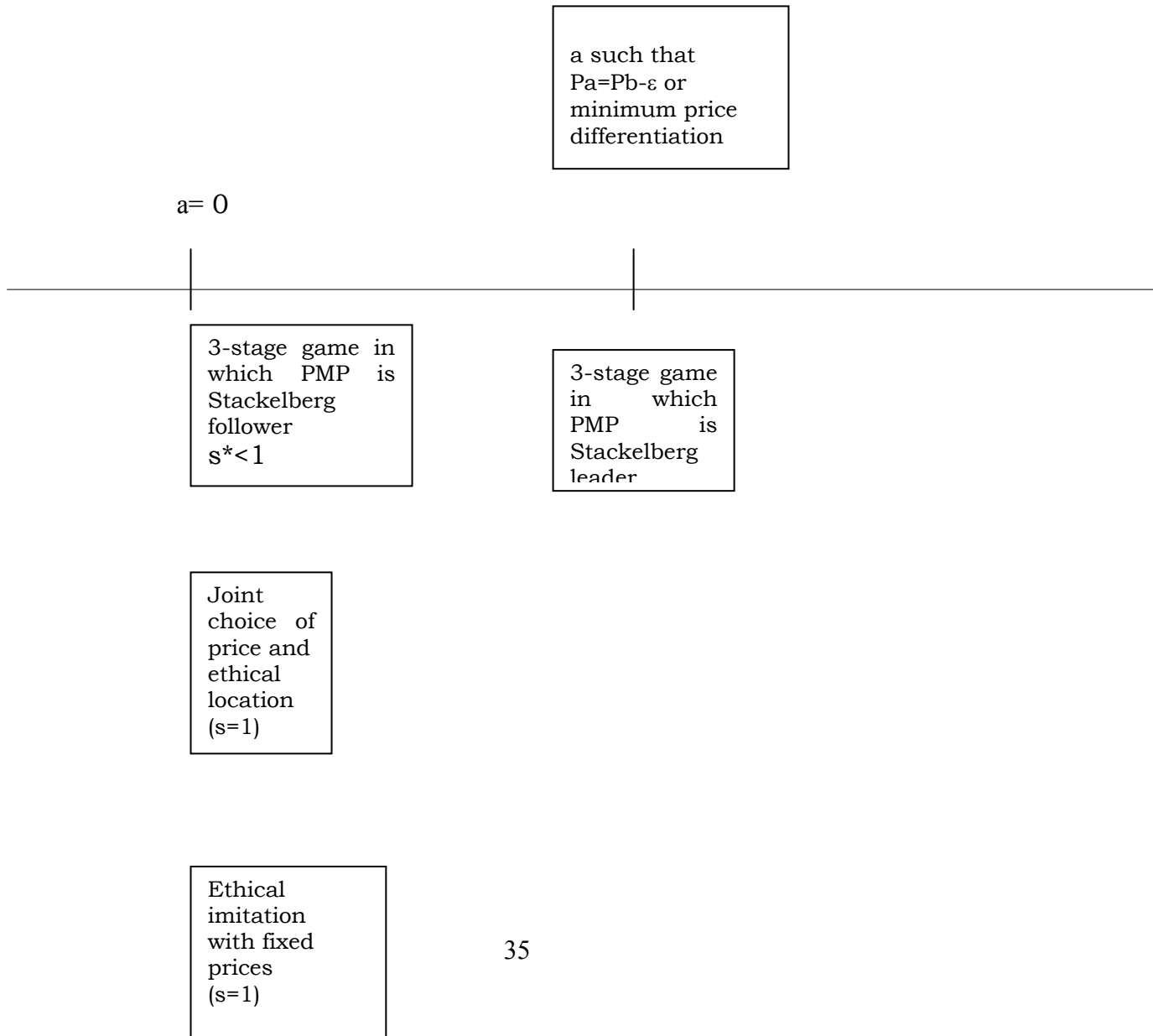
Legend: when the incumbent location is fixed he finds it optimal to reduce price after the ethical producer's entry and his optimal price is halfway between his zero profit price and the zero profit price of the ethical producer.

Figure 3 Why it is so costly for the incumbent to imitate the ethical entrant



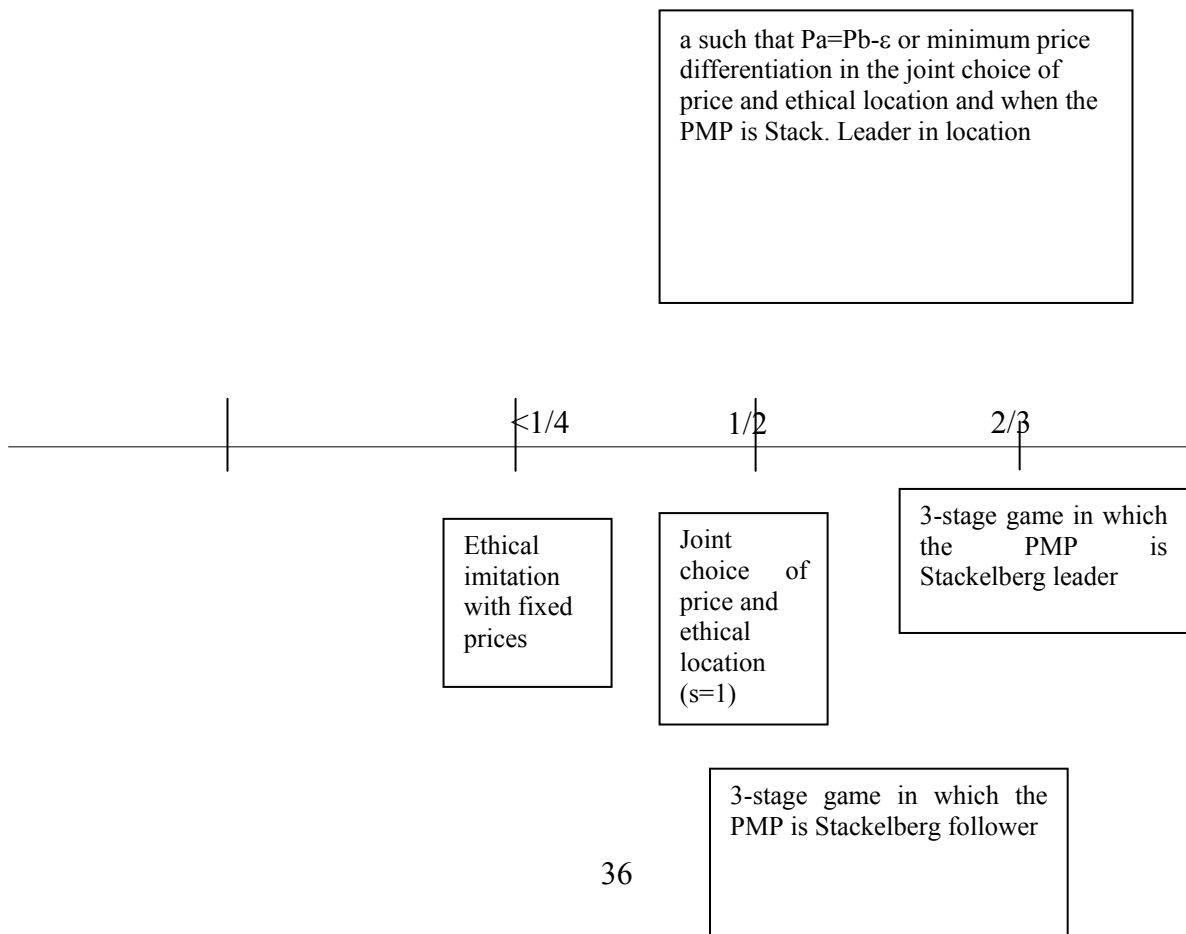
Under the assumption of no "free lunches" in ethical imitation, when the incumbent moves to the right he must move on the dotted line. He therefore conquers additional market share at the cost of reducing his profit margin - which passes from $[P_A - w(1+g+d)] * x^*(P_A)$ to $[P'_A - w(1+g+d+as)] * x^*(P'_A)$.

Figure 4a. PMP ethical location when consumers costs of ethical distance are lower than marginal costs of imitation ($t < sw$)



The maximum ethical imitation is attainable when the PMP has the first move and may affect location of the FT. Notice that, when the FT is Stackelberg leader his optimal location (s) will be less ethical as he anticipates no imitation from the PMP and therefore reduce prices to avoid an excessive reduction of his market share.

Figure 4b. PMP ethical location when consumers costs of ethical distance are higher than marginal costs of imitation ($t > sw$)



The maximum ethical imitation is attainable in the game in which the FT is Stackelberg leader as he anticipates that the PMP will choose imitation and minimum price differentiation and goes further to drive him more to the right.

Synthesis of figures 4a-4b. An increase of t such that t gets higher than sw increases total ethical location of the system. The best solution is obtained when the PMP is Stackelberg leader in location.