# Pricing, Advertising and Trade Policy

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**Abstract**

When selling their products domestically or internationally firms rely on more than just the price as a strategic variable. Any trade policy that affects or limits the use of one of these strategic variables will likely have consequences for all the others. For instance, will liberalization of advertising markets lead to more price competition or will it instead soften price competition as firms will compete more intensively through advertising? In this paper we present a model to provide tentative answers: using a Hotelling model with advertising we study how a domestic and a foreign firm compete not only through their pricing strategy but also through advertising. We first present the equilibrium with free trade and then proceed to study how different trade policies affect the equilibrium strategy mix between pricing and advertising. This model is a first attempt to focus on how trade policy in the service industry, which increases the cost of advertising for foreign firms, alters price competition on the goods market. On the other hand the model allows us analyze how other WTO sanctioned trade policies affect the optimal price advertising mix for both domestic and foreign producers. We show that, in the presence of advertising cost differentials, knowing that AD-duties will be imposed, does not always deter foreign firms from dumping.

**Keywords and Phrases**: Advertising, Trade Policy, Antidumping, Hotelling.

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# 1 Introduction

Many countries still greatly favor local advertisers over foreign advertising companies. Not only does this decrease competition on the local advertising market, it also puts foreign firms, active on the product market, at a disadvantage compared to local producers. Two examples illustrate this.

*In Brazil, an executive decree was signed in 2002 that would require the payment of US$ 28,000 importation fee for each foreign 30-second television commercial.*

*In Australia, imported commercials can not be used, except when a full Australian crew took part in production and no more than 20% of commercial footage may be of foreign places, persons, events, sounds, voices not available in Australia, but production must be an Australian company* (USCIB (2002)).

Foreign firms wanting to advertise their products in these markets are thus either required to use, to a certain degree, local advertisers or they can import their own commercials at an extra cost. Both these restrictions put the foreign firm at a cost disadvantage with respect to the local firm when purchasing advertising services. In this paper we study how these common features influence product market price competition between domestic and a foreign firm. For these firms, both pricing and advertising form part of their strategy mix. Does a disadvantage in using advertising mean that the foreign firm will more or less aggressive on pricing. If it prices more aggressively, it can be perceived to be dumping. If so, what would the effect of an anti-dumping policy be? Will liberalization of advertising markets lead to more price competition or will it instead soften price competition as firms will compete more intensively through advertising? Alternatively, one can wonder how a protectionist tariff, a disadvantage in using pricing, affects the foreign firm's incentive to advertise. Any trade policy that affects or limits the use of one of these strategic variables will likely have consequences for all the others.

We present a model to provide tentative answers to the above questions: using a Hotelling model with advertising we study how a domestic and a foreign firm compete not only through their pricing strategy but also through predatory advertising. We first present the equilibrium with free trade and then proceed to study how different trade policies affect the equilibrium strategy mix between pricing and advertising. This model is a first attempt to focus on the way trade policy in the service industry, which increases the cost of advertising for foreign firms, alters price competition on the goods market. On the other hand, when facing WTO sanctioned trade policies (such as anti-dumping), we can analyze how these policies affect the optimal price advertising mix for both domestic and foreign producers.

We believe that our model provides a few new and interesting insights in the trade literature. We first study how differential advertising costs affect the pricing game and show that the this leads the foreign firm to price more aggressively and advertise less. This result is straightforward but it provides an alternative explanation for price-based dumping. The latter is most commonly attributed to differences in transportation costs (Brander and Krugman (1983)), but here dumping arises from differential costs of using one of many strategic variables. When introducing a tariff we show, interestingly, that it has the exact same consequences as a restriction on advertising: it reduces the foreign firm's use of advertising and has it price more aggressively than the home firm. This is due to the fact that a tariff leads to a lower margin for the foreign firm which subsequently reduces the marginal benefit from advertising and, other things equal, induces it to use her pricing tool more intensively. Hence, no matter whether the disadvantage is in pricing or in advertising, the foreign firm will be tempted to use its pricing tool more intensively and its advertising tool less intensively.

We subsequently investigate the link between the trade restrictions on the service and product market by determining the tariff below which the foreign firm decides to use both advertising and pricing. We then provide a new insight in the trade literature, in which tariffs are known to increase prices: when advertising is rather cheap, the introduction of a tariff leads the foreign firm to decrease its price.

We conclude by introducing to our first scenario an anti-dumping tariff in the form of the price differential to be paid by the foreign firm. We show that, in the presence of advertising, this AD-tariff does not always deter dumping. That is, we can have (perceived) dumping, even in the presence of AD laws. Or, in other words, AD laws do not always deter dumping.

Our paper draws from both the IO literature on horizontal product differentiation and advertising and from the trade policy literature in the presence of an oligopoly. We draw from Matsumura and Matsushima (2009) when introducing tariffs which transforms the classic Hotelling model in one with asymmetric marginal costs. Regarding advertising, a notable reference is Bagwell (2001). In the trade literature, the closest to our paper and, as far as we know, the only paper discussing the effect of trade and industrial policy on advertising and pricing is Ma and Ulph (2009). They study advertising in the context of differentiated duopoly and strategic, export oriented, industrial and trade policy. Ma and Ulph aim to study the robustness of industrial policy versus export subsidies/taxes in the tradition of Bagwell and Staiger (1994), Maggi (1996) and Leahy and Neary. Our paper differs from theirs in at least two dimensions. First, they focus on the robustness of strategic trade policy à la Brander-Spencer (1985) on the goods market from the point of view of the exporting country, while we focus on WTO sanctioned tariff policies from the point of view of importing country, including Anti-dumping measures. Second, our main objective is to study *how* trade restrictions on different markets (goods and/or services) influence the strategy mix of both the protected and the foreign firm. Although the issue of robustness is a very important one, it is beyond the scope of this paper.

The rest of paper is organized as follows. In section 2 we develop the basic model and introduce differential costs of advertising due to restrictions to foreign advertising. Section 3 introduces tariffs and discusses the main results. Section 4 discusses anti-dumping and shows that dumping can occur even in the presence of AD-laws. Section 5 concludes.

## 2 The Model

We consider an international duopoly with a home ($H$) and foreign ($F$) firm where, prior to engaging in price competition, firms invest in advertising to induce loyalty in consumers who would otherwise buy the cheapest product in the home market. The game lasts for two periods. In the first period, the two firms choose simultaneously their amount of advertising and, in the second period compete in prices. Marginal production costs $c_i = c$, $i = \{H, F\}$ are assumed to be constant, and there are no fixed costs. Let $A_i$ be the amount of advertising chosen by the firms, and $C(A_i)$ its associated cost. Advertising costs are assumed to be monotonically increasing and convex: $C_i^{'}(A_i) > 0$, $C_i^{''}(A_i) > 0$ and $C_i^{'}(0) = 0$.

In modeling advertising, we follow a standard Hotelling model of horizontal differentiation. We assume that there is a continuum of consumers uniformly distributed on a line of unit length, with population normalized to one. The two firms are located at the extreme ends of this line, say the home firm at point zero, and the foreign firm at point one. Each consumer is characterized by a location $\xi \in [0, 1]$, measuring its relative taste for the two products. There is a disutility, interpreted as a transportation cost, of

$\xi$ when purchasing the domestic product and of $1-\xi$ when purchasing from the foreign firm. Consumers hence face a discrete choice of either buying the home or the imported product. The reservation price of the consumers is $\alpha$, assumed to be large enough so that the market is covered. The utility of the consumer located at $\xi$ buying the home or the foreign good is respectively given by:

$$\begin{aligned} U_{\xi,H} &= \alpha + A_H - \xi - p_H && (1) \\ U_{\xi,F} &= \alpha + A_F - (1-\xi) - p_F && (2) \end{aligned}$$

If neither firm advertises ($A_i = 0$), consumers will purchase from the firm with the best price-location combination, where $\xi$ and $1-\xi$ represent the distance to the home and foreign firm and $p_i$, the price of product $i$. Firms invest in advertising campaigns because it changes a product's image and, therefore, its perceived location in the eye of the consumer. Advertising therefore creates subjective differentiation.

Let us now define the consumer located at $\xi^*$ that is indifferent between buying the domestic or the imported product. By definition, the utility procured by this consumer is the same for either good, that is:

$$\begin{aligned} U_{\xi^*,H} &= U_{\xi^*,F} \\ \alpha + A_H - \xi^* - p_H &= \alpha + A_F - (1-\xi^*) - p_F && (3) \end{aligned}$$

By solving for $\xi^*$, we can derive the demand functions, by posing $q_H = \xi^*$ and $q_F = 1 - \xi*$, therefore:

$$q_i = \frac{1 + p_j - p_i + A_H - A_F}{2}, \quad i, j = H, F, \quad i \neq j \tag{4}$$

Since the market is fully covered, total demand and output are equal to one. Note that if the firms choose the same amount of advertising, then consumers will choose strictly on the basis of price. It is only when a firm advertises more than its rival that it succeeds to increase its demand, ceteris paribus. A more convenient way to express quantities is in terms net advertising levels $\phi_i = A_i - A_j$ . The quantities are therefore given by:

$$q_i = \frac{1 + p_j - p_i + \phi_i}{2} \tag{5}$$

We first characterize the equilibrium when there is free trade ($ft$) in the goods market. As usual with multistage games, we use the notion of backwards induction to obtain a subgame perfect Nash equilibrium. Starting at the second stage, the optimization problem of the home and foreign firm is given by:

$$\max_{p_i} \ \pi_i = (p_i - c)\left(\frac{1 + p_j - p_i + \phi_i}{2}\right)$$

From the first-order condition,

$$1 + p_j - 2p_i + \phi_i + c = 0$$

we obtain the second-stage equilibrium ($*$) prices and outputs as function of net advertising:

$$(p_i^{ft})^* = \frac{3 + 3c + \phi_i}{3} \tag{6}$$

$$(q_i^{ft})^* = \frac{3 + \phi_i}{6} \tag{7}$$

By plugging the equilibrium prices and quantities into the profit functions, the optimal second stage payoffs can be derived:

$$(\pi_i^{ft})^* = \frac{(3 + \phi_i)^2}{18}$$

Having solved the second-stage of the game, it is now possible to address the advertising levels chosen by the firms in the first stage. At this point, it is useful to provide a functional form for the advertising cost. As mentioned above, advertising costs are monotonically increasing and convex. We assume the cost functions for the home and foreign firm take the following quadratic form:

$$C_H(A_H) = \frac{a}{2}[A_H]^2 \tag{8}$$

$$C_F(A_F) = \frac{a}{2}[A_F]^2 + \gamma A_F \tag{9}$$

where $a$ and $\gamma$ are positive parameters. Parameter $a > 0$, common to both firms, measures the cost of advertising. If advertising is associated with low cost (a low $a$) then firms are inspired to advertise a great deal. On the other hand, $\gamma$ represents a tax on using foreign advertising in the home market and more generally it can be interpreted as a measure of the amount of barriers that exist on services market, namely the advertising market, which puts the foreign firm in a position of disadvantage with respect its home rival.

Pursuing the game, in stage one, the firms maximize the payoff expressions given by $\Pi_i = (\pi_i^{ft})^* - C_i(A_i)$ with respect to advertising levels. Consequently, the maximization problem for the home and foreign firm are given by:

$$\max_{A_H} \ \Pi_H = \frac{1}{18}\Big[3 + A_H - A_F\Big]^2 - \frac{a}{2}[A_H]^2 \tag{10}$$

$$\max_{A_F} \ \Pi_F = \frac{1}{18}\Big[3 + A_F - A_H\Big]^2 - \frac{a}{2}[A_F]^2 - \gamma A_F \tag{11}$$

Solving for the Nash Equilibrium $(*)$ advertising levels under free trade $(ft)$ in the goods market and barriers in the services market $(\gamma)$ yields :

$$(A_H^{ft})^* = \begin{cases} \frac{1}{3a}\left[1 + \frac{3\gamma}{9a-2}\right] & \text{if } 0 \leq \gamma < \bar{\gamma}; \\ \\ \frac{3}{9a-1} & \text{if } \gamma \geq \bar{\gamma}. \end{cases}$$

$$(A_F^{ft})^* = \begin{cases} \frac{1}{3a}\left[1 - \frac{3\gamma(9a-1)}{9a-2}\right] & \text{if } 0 \leq \gamma < \bar{\gamma}; \\ \\ 0 & \text{if } \gamma \geq \bar{\gamma}. \end{cases}$$

where, $\bar{\gamma}$ the prohibitive level of $\gamma$, given by:

$$\bar{\gamma} = \frac{1}{3}\left(\frac{9a-2}{9a-1}\right)$$

Intuitively, the higher the services market barrier, the more costly advertising becomes for the imported product, making the foreign firm less prone to use advertising in its strategy mix. We furthermore need some conditions on $a$ which we provide in the following lemma 1:

**Lemma 1** *For the foreign advertising level to be strictly positive* $(A_F)^* > 0$, *then* $\gamma < \frac{1}{3}\left(\frac{9a-2}{9a-1}\right) = \bar{\gamma}$ *which therefore implies that* $a > 2/9$. *The Home advertising level is always* $(A_H^{ft})^* > 0$.

**Proof.** We start by providing the level of $\gamma$ that allows foreign firm to have positive advertising: $(A_F^{ft})^* > 0$. The latter is satisfied whenever:

$$\bar{\gamma} = \frac{1}{3}\left(\frac{9a-2}{9a-1}\right) > \gamma \tag{12}$$

Next, Form the second order condition of maximization problems (10) and (11), we deduce that $a > 1/9$. Since $\gamma \geq 0$, and the denominator in (12) positive, so for inequality (12) to hold, it must be that $a > 2/9$. Note that $a$ cannot be equal to $2/9$, for which equilibrium advertising levels are not defined. Moreover, since $(A_H^{ft})^* > (A_F^{ft})^*$ (with equality, whenever $\gamma = 0$) then $(A_H^{ft})^* > 0$ is automatically satisfied. $\square$

As mentioned before, it is more convenient to express the first stage Nash advertising levels in terms of net advertising, given by:

$$(\phi_H^{ft})^* = -(\phi_F^{ft})^* = \begin{cases} \frac{9\gamma}{9a-2} & \text{if } 0 \leq \gamma < \bar{\gamma}; \\ \\ \frac{3}{9a-1} & \text{if } \gamma \geq \bar{\gamma}. \end{cases}$$

Using (19) in (8) and (9), we obtain the equilibrium prices

$$(p_H^{ft})^* = \begin{cases} 1 + c + \frac{3\gamma}{9a-2} & \text{if } 0 \leq \gamma < \bar{\gamma}; \\ \\ 1 + c + \frac{1}{9a-1} & \text{if } \gamma \geq \bar{\gamma}. \end{cases} \tag{13}$$

$$(p_F^{ft})^* = \begin{cases} 1 + c - \frac{3\gamma}{9a-2} & \text{if } 0 \leq \gamma < \bar{\gamma}; \\ \\ 1 + c - \frac{1}{9a-1} & \text{if } \gamma \geq \bar{\gamma}. \end{cases} \tag{14}$$

and outputs:

$$(q_H^{ft})^* = \begin{cases} \frac{1}{2}\left[1 + \frac{3\gamma}{9a-2}\right] & \text{if } 0 \leq \gamma < \bar{\gamma}; \\ \\ \frac{1}{2}\left[1 + \frac{1}{9a-1}\right] & \text{if } \gamma \geq \bar{\gamma}. \end{cases} \tag{15}$$

$$(q_F^{ft})^* = \begin{cases} \frac{1}{2}\left[1 - \frac{3\gamma}{9a-2}\right] & \text{if } 0 \leq \gamma < \bar{\gamma}; \\ \\ \frac{1}{2}\left[1 - \frac{1}{9a-1}\right] & \text{if } \gamma \geq \bar{\gamma}. \end{cases} \tag{16}$$

These results lead to the following proposition:

**Proposition 2** *Trade barriers in the advertising market ($\gamma > 0$), increase the cost of advertising for the foreign product, consequently altering price competition in the goods market. Namely, a higher $\gamma$ makes advertising*

1. A more appealing strategy tool for the home firm, driving it to price less aggressively
2. A less appealing tool for the foreign firm, inducing the firm to use its pricing strategy more aggressively

Proposition 2 details how protection and barriers in the service market have an impact on the goods market. In consequence, as $\gamma$ increases, the foreign firm advertises less making advertising more beneficial for the home firm. Put differently, a higher $\gamma$, increases the marginal cost of advertising for the importing firm, which decrease its advertising level, translating in lower price for the foreign product and a higher price for the domestic product. The latter increase the domestic firm's margin and thus increases its marginal benefit from advertising. Advertising enables the home firm to increase its price and its sales at the same time, as can be seen from (13) and (15). Further, note from $(q_F^{ft})^*$ that a prohibitive level of $\gamma$ in the services market, even though reduce reducing the amount of trade, does not prohibit trade in the goods market. This is stated formally in next proposition:

**Proposition 3** *A prohibitive level of protection in the advertising market ($\gamma \geq \bar{\gamma}$), reduces trade but does not prohibit trade in the goods market.*

# 3 Advertising and Trade Policy in the Goods Market

In this section we enrich the model in section 2 by introducing a tariff ($t$) in the goods market. The aim is to see how trade policy in the goods market affects the advertising and pricing strategies of the firms. We first derive the equilibrium when a tariff $t$ is imposed and subsequently interpret the results.

## 3.1 The Tariff Equilibrium

When the home government imposes a tariff, the foreign firm has to pay a unit duty $t > 0$ on each unit of imported good. The tariff leaves unaltered the home firms second-stage profit maximization, but changes that of the foreign firm, which becomes:

$$\max_{p_F} \ \pi_F = (p_F - c - t)\left(\frac{1 + p_H - p_F + \phi_F}{2}\right)$$

From the first order condition for the home firm and

$$1 + p_H - 2p_F + \phi_F + c + t = 0$$

for the foreign firm, we obtain the second-stage equilibrium (*) under a tariff regime (t) given as a function of net advertising ($\phi_i$) of prices:

$$(p_H^t)^* = \frac{3 + 3c + \phi_H + t}{3} \quad (17)$$

$$(p_F^t)^* = \frac{3 + 3c + \phi_F + 2t}{3} \quad (18)$$

and outputs:

$$(q_H^t)^* = \frac{3 + \phi_H + t}{6} \quad (19)$$

$$(q_F^t)^* = \frac{3 + \phi_F - t}{6} \quad (20)$$

By plugging the home and foreign equilibrium prices and quantities into the profit functions, respectively , the optimal second stage payoffs can be derived:

$$(\pi_H^t)^* = \frac{(3 + \phi_H + t)^2}{18} \quad (21)$$

$$(\pi_F^t)^* = \frac{(3 + \phi_F - t)^2}{18} \quad (22)$$

The results obtained here are fairly standard. *Given* the advertising levels, a tariff leads to an increase of the domestic price, and a even greater increase of the import price. Hence a tariff $t > 0$ will decrease sales for the foreign firm and therefore increase home output as seen in equations (19) and (20). But the firms will have the opportunity, in stage 1, to adjust their advertising levels. This allows us to study whether advertising provides new insights to these standard results.

Focusing on the first-stage of the game, the firms will maximize the following payoffs with respect to advertising levels. The respective maximization problem for the home and foreign firm becomes:

$$\max_{A_H} \ \Pi_H = \frac{1}{18}\Big[3 + A_H - A_F + t\Big]^2 - \frac{a}{2}[A_H]^2 \tag{23}$$

$$\max_{A_F} \ \Pi_F = \frac{1}{18}\Big[3 + A_F - A_H - t\Big]^2 - \frac{a}{2}[A_F]^2 - \gamma A_F \tag{24}$$

We distinguish two cases. First when $\gamma < \bar{\gamma}$ and then when $\gamma \geq \bar{\gamma}$.

**Case 1:** $\gamma < \bar{\gamma}$. Solving for the Nash Equilibrium ($*$) advertising levels with a tariff ($t$) in the goods market yields :

$$(A_H^t)^* = \begin{cases} \frac{1}{3a}\left[1 + \frac{3(\gamma+at)}{9a-2}\right] & \text{if } 0 < t < \bar{t}; \\ \\ \frac{3+t}{9a-1} & \text{if } t \geq \bar{t}. \end{cases} \tag{25}$$

$$(A_F^t)^* = \begin{cases} \frac{1}{3a}\left[1 - \frac{3\gamma(9a-1)+3at}{9a-2}\right] & \text{if } 0 < t < \bar{t}; \\ \\ 0 & \text{if } t \geq \bar{t}. \end{cases}$$

where, $\bar{t}$ is the critical level above which the foreign firm does not advertise. It is given by[1]:

$$\bar{t} = \frac{(9a-2) - 3\gamma(9a-1)}{3a}$$

In terms of net advertising:

$$(\phi_H^t)^* = -(\phi_F^t)^* = \begin{cases} \frac{9\gamma+2t}{9a-2} & \text{if } 0 < t < \bar{t}; \\ \\ \frac{3+t}{9a-1} & \text{if } t \geq \bar{t}. \end{cases} \tag{26}$$

Before discussing the results in the next section, we provide the final equilibrium prices, given by:

[1]Note that for $\bar{t} > 0$, then $\gamma < \bar{\gamma}$, which is the case under review.

$$(p_H^t)^* = \begin{cases} 1 + c + \frac{3(\gamma + at)}{9a-2} & \text{if } 0 < t < \bar{t}; \\ \\ 1 + c + \frac{1+3at}{9a-1} & \text{if } t \geq \bar{t}. \end{cases} \tag{27}$$

$$(p_F^t)^* = \begin{cases} 1 + c + \frac{2(3a-1)t - 3\gamma}{9a-2} & \text{if } 0 < t < \bar{t}; \\ \\ 1 + c + \frac{(6a-1)t-1}{9a-1} & \text{if } t \geq \bar{t}. \end{cases} \tag{28}$$

and outputs:

$$(q_H^{ft})^* = \begin{cases} \frac{1}{2}\left[1 + \frac{3(\gamma + at)}{9a-2}\right] & \text{if } 0 < t < \bar{t}; \\ \\ \frac{1}{2}\left[1 + \frac{1+3at}{9a-1}\right] & \text{if } t \geq \bar{t}. \end{cases} \tag{29}$$

$$(q_F^{ft})^* = \begin{cases} \frac{1}{2}\left[1 - \frac{3(\gamma + at)}{9a-2}\right] & \text{if } 0 < t < \bar{t}; \\ \\ \frac{1}{2}\left[1 - \frac{1+3at}{9a-1}\right] & \text{if } t \geq \bar{t}. \end{cases} \tag{30}$$

**Case 2:** $\gamma \geq \bar{\gamma}$. When $\gamma$ is prohibitive in the the services market then the foreign firm does not advertise. The equilibrium levels of advertising, prices and output correspond to the above case of $t \geq \bar{t}$, with the difference that they are given for $\forall t > 0$.

### 3.2 Limits on the link between the Goods and Services Market

Vital to world trade is the appreciation of the political environment within which a foreign firm plans to operate. Governments are still very much involved in business activities therefore influencing business operations via trade policy and regulations the goods and services market. This section aims to understand the link between two markets. More specifically it aims at understanding the amount of autonomy a government has in using say a tariff in the goods market when the services market is relatively protected (a high $\gamma$) and vice versa.

Starting from a given level of protection in the services market ($\gamma < \bar{\gamma}$), we obtain the range with which a government can choose its specific tariff without prohibiting advertising for the foreign market, i.e. $t < \bar{t}$. We then study how this range is affected when protection increase in the services market. Furthermore, for any specific tariff $t < \bar{t}$ to be effective it needs to be positive and non prohibitive in the goods market. We denote the prohibitive tariff in the goods market by $t^{p_1}$, deduced from the top equation of (30), when the foreign output is zero, $(q_F^t)^* = 0$:

$$t^{p_1} = \frac{(9a-2) - 3\gamma}{3a} \tag{31}$$

Trade policy does not prohibit advertising and trade in the goods market, whenever $t < \bar{t} \leq t^{p_1}$. It can easily be seen that

$$\bar{t} = \frac{(9a-2) - 3\gamma(9a-1)}{3a} < t^{p_1} \tag{32}$$

This leads us to the following conclusion, that the higher the barrier in the advertising market ($\gamma$), the smaller the governments range $[0, \bar{t})$ over which the government can choose its tariff without prohibiting the advertising market for the foreign firm.

Bear in mind that the government can always choose a tariff $t$ above $\bar{t}$. In such a case, trade policy in the goods market prohibits the use of advertising by foreign firm. More formally, let $t^{p_2}$ be the prohibitive tariff obtained from bottom equation of (41):

$$t^{p_2} = \frac{(9a-2)}{3a} \tag{33}$$

the government can always choose $t \leq t^{p_2}$. An important conclusion that arises is that, a government is always free to choose a specific tariff $t \in [0, t^{p_2}]$. For the case where $\gamma \geq \bar{\gamma}$ (case 2 above), trade policy in the goods market does not affect the advertising market. On the other hand, if $\gamma < \bar{\gamma}$, for trade policy to allow advertising by the foreign firm, the government needs to commit to a tariff $t < \bar{t}$. This leads to the following proposition:

**Proposition 4** *For the services market, represented here by the advertising market, to liberalize, the home government needs to commit to a low level of* *tariff. Specifically, for a given level of $\gamma$, a tariff $t$ must satisfy:*

$$t < \bar{t} = \frac{(9a-2) - 3\gamma(9a-1)}{3a}$$

### 3.3 Interpretation

We now show and interpret the two main results of our paper. First, no matter whether the trade restriction (tariff) is placed on advertising or on the good itself, the foreign (home) firm prefers to increase (decrease) its use of its pricing tool and give up some of (increase) its advertising. Second, in the presence of advertising, tariffs do not always lead both firms to increase their price: it can lead the foreign firm to decrease its price. These are summarized in the following proposition:

**Proposition 5** *The imposition of a tariff $t > 0$ in the goods market, increases (decreases) the marginal benefit of advertising to the home (foreign) firm, which makes:*

1. The home firm use more advertising in its strategy mix with respect to free trade, leading to an increase in the domestic price.
2. The foreign firm use less advertising with respect to free trade, leading it to be more competitive on its import price, relative to the domestic firm.
3. Moreover, when $2/9 < a < 1/3$, the introduction of a tariff will lead the foreign firm to decrease its price.

First let us discuss the effect of a tariff on the strategy mix between advertising and pricing: a tariff leads to a decrease of the advertising level of the foreign firm and an increase of that of the domestic. In order to understand this, let us ignore for the moment the possibility of advertising. Then a tariff will lead to a lower margin and a lower demand for the domestic firm. Given this, and now allowing the firms to advertise we can easily see that the marginal benefit of one unit of advertising for the foreign firm is lower than that of the domestic firm:

$$\frac{d(q_F^t)(p_F^t - c - t)}{dA_F} \mid_{A_F = A_H = 0} < \frac{d(q_H^t)(p_H^t - c)}{dA_H} \mid_{A_F = A_H = 0}$$

That is, other things equal, the domestic firm has a stronger incentive to use its advertising tool. At the same time, its marginal cost of advertising is lower than that of the foreign firm ($\gamma > 0$). This will lead the home firm to advertise more and lead the domestic firm to switch more toward its pricing strategy.

Alternatively, the effect of $t$ on advertising levels can be addressed by totally differentiating the first order condition of the firms first-stage profits (23) and (24) and solving yields:

$$\frac{d(A_H^{t,\gamma})^*}{dt} = -\frac{\partial^2 \Pi_H}{\partial A_H \partial t} \Big/ \frac{\partial^2 \Pi_H}{\partial A_H^2} \quad (34)$$

$$\frac{d(A_F^{t,\gamma})^*}{dt} = -\frac{\partial^2 \Pi_F}{\partial A_F \partial t} \Big/ \frac{\partial^2 \Pi_F}{\partial A_F^2} \quad (35)$$

A tariff, imposed in the goods market, will result in lower levels of advertising for the foreign firm and higher levels for the home firm, with respect to free trade. This is because a tariff decreases (increases) the marginal benefit of advertising to the foreign (home) firm. Moreover, since advertising becomes less attractive in the foreign firm strategy mix between pricing and advertising, the firm is constraint in using its pricing tool more intensively if it is to keep its market share.

We now turn to the effect of a tariff on the price of the foreign firm. When the cost of advertising for both firms is relatively low (a low $a$), then they are using this tool rather intensively. In other words, they compete more through advertising than through pricing. When this is the case, a tariff will have a more important effect on price competition. For low levels of $a$, $a \in (\frac{2}{9}, \frac{1}{3})$, the initial price increase of a tariff will be completely washed away by the strategy mix switch from advertising to pricing. We can appreciate this by studying the limits of the foreign's equilibrium advertising level and price when $a \to \frac{2}{9}$:

$$\frac{d(A_F^{t,\gamma})^*}{dt} = -\frac{1}{9a-2} \quad (36)$$

$$\frac{d(p_F^{t,\gamma})^*}{dt} = \frac{2(3a-1)}{9a-2} \quad (37)$$

These results provide new insights in the trade literature with price competition, where specific tariffs are known to increase prices. Proposition 5 does not contradict this result. The explanation for the difference resides in the fact that in advertising intensive markets, pricing is not the only tool available to firms. As it happens, the conventional result is equivalent to the second-stage pricing equilibrium (17) and (18). That is for a given amount of advertising, the imposition of a tariff increases prices. Furthermore, the increase in price of the imported product is greater than that of the home product. The results change however, once advertising strategies are taken into account. Once the advertising tool of the foreign firm becomes constrained by the imposition of a tariff, it is more advantageous for the firm use its pricing tool to regain part of its market share, lost because of the tariff. In other words, it is cheaper for the foreign firm to lower its price than to use more advertising to have a higher profits. The more firms are competition through advertising than through pricing (low range of $a$), the more pronounced this effect.

# 4 Dumping in the face of Antidumping duties

In section 2 we demonstrated that a cost disadvantage in advertising led foreign to price below the domestic firm. In this section we allow the domestic government to impose an antidumping measure in the form of a tax equal to the dumping margin, $t_{AD} = p_H - p_F$, to be paid by the foreign firm. The optimization problem in period 2 for home does not change while for foreign it becomes

$$\max_{p_F} \begin{array}{c} (p_F - c)\left(\frac{1+p_H-p_F+\phi_F}{2}\right) \text{ if } p_F \geqslant p_H \\ (2p_F - p_H - c)\left(\frac{1+p_H-p_F+\phi_F}{2}\right) \text{ if } p_F < p_H \end{array}$$

We are interested to examine whether 'dumping' can still occur, even if the foreign firm knows that it will be hit by an AD-duty. This is important, given the empirical stylized fact that the proliferation of anti-dumping laws does not seem to have decrease the number of anti-dumping cases. The following proposition affirmatively answers this question for high enough cost differentials in using advertising.

**Proposition 6** *Let the dumping margin be $t = p_H - p_F$. When $\gamma \in \left(\frac{a}{3}, \frac{1}{3}\left(\frac{9a-2}{9a-1}\right)\right)$ with $a \in \left(\frac{2}{9}, \frac{5+\sqrt{7}}{9}\right)$, then the equilibrium price for foreign, $(p_F^{AD})^*$, is smaller than that of the domestic firm, $(p_H^{AD})^*$: dumping occurs in the presence of AD-duties.*

**Proof.** See Appendix. □

## 5 Conclusion

In this paper we presented a Hotelling model with advertising in order to study the strategic interaction between a domestic and a foreign firm who compete not only through their pricing strategy and but also through advertising in the presence of trade restrictions. The two main results of our

paper are as follows: first, no matter whether the trade restriction (tariff) is placed on advertising or on the good itself, the foreign (home) firm prefers to increase (decrease) its use of its pricing tool and give up some of (increase) its advertising. Second, in the presence of advertising, tariffs do not always lead both firms to increase their price: it can lead the foreign firm to decrease its price.

This model is a first attempt to focus on *how* trade policy in the service industry, which increases the cost of advertising for foreign firms, alters price competition on the goods market. At the same time the model allows us analyze how other WTO sanctioned trade policies affect the optimal price advertising mix for both domestic and foreign producers. We show that, in the presence of advertising cost differentials, AD-duties do not always deter foreign firms from dumping.

Although our basic model is rather simple, we believe it can serve as a benchmark which can be easily adapted to other environments. For example, one could introduce informative advertising, location choice, other trade policies such as price undertakings. We are currently working on all these extensions.

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# 6 Appendix

**Proof of Proposition 6**

In order for $p_F^* < p_H^*$ to be an equilibrium it must be that the, given $p_H^*$. Foreign's profits are maximized in the region where $p_F < p_H^*$. That is the first-order condition for Foreign is:

$$4p_F = 2 + 3p_H + 2\phi_F + c$$

For Home the first order condition is

$$2p_H = 1 + p_F - \phi_F + c$$

From this we get that

$$
\begin{aligned}
p_H^* &= \frac{6 - 2\phi_F + 5c}{5} \\
p_F^* &= \frac{7 + \phi_F + 5c}{5}
\end{aligned}
$$

Note that for $p_F^* < p_H^*$ it must be that $-1 - 3\phi_F > 0$ or $\phi_F < -\frac{1}{3}$.

In order to verify whether this can be possible in equilibrium we need to analyze the advertising stage. Profits from the pricing stage are:

$$
\begin{aligned}
\Pi_H &= \frac{1}{50}(6 + 2(A_H - A_F))^2 \\
\Pi_F &= \frac{2}{50}(4 + 2(A_F - A_H))^2
\end{aligned}
$$

Hence the first order conditions of the first stage problem become, for home and foreign are:

$$
\begin{aligned}
\frac{4}{50}(6 + 2(A_H - A_F)) &= aA_H \\
\frac{8}{50}(4 + 2(A_F - A_H)) &= aA_F + \gamma
\end{aligned}
$$

Hence we obtain that

$$
\phi_F = \frac{50\gamma - 8}{24 - 50a}
$$

For $\phi_F < -\frac{1}{3}$ is must be that

$$
\gamma > \frac{a}{3}
$$

Can $\gamma > \frac{a}{3}$ be part of an equilibrium with foreign trade and foreign advertising? We need that both

$$
\bar{\gamma} = \frac{1}{3}\left(\frac{9a - 2}{9a - 1}\right) > \gamma
$$

and

$$
a > \frac{2}{9}
$$

Hence we need that $\frac{1}{3}\left(\frac{9a-2}{9a-1}\right) > \gamma > \frac{a}{3}$ and $a > \frac{2}{9}$. We can always find such a $\gamma$ as long as $a \in \left(\frac{2}{9}, \frac{5+\sqrt{7}}{9}\right)$.