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Tariff Policy Towards a Monopolist in the Presence of Persuasive Advertising

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Abstract: This paper considers the positive and normative aspects of tariffs and advertising taxes in a situation in which a foreign monopolist chooses advertising as well as output. On the positive side it is shown that under certain circumstances a tariff will induce a fall in the domestic consumer price of the import. On the normative side the paper demonstrates that an import subsidy can be optimal under two different specifications of the welfare function.

I INTRODUCTION

Brander and Spencer (1984) have shown that a tariff employed against a foreign monopolist will raise home welfare provided that the marginal revenue curve is more steeply sloped than the inverse demand curve.[1] In their model protection only affects the output (or price) decision of the monopolist. However, in practice protection can be expected to affect a whole range of variables including capacity choice, R&D, product development and advertising. The purpose of this paper is to examine the positive and normative implications of tariffs in a situation in which the firm is also engaging in

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1. Katrak (1977) had earlier shown that "a country that obtains supplies of a product from a foreign monopolist may find that free trade is not the appropriate policy". It is argued by de Meza (1979) that price controls set just above the monopolist's average cost is the best policy. However, price ceilings on imports are not a commonly observed policy. Helpman and Krugman (1989) provide an overview of the arguments.

persuasive advertising. On the positive side an important result of this paper is the possibility of a Metzler paradox: a tariff will in some instances lead to a fall in the market price of a good. On the normative side I show that the presence of persuasive advertising can strengthen or weaken the case for a tariff depending on whether the good is over valued or under valued by consumers.

In the model that I consider in this paper the firm optimally chooses its advertising expenditure as well as its output (or price). I restrict attention to advertising that affects consumer tastes, specifically I assume that an increase in advertising shifts the inverse demand for the good to the right. This is usually referred to as "persuasive" advertising, as distinct from advertising that serves to inform the consumer.[2]

Assessing the welfare implications of protection in circumstances in which it induces changes in tastes is clearly problematic. Should welfare comparisons between household consumption levels before and after protection be made at pre-protection tastes, post-protection tastes or at some other tastes? Since persuasive advertising positively affects the utility function of the consumer should it therefore be modelled as positively affecting welfare? These issues have been extensively debated.[3] Through most of the paper I choose to adopt the Dixit and Norman (1978) approach to analysing welfare change in the presence of persuasive advertising and endogenous tastes. This involves making the assumption that the government has a "standard of judgement" in that there is a hypothetical level of advertising that makes the inverse demand function equal to the "true" marginal social valuation function. Where necessary, however, in order to investigate robustness, I contrast the results with those obtained when it is assumed that the true marginal social valuation curve always coincides with the inverse demand. This second approach involves making the assumption that welfare is directly increasing in advertising.[4]

Following some preliminaries, Section II of the paper is concerned with the case of a foreign monopolist selling into the home market. It is shown that protection affects imports in two ways: firstly, there is the direct effect that operates through the increase in the marginal costs faced by foreigners: secondly, there is an indirect effect since protection influences the level of advertising and through this sales. The optimal tariff is calculated under both specifications of the welfare function. In Section III I extend the analysis to

2. For a discussion of this in a similar context see Shapiro (1980) and Grossman and Shapiro (1984).

3. See Dixit and Norman (1978, 1979, 1980), Fisher and McGowan (1979) and Shapiro (1980).

4. See Dixit and Norman (1978, 1979) and Fisher and McGowan (1979) for a debate on this issue.

consider the possibility that the foreign monopolist will carry out its advertising in the home country itself. I examine an optimal tariff and advertising tax combination under these circumstances. Finally Section IV is a short conclusion.

II FOREIGN MONOPOLY

Consider a foreign monopolist supplying a good to the domestic market. The monopolist advertises this commodity to domestic consumers. To keep the analysis as simple as possible I will assume the existence of an aggregate household with a quasi-linear utility function:

$$U = u(y,m) + n_c, \tag{2.1}$$

where y represents the imports of the monopolised good and n_c the consumption of a competitively produced numeraire good which is produced in the home country. In order to simplify the analysis I will assume that utility is quadratic in y and that an increase in advertising expenditure m, shifts the utility function upwards: $u(y,m) = y[a(m) - (b/2)y]$. Let p be the consumer price of the import. Utility maximisation implies that:

$$U_y = p = a(m) - by, \tag{2.2}$$

where b is a constant. I will assume that $a'(m) > 0$,[5] which implies that the inverse demand function is shifted upwards in a parallel manner when advertising increases. In addition, I will assume that a(m) is strictly concave in advertising so that $a''(m) < 0$. This assumption is needed to ensure an interior solution.

The monopolist faces a constant marginal production cost denoted by c and a constant marginal cost of advertising denoted by μ. The home government imposes a tariff of t. The profit function of the monopolist is:

$$\pi = (p - c - t)y - \mu m, \tag{2.3}$$

for its sales to the home market. If the firm sells on more than one market then it is assumed that the overall profit function is separable and m is its advertising specifically for the home market. The firm chooses output and advertising to maximise profits. This implies the first-order conditions:

5. A prime indicates a derivative.

$$\pi_y = a(m) - 2by - c - t = 0, \tag{2.4}$$

for optimal choice of output and:

$$\pi_m = yp_m - \mu = 0, \tag{2.5}$$

for advertising. The second-order conditions are: $\pi_{yy} = -2b < 0$, and $\pi_{yy}\pi_{mm} - \pi_{ym}\pi_{my} = -2bR > 0$, where $R \equiv a''y + (a')^2/2b < 0$. The second partial derivatives $\pi_{mm} = a''y$ and $\pi_{my} = \pi_{ym} = a'$ are obtained from (2.4) and (2.5). Equations (2.4) and (2.5) give the equilibrium output and level of advertising respectively, in implicit form. The equilibrium price is obtainable from (2.2) and (2.4):

$$p = [a(m) + c + t]/2, \tag{2.6}$$

while the import price is $p^* = p - t$. Prices and the level of imports are affected in two ways by a tariff: directly and through induced changes in m.

I turn now to the comparative statics of the equilibrium. It would be useful to obtain an expression for the supply response of imports to the tariff. Proceed by totally differentiating (2.5) to get:

$$dm/dt = -a'y_t/(a'y_m + a''y) < 0, \tag{2.7}$$

where $y_m = a'/2b$ from (2.4), is the partial derivative of y with respect to m and $y_t = -1/2b$ represents the impact of a tariff on the level of imports at a constant level of advertising. It is clear from (2.7) that a rise in the tariff reduces advertising by the foreign monopolist. Now use (2.7) in the total derivative of (2.4) to give:

$$dy/dt = -[a''y/R]/2b < 0. \tag{2.8}$$

The supply response is larger in the presence of endogenous advertising than in its absence. This is easily seen when (2.8) is rewritten as:

$$dy/dt = y_t[1 - a'dm/dt]. \tag{2.9}$$

It is straightforward to show that the expression in parentheses is larger than unity. From equation (2.6) it is possible to obtain:

$$dp/dt = p_t[1 + a'dm/dt]. \tag{2.10}$$

The effect of the tariff at a given level of advertising is represented by

$p_t = 1/2$, and the term in parentheses is less than unity. Now using (2.5) and (2.7) allows (2.10) to be rewritten as:

$$dp/dt = p_t[1 + a'y_m/R], \tag{2.11}$$

It is now clear that dp/dt can be negative, that is to say a Metzler paradox is possible. The condition for this is: $a'y_m + R = a''y + (a')^2/b > 0$.

Proposition 1: In the monopoly case, when advertising is endogenous, a tariff causes imports to fall by more, and the price to rise by less than when the level of advertising is fixed. The consumer price of the import will rise if $a''y + (a')^2/b < 0$.

The tariff reduces output leading to an upward movement along the inverse demand curve but it also induces a fall in advertising spending which shifts this demand curve inwards. As a result the quantity imported and the import price p^* both fall by more than they would if advertising was fixed.

The terms of trade improvement resulting from the tariff is obtained from (2.7). It is:

$$dp^*/dt = p^*_t[1 - a'dm/dt], \tag{2.12}$$

where $p^*_t = -1/2$ represents the effect of a tariff on the terms of trade with advertising fixed.

I now turn to the problem of welfare maximisation. Following Dixit and Norman (1978) I shall assume that there is a reference level of advertising, m = A, which could be zero, that sets the inverse demand curve for the import equal to the government's marginal social valuation curve for that good. The domestic welfare function is therefore:

$$W = U(y,A,n_c) = u(y,A) + n_c, \tag{2.13}$$

$$\text{where } u(y,A) = [\alpha - (b/2)y]y, \text{ and } \alpha \equiv a(A).$$

The model can be embedded in a general equilibrium framework by assuming that the home country exports the numeraire good in exchange for the good produced by the monopolist. The balanced trade condition is:

$$n_p - n_c = p^*y, \tag{2.14}$$

where n_p is the production of the numeraire good. Using (2.14) in (2.13) it is possible to write the welfare function in the following way:

$$W = u(y,A) - py + ty + n_p. \tag{2.15}$$

The first two terms on the right hand side of (2.15) represent the social surplus, net of tax revenue, that is obtained from consumption of the imported good. The third term (ty) is government revenue from the tariff and the last term (n_p) is the production of the numeraire good which is assumed to be constant.

Total differentiation of the welfare function yields:

$$dW = -y[dp - dt] + tdy + [\alpha - a(m)]dy \tag{2.16}$$

The first two terms on the right hand side of (2.16) represent the familiar terms of trade and volume of trade effects. The last term occurs because there is in general a gap between the shadow price of the monopolised good and its market price. This gap, $\alpha - a(m)$, will be negative when the actual level of advertising exceeds the reference level A.

The first-order condition for welfare maximisation by choice of t is:

$$dW/dt = -ydp^*/dt + (\alpha + t - a(m))dy/dt = 0. \tag{2.17}$$

Using (2.12) in (2.17) it is possible to obtain an explicit expression for the optimal tariff.

$$t^o = a(m) - \alpha + by^o \tag{2.18}$$

Substitution into this for y^o, the optimal value of y, yields:

$$t^o = a(m) - (2\alpha + c)/3. \tag{2.19}$$

This gives the following result.

Proposition 2: The optimal tariff is declining in α and c. For a sufficiently large positive difference between the shadow price $u_y(y,A)$ and the market price p the optimal policy is an import subsidy.

I now consider the optimality of a tariff under an alternative specification of the welfare function. One reason for doing this is that Fisher and McGowan (1979) criticise Dixit and Norman's approach to modelling welfare change in the presence of advertising and endogenous tastes. They argue that "if the amount of advertising enters the utility function the natural criterion for welfare comparison is the unrestricted utility function so defined". Dixit and Norman compare the utility obtained from post-advertising output with the utility obtained from pre-advertising output at (i) pre-advertising tastes and (ii) post-advertising tastes. Fisher and McGowan argue that one should compare utility at post-advertising output and tastes with the utility level at

pre-advertising output and tastes.[6] When this "non-paternalistic" approach is adopted the welfare function is increasing in advertising. It is worth examining the difference that this makes to the results: I will replace the welfare function given in (2.13) with the utility function of the aggregate household given in (2.1). The government's welfare maximisation problem is now:

$$\underset{t}{\text{Max}}\ W = U = [a(m) - (b/2)y]y + n_c. \tag{2.20}$$

Use of (2.14), the balanced trade condition, in (2.20) yields:

$$\underset{t}{\text{Max}}\ W = u(y,m) - py + ty + n_p. \tag{2.21}$$

This is similar to (2.15) the one difference is that the first two terms on the right hand side now represent *actual* consumer surplus, which is increasing in advertising. Totally differentiating this yields:

$$dW = u_m dm - y(dp - dt) + tdy. \tag{2.22}$$

Comparing (2.22) with (2.17) we can see that a term in $(\alpha - a(m))$ is absent from (2.21). There is now no divergence between the market price of the imported good and its shadow price. However, there is now a new term in $u_m dm$; welfare is increasing in advertising in this case. The first-order condition for the welfare maximising choice of the tariff is:

$$dW/dt = 0 = y[a'dm/dt - dp^*/dt] + tdy/dt. \tag{2.23}$$

From (2.22) it is possible to obtain the following expression for the optimal tariff:

$$t^o = -y[1 + bdy/dt]/(dy/dt). \tag{2.24}$$

The sign of the optimal tariff clearly depends on the sign of the bracketed term in the numerator. Substitution of (2.8) into (2.24) yields:

$$t^o = b[a''y + (a')^2/b]/a''. \tag{2.25}$$

It is clearly possible for this optimal tariff to be negative.

6. Let y_o be consumption of the imported good in the absence of advertising and y_1 be the consumption level with advertising. Let $V_o(\ )$ be the utility function at pre-advertising tastes and $V_1(\ )$ be the utility function at post-advertising tastes. Then Dixit and Norman compare; (i) $V_o(y_o)$ with $V_o(y_1)$ and (ii) $V_1(y_o)$ with $V_1(y_1)$. While Fisher and McGowan argue that one should compare $V_o(y_o)$ with $V_1(y_1)$.

Proposition 3: With the non-paternalistic specification of the welfare function (i) the optimal tariff will be positive if $a''y + (a')^2/b < 0$, (ii) the optimal tariff will be smaller when advertising is endogenous than when it is exogenously fixed.[7]

It can be seen from Proposition 2 and Proposition 3 that an import subsidy may be optimal under both specifications of the welfare function. However the conditions required for an optimal subsidy are very different. Whereas under the Dixit and Norman specification a negative optimal tariff cannot occur (assuming linear demands), if consumers "correctly" value the import, it is possible under the alternative specification where the import subsidy causes an increase in advertising which in itself raises welfare.

III THE MONOPOLIST'S ADVERTISING USES DOMESTIC RESOURCES DIRECTLY

So far I have assumed that all the foreign monopolist's advertising is conducted outside the home country. It is worth considering the difference it makes if the advertising directly uses domestic resources, that is, if it is undertaken in the home country itself. As I will show below, the tariff-only results obtained so far continue to hold in this case when advertising is untaxed. However one important difference is that the home government can now tax or subsidise this advertising and this raises some new considerations.

When foreign advertising uses home resources exclusively the balanced trade condition is:

$$n_p - n_c = p^*y - \mu m. \tag{3.1}$$

Let us suppose that the home country has an endowment of a composite factor of production which I will call "labour" e, and that the numeraire good uses one unit of labour to produce one unit of output. Since μm represents the total labour cost of advertising we get the following full employment condition:

$$e = n_p + \mu m. \tag{3.2}$$

Combining (3.1) and (3.2) yields:

$$n_c = e - p^*y. \tag{3.3}$$

7. Note that, for the case of a negative optimal tariff, a small increase in the tariff from its optimal level will bring about a fall in the market price of the import (from Proposition 1).

Substitution of (3.3) into (2.13) gives the following Dixit and Norman type welfare function:

$$W = u(y,A) - py + ty + e, \tag{3.4}$$

which is for our purposes essentially the same as (2.15). If the alternative non-paternalistic approach is adopted the appropriate welfare function becomes:

$$W = U = u(y,m) - py + ty + e, \tag{3.5}$$

which is in effect the same as (2.21). Using (3.4) and (3.5) it is possible to derive all the tariff-only results in Section II. So far allowing advertising to use domestic resources has made no difference because the resources are valued at their true social cost. However it is now possible for the government to tax this advertising.

When the monopolist buys its advertising in the home country it may face a home advertising tax. I wish now to consider an optimal tariff imposed in a situation in which an optimal advertising tax is also being used. I will adopt a welfare function like that in (3.4) which must now be extended to include advertising tax revenue:

$$W = u(y,A) - py + ty + \theta m + e, \tag{3.6}$$

where θ is the specific advertising tax.

The first-order condition for the optimal choice of the tariff implies:

$$dW/dt = (\alpha + t - a(m))(dy/dt) - y(dp^*/dt) + \theta(dm/dt) = 0. \tag{3.7}$$

A comparison of this with (2.17) reveals that there is now an additional term in θ. When the advertising tax is positive $\theta > 0$, an increase in the tariff clearly reduces the revenue from this source. This works against a positive optimal tariff.

The first-order condition for the optimal advertising tax is:

$$dW/d\theta = (\alpha + t - a(m))(dy/d\theta) - y(dp/d\theta) + m + \theta dm/d\theta = 0. \tag{3.8}$$

When the tariff is being chosen optimally according to (3.7) it is possible to use that equation to eliminate t in (3.8). When (3.7) is used in (3.8) several terms cancel leaving the following expression for the optimal tax on advertising:

$$\theta^o = 2bm(dy/dt)/(dm/d\theta) = -a''ym > 0. \tag{3.9}$$

Proposition 4: When the government is imposing an optimal tariff on imports produced by a foreign monopolist the optimal advertising tax is positive.

Note that this result is independent of the gap between market and shadow prices.

An explicit expression for the optimal tariff can now be derived from (3.7) and (3.9):

$$t^o = (a(m) - \alpha) + by^o(m) - 2bm[(dm/dt)/(dm/d\theta)]. \qquad (3.10)$$

The optimal tariff is once again declining in α.

IV CONCLUDING REMARKS

The purpose of this paper is to contribute to the analysis of import protection under imperfect competition. Its focus is on the positive and normative aspects of tariffs in a situation in which a foreign monopolist chooses advertising as well as output. The most surprising positive finding is the possibility of a Metzler paradox. Under certain circumstances a tariff can bring about a fall in the domestic price of the import. I have also shown that an import subsidy can be an optimal policy under two different specifications of the welfare function.

The monopoly assumption imposed throughout this paper though useful as a first approach is clearly rather simple. In Leahy (1992) I extend the analysis to consider tariff protection under Cournot oligopoly in the presence of advertising.

Although I have concentrated on the issue of persuasive advertising in this paper, it is possible to extend the analysis to consider product development. If product development means an increase in the quality of the good, then this quality improvement can be modelled as raising the level of consumer utility and national welfare directly, just as advertising does under the non-paternalistic welfare function considered in this paper.

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