

Revenue Implications of Trade Liberalization under Imperfect Competition

by
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Abstract: This paper makes a first attempt at formally addressing the revenue consequences of trade liberalization in an imperfectly competitive setting. We show that only where the industry in question is a monopoly can we unequivocally assert that exclusive reliance by the government on the less distortionary profit tax is sufficient to make up any shortfall in tariff revenue and ensure higher welfare for both consumers and producers; if the industry consists of more than one firm then the government may, in addition, have to turn to more distortionary forms of taxation, such as the commodity tax.

Keywords: Trade Liberalization; Taxation; Imperfect Competition

JEL classification: F12; H20

This is the working-paper version of the article published in the *Economics Letters* (Vol.82, 2004)

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1. Introduction:

In many developing economies import duties continue to constitute a significant source of government revenue. For instance, in India and in the Philippines, in 1999, import duties accounted for about 20% of total government revenue. While these economies have, over the years, undertaken significant cuts in tariffs (whether unilaterally or through multilateral proddings) their average tariff rates are still quite high. Their chief concern in effecting further, deeper cuts and moving towards full liberalization is how are they to make up the shortfall in revenue that such cuts eventually entail (see Keen and Ligthart, 2002).

There is now a fairly-sized literature that seeks to address this concern (see e.g., Michael et al, 1993; Hatzipanayotou et al, 1994; Keen and Ligthart, 2002). Specifically, this literature aims at uncovering the kinds of tariff reductions and concomitant commodity tax changes that will raise welfare without lowering revenue. However, the tariff-tax reform strategies served up by this literature are devised under conditions of a perfectly competitive production sector and hence may turn out to be off the mark in imperfectly competitive settings. In fact, Keen and Ligthart (2002) explicitly note that the results of their paper do not routinely extend to an imperfectly competitive milieu.

Further, despite the large share of intermediate inputs in world trade, scant attention has been paid to devising tariff-tax reform strategies for this class of goods. The fact that Keen and Ligthart accord a separate section to the discussion of intermediate inputs indicates that this class of goods deserves special treatment. Importantly, from our perspective, what little effort has been made in this direction again

occurs under perfectly competitive settings (see, e.g., Lopez and Panagariya, 1992; Panagariya, 1992, besides Keen and Ligthart).

In this paper we seek to examine, in an imperfectly competitive setting, how, with a reduction in tariff on an intermediate input, the government can make up any shortfall in revenue (assuming there is one) while ensuring that both consumers and producers are better off in the post-liberalization period compared to their respective pre-liberalization states.¹ In particular, we would like to determine whether the government can rely exclusively on a tax on firm profit to achieve the above objective or must it turn to more distortionary forms of taxation, such as the commodity tax.² There are a couple of other reasons for our interest in the profit tax. First, in many developing countries that are just now opening their doors to foreign competition, many industries tend to be highly oligopolistically organized. Now, if the price elasticity of demand is very low (as is likely to be the case in the short-run) then producers may pass on only a small percentage of the tariff reduction to consumers in the form of a lower price and consequently reap “windfall” profits (see Cheasty, 1990). Such profit, at least from the government’s perspective, presents an attractive revenue pool that it can tap into. Second, since firms, in this case, appropriate a substantial share of the benefit of the tariff reduction, consumer groups may offer stiff resistance to any moves for meeting the

¹ It may be worth noting here that there have been attempts at analyzing the effects of trade liberalization in imperfectly competitive settings (e.g., Buffie and Spiller, 1986; Eldor and Levin, 1990). These endeavors, however, have not been concerned with the revenue implications of trade liberalization.

² This issue was explored at a very rudimentary level in Mujumdar (2002). Needless to say, the principal results of our current paper (contained in propositions 1 and 2) were not obtained in the earlier (2002) paper.

revenue shortfall through higher consumption taxes and advocate, instead, that firms bear the burden of making up this deficit.

We would like to point out here that while the scope of this paper is very narrow (since we deal with only product category and one sector), it represents only a first attempt at studying tariff-tax reform strategies under imperfect competition.

The rest of the paper is organized as follows: In section 2 we develop a very simple model to capture the underlying context of our study and note some preliminary results. Section 3 discusses the role of the profit tax in addressing the main concern of our paper. In section 4 we remark on the possibilities that surface once we make room for a commodity or consumption tax in our model. This tax was deliberately excluded from our model so as not to detract from the central focus of our paper.

2. The Model

Consider an industry with N firms. For simplicity we assume that these firms are identical. That is, they all have the same cost function. All firms import a certain key input. To keep things simple we assume that production technology is of the ‘screw-driver’ type and that each firm sells its entire output in the domestic market. Let us explain this ‘business conduct’ of a firm with an example. Suppose the industry in question is the personal computer industry. Each firm in this industry imports ‘computer kits’, assembles them into computers and sells these computers in the domestic market.

Let P^f denote the import price of the ‘input kit’. We assume that the firms are price takers with respect to this import price and changes in the total quantity demanded of the input kits by the concerned industry does not affect P^f (this is akin to the familiar

small, open economy assumption). The tariff (ad valorem) that applies to the importation of an ‘input kit’ is given by t . The cost of assembling each unit is assumed to be identical across firms and is equal to c . Let q_i denote the output of some firm i where $i=1,\dots,N$. We can now describe the total cost function of firm i as $C_i = [P^f(1+t) + c]q_i$. The aggregate demand for the industry’s product is represented by the inverse demand function; $P = a - bQ$, where $Q = \sum_{i=1}^N q_i$ is the total industry output and P is the market price. Further, purchasing the product from the domestic market is assumed to be cheaper than importing it.

Firm profit is taxed at the rate T (where $0 \leq T < 1$) and the objective of a firm is assumed to be the maximization of its after-tax profit. Lastly, firms are assumed to compete in quantities.

The objective of any firm i can be stated as follows:

$$\text{Max}_{q_i} \pi_i = (1-T) \{ Pq_i - [c + P^f(1+t)]q_i \}$$

It can be shown that the Cournot-Nash equilibrium output level for firm i is given by

$$q_i^c = \frac{a - c - P^f(1+t)}{(N+1)b} \quad (1)$$

It is, of course, assumed that firm i is a producing firm. Total (equilibrium) industry output is given by

$$Q^c = Nq_i^c = \left(\frac{N}{N+1} \right) \left[\frac{a - c - P^f(1+t)}{b} \right] \quad (2)$$

Now, note that the smaller the number of firms and the steeper the market demand curve (that is, the more inelastic it is), the smaller is the increase in output from a given

reduction in the tariff rate (and vice versa). While there is nothing new about this finding, it is worthwhile making it explicit as it will be put to service later on.

3. The Profit Tax, Revenue and Welfare

In this section we examine whether the government, by solely relying on the profit tax rate, can generate enough revenue so as to make up any deficit that may arise following the tariff reduction and yet make sure that both consumers and producers are better off in comparison to their respective pre-tariff reduction states³.

The tariff reduction will lower the equilibrium price and consequently make consumers better off. Now, altering the profit tax rate will not affect this price⁴ and hence will leave unchanged the consumers' enhanced state of welfare. This allows the government, then, to confine its attention to only the revenue and producer-welfare components of its objective.

Thus the government's task is to determine a profit tax rate (that will apply in the post-liberalization state) so that the following conditions are met:

(i) Total revenue in the post-liberalization state is equal to total revenue from the pre-liberalization state.

³ Government revenue, in the context of our model, comprises of profit tax revenue and tariff revenue.

⁴ In more sophisticated formulations of firm behavior, firm profit is often explicitly modeled as a return to entrepreneurial effort. One might wonder whether, in such formulations, an increase in the profit tax rate will lower the equilibrium level of output (and hence raise the price) by curtailing effort. As long as it is ensured that the profit tax rate is not raised to such a level that a firm's post-tax profit falls in the post-liberalization period, there seems to be no reason, a priori, to expect a decline in effort. Note that this is a weaker condition than the one imposed in this paper.

(ii) The industry's after-tax profit in the post-liberalization state is greater than its pre-liberalization level (which would imply, in our setting, that each producer has higher after-tax profit and, hence, higher welfare).

Let us formally express the above conditions. To do so, we must first establish some notation. The subscript, A , attached to a variable is used to denote its value in the post-liberalization state and the subscript, B , its value in the pre-liberalization state. Π^p denotes the industry's equilibrium pre-tax profit and P^c , the equilibrium market price. The two conditions can now be formally expressed as follows.

$$(i)' \quad T_A \Pi_A^p + t_A P^f Q_A^c = T_B \Pi_B^p + t_B P^f Q_B^c \quad (\text{where } t_A < t_B)$$

$$(ii)' \quad (1 - T_A) \Pi_A^p > (1 - T_B) \Pi_B^p$$

Re-arranging (ii)' yields

$$\Pi_A^p - \Pi_B^p > T_A \Pi_A^p - T_B \Pi_B^p \tag{3}$$

Now, from (i)' we have, $T_A \Pi_A^p - T_B \Pi_B^p = t_B P^f Q_B^c - t_A P^f Q_A^c$. Hence (3) can be re-written as

$$\Pi_A^p - \Pi_B^p > t_B P^f Q_B^c - t_A P^f Q_A^c \tag{3}'$$

It is easily discerned that the industry's pre-tax profit will rise with the tariff reduction (implying that $\Pi_A^p > \Pi_B^p$). Further, the tariff reduction will produce a fall in tariff revenue if

$$a > c + P^f (1 + t_B + t_A) \tag{4}$$

Note that if (4) is satisfied then this ensures that the condition for firm i to be a producing firm, given by,

$$a > c + P^f (1 + t_B) \tag{5}$$

is also satisfied. Henceforth, we will assume that the condition in (4) has been met. Now, (3)' yields the following implication. As long as the increase in the industry's pre-tax profit is greater than the shortfall in tariff revenue, a profit tax rate (T_A) can be found that will achieve the government's revenue-welfare objective.

Let us now determine the conditions under which the increase in pre-tax profit will be greater than the fall in tariff revenue. Writing out the expressions for Π_A^p and Π_B^p in (3)' yields

$$[P_A^c - c - P^f(1+t_A)]Q_A^c - [P_B^c - c - P^f(1+t_B)]Q_B^c > t_B P^f Q_B^c - t_A P^f Q_A^c \quad (6)$$

Re-arranging terms gives us

$$[P_A^c - c - P^f]Q_A^c > [P_B^c - c - P^f]Q_B^c \quad (7)$$

Note that the terms, $[P_A^c - c - P^f]$ and $[P_B^c - c - P^f]$ are positive (follows from (4)).

Thus (7) can be written as

$$\frac{Q_A^c}{Q_B^c} > \frac{P_B^c - c - P^f}{P_A^c - c - P^f} \quad (8)$$

Writing out the expressions for Q_A^c and Q_B^c in (8) and simplifying gives us

$$\frac{a - c - P^f(1+t_A)}{a - c - P^f(1+t_B)} > \frac{a - c - P^f + NP^f t_B}{a - c - P^f + NP^f t_A} \quad (9)$$

Note that the numerator and the denominator on each side of the above inequality are positive (- this follows from (4)). Re-arranging and simplifying (9) yields

$$t_A[(N-1)(a-c)] + P^f t_A[1-N-Nt_A] > t_B[(N-1)(a-c)] + P^f t_B[1-N-Nt_B] \quad (10)$$

Let us vary N and examine how (10) responds. Consider the case where $N=1$ and where the tariff, while lower, has not been eliminated. Now, (10) reduces to the

inequality: $t_A < t_B$, which, of course, is true. What if the tariff is eliminated? In this case (10) becomes the inequality: $0 > -P^f(t_B)^2$, which, again, is true. Hence, when the industry in question is a monopoly, the government can always find a profit tax rate (T_A) to achieve its objective.⁵

Consider the case where $N > 1$ and $t_A = 0$. The left-hand-side (L.H.S) of (10) is now equal to zero. The first term on the right-hand-side (R.H.S) of (10) is positive whereas the second term is negative. The net value of the R.H.S is indeterminate. Hence, we cannot maintain that the L.H.S $>$ the R.H.S. Is this also the case if the tariff were not eliminated but only reduced? Now, first, note that the first term on each side of the inequality is positive whereas the second term is negative. Second, the first term on the L.H.S of the inequality is less than the first term on the R.H.S of the inequality. Third, the absolute value of the second term on the L.H.S of the inequality is less than the absolute value of the second term on the R.H.S of the inequality. Thus, again, we cannot assert that the L.H.S $>$ the R.H.S. This implies that if the industry in question contains more than one firm, the government may not be able find a profit tax rate to achieve its objective.

⁵ It is possible that the government will not have to raise the profit tax rate to achieve its objective. This occurs if the increase in pre-tax profit is so large that the consequent increase in profit tax revenue (holding the profit tax rate constant) makes up for the shortfall in tariff revenue. It is easily checked that the larger N is, the less likely it is that the government will not have to raise the profit tax rate. In fact, as will be made apparent soon, it will also be less likely that the government can find a higher profit tax rate to attain its objective.

Now, how does the likelihood of finding the desired profit tax rate vary with N (where, $N > 1$)? To address this, consider the inequality in (9). Note that the value of the R.H.S of this inequality is increasing in N , whereas the value of the L.H.S of the inequality does not vary with N . Thus the larger N is, the less likely it is that (9) will be satisfied. The explanation for this runs as follows. First, the larger the number of firms, the smaller is the increase in the industry's pre-tax profit following the tariff reduction. This is because the larger the number of firms, the bigger is the expansion in industry output and, consequently, the stronger is the dampening effect on price, leading to a smaller rise in profit. Second, given that the parameters are such that tariff revenue will fall no matter what the size of the industry, this fall will be greater, the larger the number of firms. Note that the percentage reduction in tariff revenue is the same irrespective of the size of the industry. However, with the tariff revenue being larger for an industry of greater size, the same percentage reduction produces a greater fall in the amount of the tariff revenue for a larger industry than it does for a smaller industry. So, the larger the number of firms, the smaller is the increase in the industry's pre-tax profit and the greater is the reduction in its tariff revenue, making it less likely for (9) to hold and, consequently, making it less likely for the government to find the desired profit tax rate.

The main results of this section are summarized in the propositions below.

Proposition 1: *Only where the industry in question is a monopoly can we be certain that the profit tax alone will generate enough revenue to make up for the shortfall in tariff proceeds (following a reduction in the tariff rate) while ensuring that consumers and producers are still better off in comparison to their respective pre-tariff reduction states.*

Proposition 2: *For any given profit tax rate, the larger the number of firms in the industry the lower the likelihood of the profit tax alone being able to meet the revenue-welfare objective of the government.*

While the likelihood is greater that the profit tax will be ‘up to the task’ for a smaller number of firms, there is no guarantee of this. Hence, even if the industry is highly oligopolistically organized and makes a ‘windfall’ profit from the tariff reduction, the government may not be able to avoid the use of more distortionary forms of taxation, such as the commodity tax and, consequently, the ire of consumer groups. This brings into focus a possible undesirable outcome of trade liberalization: the greater use of more distortionary types of taxes.

4. The Consumption Tax Extension

Now, suppose that besides the profit tax we also have in place a tax on the consumption of the industry’s product. If this tax is levied in an ad valorem form – that is, as a percentage of the price of the commodity – then consumption tax revenue can go up or down following the tariff reduction. In the short run, it is likely to fall since demand tends to relatively inelastic over this time horizon. With consumption tax revenue undergoing a contraction, the profit tax will come under greater ‘revenue’ pressure – in the sense that it must now shore up not only tariff revenue but also consumption tax revenue. Such a scenario will make it all the more likely for the

government to turn to the more distortionary consumption tax to meet its revenue and welfare objectives.

However, if the consumption tax is of the ‘specific’ type – that is, it is independent of the price of the commodity and takes the form of a fixed dollar amount per unit that is purchased of it – then consumption tax revenue will increase with the tariff reduction (since output increases). This will, to some extent, ease up the ‘revenue’ pressure on the profit tax. The following implications, then, emerge. One, the set of cases that Proposition 1 encompasses may become larger. Two, it may be possible to actually *lower* the consumption tax rate and yet achieve the revenue and welfare objectives of the government. Such a possibility has never been alluded to in the literature, so far, on tariff-tax reform strategies. Hence, a formal investigation of this issue may prove beneficial.

The attractive ‘revenue’ property of the specific tax may lead us into wondering whether all consumption taxes in the import sector should be of this type. It might be worthwhile to undertake a formal comparison of the revenue and welfare properties of the two types of taxes and check whether the ad valorem tax retains the ‘superior’ status that it currently enjoys in various models of imperfect competition (see, e.g., Delipalla and Keen, 1992; Mujumdar and Pal, 1998).

Acknowledgements

I am grateful to an anonymous referee for helpful comments.

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