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### Revenue-enhancing Trade Liberalization in Developing Countries

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#### Abstract

Recovering revenue loss due to the reduction in import tariffs is a major concern of many developing economies. In an economy with free entry, which affects the product market competition, we show that, even if there is no other tax reform such as a profit tax reform, the market mechanism itself takes care of the loss of government revenue following a tariff reduction if entry is sufficiently costly. A compensatory profit tax to compensate the loss of government revenue following a tariff reduction is required for an intermediate level of entry cost. If the entry cost is very small, the loss of government revenue following a tariff reduction cannot be compensated even with a profit tax reform. Hence, the net effect of a tariff reduction on government revenue therefore depends on how much tariff and tax revenues are created by entry, which is affected by changes in both the tariff rate and the profit tax rate.

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## 1. Introduction

An important suggestion of the World Trade Organization is to lower the tariff rates on imports, whereas many developing countries have relied historically on import duties as a primary source of government revenue (see Table I). While developing countries have, over the years, undertaken significant cuts in tariffs, their average tariff rates are still quite high. The major concern of these countries towards full trade liberalization is how to make up the shortfall in tariff revenue through other compensatory taxes while making neither producers nor consumers worse-off in the post-liberalization period.

**Table I: Import duties (% of tax revenue) in 2000**

(Source: World Development Indicators CDROM 2002)

<b>Country</b>	<b>2000</b>
Philippines	20.65
Vietnam	20.73
Congo, Rep.	22.87
Jordan	23.71
India	26.67
Bahrain	26.74
Nepal	31.13
Mauritius	31.55
St. Vincent and the Grenadines	42.43
Bahamas, The	47.41
Seychelles	52.05
Madagascar	53.53
Swaziland	54.70
Maldives	63.71

We show that this skepticism about government revenue loss following a tariff reduction may not be valid in an imperfectly competitive market with free entry, which affects product market competition. Even if there is no other tax reform such as a profit tax reform, the market mechanism itself takes care of the loss of government revenue following a tariff reduction if entry is sufficiently costly. Hence, the government does not need to reform profit taxes to compensate the revenue loss following a tariff reduction if entry is very costly. A compensatory profit tax reform to compensate the government revenue loss following a tariff reduction is required for an intermediate level of entry cost. If the entry cost is very small, the loss of government revenue following a tariff reduction cannot be compensated even with a profit tax reform.

The reason for our results is as follows. *Ceteris paribus*, a tariff reduction creates entry by reducing the cost of production and may increase tariff revenue. However, a higher profit tax rate has two opposing effects. On one hand, it tends to increase tax revenue for a given number of firms, but, on the other hand, it tends to reduce entry by reducing the post-tax profits of the firms, which may have a negative impact on government revenue. The net effect of a tariff reduction on government revenue therefore depends on how much tariff and tax revenues are created by entry, which is affected by changes in both the tariff rate and the profit tax rate. If the profit tax rate is unchanged, a tariff reduction increases government revenue by creating sufficient entry when the cost of entry is high. If the cost of entry is not very high, a tariff reduction does not create significant entry. In this situation, government revenue may be increased following a tariff reduction provided the profit tax rate is

increased. If the cost of entry is very small, the number of firms in the industry is very high and therefore, the pre-tax profits of the firms are very small. In this situation, neither a tariff reduction creates significant entry nor a higher profit tax rate increasing the tax revenue significantly. As a result, a tariff reduction does not increase government revenue even with a profit tax reform if the cost of entry is very small. For the intermediate cost of entry, even if entry following a tariff reduction is not high enough to increase government revenue, a higher profit tax rate, yet its negative effects on entry, increases the tax revenue sufficiently to compensate the loss of government revenue due to a tariff reduction.

There is an existing literature uncovering the kinds of tax reform along with tariff reductions that raises welfare (Michael et al., 1993, Hatzipanayotou et al., 1994 and Keen and Ligthart, 2002, Emran, 2005 and Emran and Stiglitz, 2005). These studies have focused on perfectly competitive product market, and despite the large share of intermediate inputs in the imports of the developing countries (López and Panagariya, 1992), little attention has been paid on the imports of intermediate goods. What little effort has been made in this direction again mostly occurs under perfectly competitive settings (López and Panagariya, 1992, Panagariya, 1992). While these works have their own merits, they may not be appropriate in markets where the firms have market power. Though, like perfect competition, free entry in our analysis generates zero profit in equilibrium, the market power of the firms in the present paper play important roles in determining the revenue implications of tariff reduction.<sup>1</sup>

## 2. The model

Consider a small open economy with large number of firms with symmetric cost functions and importing a certain key input. For simplicity, assume that one unit of output requires one unit of input. The cost of assembling each unit is assumed to be zero for all firms.

Let  $p^f$  denotes import price of the input. There is an ad valorem tariff,  $t$ , imposed on each unit of input. Therefore, the marginal cost of production of the  $i$  th firm is  $MC_i = p^f(1+t)$ , where  $i = 1, 2, \dots, n$ . The profit of the  $i$  th firm,  $\pi_i$ ,  $i = 1, 2, \dots, n$ , is taxed at a rate  $T \in (0, 1)$ .<sup>2</sup> There is free entry and each producer incurs the entry cost,  $k^2$ . We interpret the entry costs as the firms' opportunity costs of investing in this industry.

The inverse market demand function is

$$P = a - Q, \tag{1}$$

where the notations have usual meanings.

The free entry equilibrium is given by the following zero profit condition:<sup>3</sup>

$$(1-T)\pi_i = k^2. \tag{2}$$

For analytical convenience, we consider the number of firms as a continuous variable that helps to avoid the integer constraint. To avoid strategic entry, which may create multiple equilibria for the entry game and does not add anything to the main purpose of this paper, we assume that the firms enter the market sequentially.

The equilibrium output and before tax gross profit of the  $i$  th firm,  $i = 1, 2, \dots, n$ , are respectively

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<sup>1</sup> Mujumdar (2004) and Haque and Mukherjee (2005) consider revenue implications of tariff reductions in an imperfectly competitive market with exogenously given number of firms. Free entry in the present paper significantly affects the results of those papers. For example, unlike those papers, tariff reduction in our analysis may not lower government revenue (or even the tariff revenue) in the absence of a compensatory profit tax reform if the cost of entry is sufficiently high.

<sup>2</sup> Consumers may oppose to more distortionary forms of taxation compared to profit tax as a compensatory measure since firms appropriate a substantial share of benefit of the tariff reduction through higher profit (Mujumdar, 2004).

<sup>3</sup> Given that the entry cost is the opportunity cost of investing in this industry, it does not fall under the profit tax. Our qualitative results hold even if there are other fixed costs, which fall under the profit tax.

$$q_i = \frac{a - p^f(1+t)}{n+1} \quad (3)$$

$$\pi_i = \left( \frac{a - p^f(1+t)}{n+1} \right)^2. \quad (4)$$

The equilibrium number of firms, total output and before tax gross industry profit are respectively:

$$n = \frac{\sqrt{1-T}(a - p^f(1+t))}{k} - 1 \quad (5)$$

$$Q = nq_i = \frac{\sqrt{1-T}[a - p^f(1+t)] - k}{\sqrt{1-T}} \quad (6)$$

$$\Pi = n\pi_i = \frac{[\sqrt{1-T}(a - p^f(1+t)) - k]k}{(1-T)}. \quad (7)$$

Tariff reduction makes the consumers better off by increasing the industry output. The firms are indifferent irrespective of the tariff rate due to the zero profit in equilibrium. Hence, if the government can maintain its total revenue, which is the summation of tariff revenue and profit tax revenue, tariff reduction makes no one (i.e., the consumers, the producers and the government) worse off.

### 3. The effect of tariff reduction

Let us first see whether, for a given profit tax rate, a tariff reduction from  $t_B$  to  $t_A < t_B$  may increase or maintain the tariff revenue, i.e.:

$$p^f t_A Q_A \geq p^f t_B Q_B \quad (8)$$

where the subscript  $A$  ( $B$ ) is attached to a variable to denote its post-liberalization (pre-liberalization) state.

Tariff reduction reduces the tariff revenue for a given number of firms (i.e., for  $n_A = n_B$ ) if and only if

$$a > p^f(1+t_A+t_B). \quad (9)$$

We assume that condition (9) holds throughout our analysis. Without (9), the government will operate in the sub-optimal region of the tariff rate and will lower the tariff rate to generate higher tariff revenue.

If (9) is satisfied, it ensures positive output of the entering firms (see (3)). From  $Q_A = n_A q_{iA}$  and  $Q_B = n_B q_{iB}$ , and utilizing (5), (6) and (9), condition (8) holds provided:

$$k \geq \sqrt{1-T}[a - p^f(1+t_A+t_B)] \equiv k^t, \quad (10)$$

and  $k^t$  decreases with higher  $T$ .

If  $k \in (0, k^t)$ , higher profit tax revenue is required to compensate the tariff revenue loss following the tariff reduction. Even if the tariff revenue reduces, the total government revenue may increase at the given profit tax rate provided:

$$p^f t_A Q_A + T\Pi_A \geq p^f t_B Q_B + T\Pi_B$$

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<sup>4</sup> Some firms always enter the market at  $k^t$  if  $\frac{a - p^f(1+t_A)}{2} > a - p^f(1+t_A+t_B)$ . No firm will enter if

$$k \geq \frac{\sqrt{1-T}(a - p^f(1+t_A))}{2} \equiv k^{\max}.$$

$$\text{or, } T(\Pi_A - \Pi_B) \geq p^f (t_B Q_B - t_A Q_A). \quad (11)$$

Utilizing (9), and from  $\Pi_A = n_A \pi_{iA}$  and  $\Pi_B = n_B \pi_{iB}$ , condition (11) holds provided:

$$k \geq \frac{\sqrt{1-T} [a - p^f (1 + t_A + t_B)]}{(1+T)} \equiv k^{TR}, \quad (12)$$

and  $k^{TR}$  decreases with higher  $T$ . We get from (10) and (12) that  $k^{TR} < k^t$ .

Hence, we have:

**Proposition 1:** (i) For a given profit tax rate, there always exists a level of entry cost,  $k \geq k^t$ , such that tariff revenue always increases following the tariff reduction in case of free entry.

(ii) For a given profit tax rate, there always exists a level of entry cost,  $k \in [k^{TR}, k^t)$  such that tariff revenue declines but total revenue increases following a tariff reduction.

(iii) For a given profit tax rate, the possibility of higher tariff revenue and total government revenue following tariff reduction is higher for a higher profit tax rate.

Propositions 1 shows that if  $k > k^{TR}$ , the market entry of new firms increases the government revenue following a tariff reduction and the government does not need to take any compensatory measure for this, thus contrasting the existing literature on this issue.

Tariff reduction encourages more firms to enter the market, thus increasing the import demand for inputs. If the cost of entry is sufficiently high, competition in the market increases significantly following the tariff reduction, which increases the tariff revenue. But, if the entry cost is not so high, i.e.,  $k \in (0, k^t)$ , the effect of tariff reduction on entry is not high enough to raise the tariff revenue by raising the import demand. However, entry of new firms following tariff reduction increases total gross industry profit and increases the profit tax revenue. If the entry cost is not very small, the number of firms in the industry will not be too many and each active firm earns significant amount of gross profit. So, if the entry cost is moderate but sufficiently high, i.e.,  $k \in [k^{TR}, k^t)$ , though tariff reduction reduces tariff revenue, the increase in the profit tax revenue (at the given profit tax rate) compensates the tariff revenue loss and increases total government revenue.

If  $k < k^{TR}$ , the government may make up the shortfall in its revenue by raising the profit tax rate (from  $T_B$  to  $T_A > T_B$ ) if the higher profit tax revenue is greater than the shortfall in tariff revenue, i.e.:

$$T_A \Pi_A - T_B \Pi_B \geq p^f (t_B Q_B - t_A Q_A). \quad (13)$$

Using  $Q_A = n_A q_{iA}$ ,  $Q_B = n_B q_{iB}$ ,  $\Pi_A = n_A \pi_{iA}$  and  $\Pi_B = n_B \pi_{iB}$  in (13), and assuming  $k = 0$ , we get (13) as follows:

$$\sqrt{1-T_A} \sqrt{1-T_B} p^f (t_B - t_A) [a - p^f (1 + t_A + t_B)] \leq 0. \quad (14)$$

Condition (14) never holds since all the terms in the left hand side are positive. Hence, the government cannot maintain the total revenue following a tariff reduction even by increasing the profit tax rate if  $k = 0$ . On the other hand, we have seen that, for  $k \geq k^{TR}$ , the government does not need to change the profit tax rate to compensate the tariff revenue loss. Since the outputs, profits and revenues are continuous in  $k$ , there exists a critical entry cost, say  $k^{TA}$ , such that for  $k \in (k^{TA}, k^{TR})$  ( $k \in (0, k^{TA})$ ), the government can (cannot) compensate the tariff revenue loss following tariff reduction by increasing the profit tax rate.

Hence, we have:

**Proposition 2:** *If the cost of entry is moderate but relatively small, i.e.,  $k \in [k^{TA}, k^{TR})$ , the government can compensate the loss of tariff revenue following the reduction in tariff rate by increasing the profit tax rate.*

**Proposition 3:** *If the cost of entry is very small, i.e.,  $k \in [0, k^{TA})$ , the government can never compensate the loss of tariff revenue following the tariff reduction by increasing the profit tax rate.*

For very small entry costs, tariff reduction does not change the industry profit significantly since the equilibrium profit of each firm is very small, generating negligible profit tax revenue. Hence, a higher profit tax rate can never compensate the tariff revenue loss. As the entry cost gets bigger, the industry profit and the profit tax revenue start increasing, and may make the recovery of the tariff revenue possible.

The above qualitative results would not be affected if we consider that the final goods producers consist of symmetric domestic and foreign producers, who produce in the domestic country. However, the results can be different if we consider that the foreign firms are exporting to the domestic country. If there are only foreign exporting firms, the profit tax revenue is always zero. If the tariff is on the final goods, this scenario is similar to our analysis with a zero profit tax rate.

If the final goods market consists of both exporting foreign firms and import competing domestic firms, it is important to see whether trade liberalization involves tariff reduction on the inputs and/or on the final goods. Tariff reduction on the inputs make the domestic firms better off, while tariff reduction on the final goods makes the foreign firms better off. The net result depends on this trade-off and the level of entry cost. We leave this issue for future research.

#### 4. Conclusion

The novelty of our analysis is that it provides new policy implications. We show that the market mechanism may compensate the tariff revenue loss by attracting new firms in the industry. So, the advice of the World Trade Organization regarding tariff reduction may not be costly for the developing countries that rely very much on tariff revenue.

It is worth mentioning that we have considered a situation where the government does not choose a tariff rate above the one that maximizes revenue in the short run, yet a tariff reduction may increase government revenue once entry is taken care off. That is, short run tax/tariff policies may not be optimal in the long-run, which internalizes the effects of entry. Therefore, a follow up research will determine optimal long run tax/tariff policies in an imperfectly competitive market where the product market structure will be determined through endogenous entry. We leave it for future research.

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