Outsourcing, Tariffs Agreement, and Trade Liberalization

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Abstract

This paper attempts to develop the theory of strategic outsourcing. It examines the strategic choices within the broader-defined outsourcing: FDI or intra-industry trade, and the effects of strategic tariff agreement and potential trade liberalization on such choices by modifying Chen, Ishikawa and Yu's two-firm-two-country model (2003), which both domestic and foreign firms produce the homogenous intermediate good and compete in the domestic market for heterogeneous final goods, with our boarder definition of outsourcing including FDI and intra-industry trade. We find that for the intermediate good, the choice made by the multinational firm between FDI and intra-industry trade depends on the bargaining power on tariffs between both developing and developed countries. Since the developing country seems possess more bargaining power with its lower marginal cost of production, we find FDI, the other form of outsourcing, is more possible to be chosen by the multinational firm, while it increases multinational firm's profit and welfare with reduction of its rival's profit. It could cause the tariff war between both countries. Moreover, when it is demonstrated as a two-stage game, the proper export tariff levied on the intermediate good by the developing country can result in the Nash equilibrium. However, when the developed country levies the import tariff as reply, lowering it will be the Nash Equilibrium to have FDI for both countries, while the ratio of tariffs for such equilibrium set up by some agreement, say, the Voluntary Import Expansions (VIEs). Therefore, the tariff agreement between two countries is necessary to build trade equilibria and the expected trade liberalization is limited. That is, free trade will not be achieved.

Furthermore, our model can be extended to the scenario that there exists different substitutability of produced final goods and shows previous results still be held, although the detailed conditions could be different.

JEL Classification: F12, F13, F14, F23

Key Words: General Outsourcing, Intra-industry Trade, FDI, Tariff Agreement, Trade Liberalization

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1. Introduction

International trade has become an import factor to the growth of world economy today. All developed and developing countries find its significant contribution to increase their total factor productivity and improve their social welfare. What happened strikingly in recent years is that growth rates of the total value of and volume of international trade have been much greater than that of total value of GDP in the world. Intra-industry trade, i.e. exchange of intermediate goods within the same industry and among countries, could explain this counter-intuitive fact. This new trade pattern allows a country to fully utilize other countries' resources and achieve the cost efficiency. It has been practiced by many countries and firms.

Furthermore, with the integration of world market, many multinational corporations are actually transferring part of their production abroad. They choose to do so because lower production cost, mainly labor cost, enables them to be more competitive and more profitable. This type of behavior is categorized as Foreign Direct Investment (FDI) or

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international outsourcing. The former is quite straightforward in its meaning, the latter, however, needs to be clarified.

Generally, there are, at least, two main definitions for "outsourcing". In "Deardorff's Glossary of International Economics" (Deardorff, 2000), Outsourcing is defined as "(1) performance of a production activity that was previously done inside a firm or plant, outside that firm or plant," or "(2) manufacture of inputs to a production process, or a part of a process, in another location, especially in another country", or "(3) another term of fragmentation". It shows that outsourcing is similar with FDI. On the other hand, according to Campbell R. Harvey's Hypertextual Finance Glossary (2003), "outsourcing means purchasing a significant percentage of intermediate components from outside supplier", in which outsourcing seems similar as intra-industry trade with intermediate goods. Different scholars adopt different definitions for their studies. Most economists, as far as we know, prefer to refer the transfer of the production to another country as "outsourcing" (Glass, 2003; Feenstra and Hanson, 1996, 1997; and Arndt, 1997, 1999; etc.). In this paper, we combine both definitions together and discuss the firms' behavior within my broadened outsourcing, which includes both FDI and intra-industry trade.

With outsourcing, multinationals will break up their production process and relocate part or all of the process, viewed as FDI, to any place where the production cost is lower. The lower production cost will affect price charged by firms and consequently, quantity demanded by consumers. Thus firms' profits and consumer surplus will all be affected, so will social welfare. Intra-industry trade on intermediate goods, however, could lower the production cost for final goods as well, which brings similar effect as FDI does. Therefore there is a need for researches on firms', especially multinationals', choice

between FDI and intra-industry trade. Firms' further decision or expectation about FDI for keeping production of intermediate goods or expanding its production to include the final goods will also affect their decision for FDI, intuitively. Moreover, firms' choice between FDI and intra-industry trade will also results in relocation of national interests, if such outsourcing occurs between countries. Tariffs will be used, therefore, as a tool to balance such interest relocation, although it often causes conflict between both countries. Therefore, to balance the "gains" and "loses" between both countries to obtain the Nash Equilibrium in international trade has become an interesting and important topic today. This has given us the initial motivation to start this paper.

There are many papers exploring "outsourcing" in recent years. Glass (2003) examines reasons for outsourcing under imperfect intellectual property rights. Girma and Gorg (2002) find that high wages attributes an important incentive for firms to go outsourcing. Lai (1998) indicates that severe imitation may lead to reduction in FDI and innovation. Feenstra (1998) shows the increase of international outsourcing by a summary of data. Fukao, Ishido, and Ito's paper (2003) empirically study the vertical intra-industry trade patterns in east Asia with different FDI levels, while they treat FDI as different assumptions in their intra-industry trade study. So far however, few papers have been discussed on consumer surplus and social welfare due to outsourcing. Such surplus and welfare would affect countries' policy making regarding both outsourcing of its own firms and hosting outsourcing from firms of other countries.

In this paper, we extend Chen, Ishikawa and Yu's idea (2002) (CIY, thereafter) to the circumstance of our broadened "outsourcing". There are two firms: the domestic one and foreign one. Both firms can produce and also use the intermediate goods to produce

single homogenous final good and then, compete in the domestic market for such final good. CIY (2002) use the definition from Harvey's Hypertextual Finance Glossary (2003), while we adopt the definition combined with Deardorff's (2000) and Harvey's (2003) definitions, and refer the Chen, Ishikawa and Yu's "outsourcing" as intra-industry trade in the intermediate goods.

The foreign country is assumed to have a lower marginal cost to produce the intermediate good. The domestic firm can then, besides purchasing the intermediate good as CIY assumed (2002), establish a subsidiary in the foreign country to produce the intermediate good for itself. This is a reasonable behavior, since purchasing the intermediate good from its own oversea subsidiary will enable the domestic firm to lower its marginal cost on the production of the intermediate goods and perhaps, and could avoid the possible import tariff on it. This will lower its final good price and increase its demand. Thus the consumer surplus as well as the producer's profit for the domestic country will increase, and result in higher social welfare. Under this strategy, the foreign firm will be worse off compare to the previous circumstance that it sells the domestic firm the intermediate good in CIY's model. To protect its own firm, the foreign government will set out to negotiate with the domestic government. We then consider two methods the foreign government may use. One is to impose an export tariff on the intermediate goods produced by the subsidiary and exported to its domestic firm. The other is to negotiate with the domestic government by lowering the import tariff charged on the final good exported by the foreign firm. We find that a lower import tariff will lower prices, increase quantity demanded and increase social welfare.

This paper also examines the situation of trade liberalization. It finds that zero tariff could be the achieved at equilibrium, only when the export tariff has already been fully replaced by a lower import tariff before the free trade policy is implemented.

The paper is organized as follows. In Section 2, we adopt the two-firm-and-two-country model with the domestic firm establishing a subsidiary in the foreign country to produce the intermediate good. Equilibrium conditions are given out for our defined outsourcing. In Section 3, we extend the model to the state where the domestic subsidiary also competes in the final goods market as the extended outsourcing. We then find the equilibrium for this extended model. Section 4 focuses on the situations under possible trade liberalization, and corresponding equilibrium is given out. Finally, in Section 5, we conclude the paper with some suggestions.

2. Basic Outsourcing with Intermediate Goods

As same as CIY's model (2002), we have one domestic firm and one foreign firm as well. Both firms use the same intermediate goods X to produce a differentiated goods Y. Marginal cost is m_F for the foreign firm and m_D for the domestic firm. Here we also assume that $m_F < m_D$, which means the foreign firm is more efficient in the production of the intermediate goods. Domestic price and demand is p_D, q_D and p_F, q_F for domestic goods Y and foreign goods Y respectively. Domestic tariff on the final goods Y is t_Y.

Let us review CIY's results under the circumstance of trade between the two firms for our later comparison. In their paper, when there is only trade in the final goods Y, i.e.

the foreign firm produces Y and sells that to the domestic market, the domestic firm uses X produced by itself, and then sells its final product Y on it's own home market. Profits for both firms are:

$$\Pi_D = (p_D - m_D)q_D(p_{D,} p_F) \tag{1}$$

$$\Pi_F = [p_F - (m_F + t_Y)]q_F(p_F, p_D) \tag{2}$$

Also in CIY's paper, the situation that the domestic firm purchases the intermediate goods X from the foreign firm is called "outsourcing", while here, we use our broardened "outsourcing" defined before. So "outsourcing" in CIY's model will be referred to as "trade in both the intermediate and the final goods", to be distinguished from our outsourcing later. Let t_X be the tariff on the intermediate goods levied by either domestic or foreign countries, and p_X be the price of X in the foreign market. CIY's results of profits for both firms are:

$$\Pi'_D = [p_D - (p_X + t_X)]q_D(p_D, p_F) \tag{3}$$

$$\Pi'_F = [p_F - (m_F + t_Y)]q_F(p_{F,} p_D) + (p_X - m_F)q_D(p_{D,} p_F) \tag{4}$$

That is, intra-industry trade for the intermediate goods occurs if $m_D > p_X + t_X$.

2.1 The model and assumptions

The domestic firm now decides to invest in the foreign country to establish a subsidiary, which produces the intermediate goods X, and then sells X to the domestic firm. We assume that the subsidiary could utilize all the cost-efficient factor in the foreign country and thus has the same level of marginal cost for X as the foreign firm,

m_F. We here, take for granted that all the construction fee and other fixed cost be normalized to zero from the perspective of a period long enough. Since transfer of goods X from the subsidiary to its home company would be considered as transfer within the firm, it is reasonable to make the assumption of zero tariff here. Obviously, $m_F < t_X + p_X$, i.e. the cost of buying goods X from its subsidiary is strictly lower than buying X from the foreign firm. So after the establishment of the domestic subsidiary, the foreign firm, as the supplier of goods X, is completely out of the market. It now only competes in domestic market for the final goods Y. Therefore, profits for both firms are:

$$\hat{\Pi}_D = [p_D - (m_F + t_X)]q_D(p_D, p_F) \tag{5}$$

$$\hat{\Pi}_F = [p_F - (m_F + t_Y)]q_F(p_F, p_D) \tag{6}$$

Equilibrium price is denoted by $p_i(m_F, t_Y)$, $i = D, F$, it must satisfy the following first order conditions:

$$\frac{\partial \hat{\Pi}_D}{\partial p_D} = 0 \tag{7}$$

$$q_D(p_D(m_{F,}t_X), p_F(m_F, t_Y)) + (p_D(m_F, t_X) - (m_F + t_X))q_{D1}(p_D(m_F, t_X), p_F(m_{F,}t_Y)) = 0$$

$$\frac{\partial \hat{\Pi}_F}{\partial p_F} = 0 \tag{8}$$

$$q_F(p_F(m_{F,}t_Y), p_D(m_{F,}t_X)) + [p_F(m_F, t_Y) - (m_F + t_Y)]q_{F1}(p_F(m_{F,}t_Y), p_D(m_F, t_X)) = 0$$

It is obvious that an increase in m_F will lead to an increase in the price for both the domestic final goods and the foreign final goods, since m_F is the marginal cost for both

firms, i.e. $\frac{\partial p_i(m_F, t_Y)}{\partial m_F} > 0$. We now examine how changes in m_F will affect the profits of both firms. Using Envelope Theorem:

$$\frac{\partial \hat{\Pi}_D}{\partial m_F} = -q_D(p_D, p_F) + (p_D - (m_F + t_X))\frac{\partial q_D}{\partial pF} \cdot \frac{\partial p_F}{\partial m_F} \tag{9}$$

(-) (+) (+) (+)

Since increase in p_F will decrease the demand for foreign goods (q_F), thus, have a positive effect on q_D, we have $\frac{\partial q_D}{\partial P_F} > 0$. We know that change in m_F will have two opposite effect on $\hat{\Pi}_D$. First, increase in m_F increases p_F thus decreases q_F, which will contribute to an increase in q_D and $\hat{\Pi}_D$. But at the same time, increase in m_F will lead to a rise in the cost for the domestic firm, so p_D will be raised. This will decrease q_D, thus decrease $\hat{\Pi}_D$. From the study of Chen and others, we know that the second effect ("direct effect" in CIY's paper) will dominate as long as $0 < \frac{\partial q_i(p_i, p_j)}{\partial p_j} < -\frac{\partial q_i(p_i, p_j)}{\partial p_i}$ i.e. quantity demanded is more sensitive to the price change of its own than that of its competitor or goods Y produced by the two firms are weak substitutes to each other. Then we may say $\frac{\partial \hat{\Pi}_D}{\partial m_F} < 0$, i.e. an increase in m_F will decrease the domestic firm's profit.

Using the same method, we have:

$$\frac{\partial \hat{\Pi}_F}{\partial m_F} = -q_F(p_F, p_D) + (p_F - m_F - t_Y) \cdot \frac{\partial q_F}{\partial p_D} \cdot \frac{\partial p_D}{\partial m_F} \tag{10}$$

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Still, the direct effect dominates the indirect one and we have $\frac{\partial \hat{\Pi}_F}{\partial m_F} < 0$

So decreases in m_F will be beneficial to both the domestic and the foreign firms.

Compare with CIY's trade in both the final goods Y and the intermediate goods X, under this outsourcing, does the domestic firm now have more profit? What about the foreign firm? Look at (3) and (5), we know that the domestic firm's marginal cost decreases from $w + t_X$ to m_F. So now, even if the domestic firm charges the same price p_D, thus has the same quantity demanded q_D, it will have more profit under outsourcing. We have another intuitive way to explain this:

From CIY's paper, we know $\frac{\partial \Pi_D'(p_X + t_X, t_Y)}{\partial w} < 0$, $\frac{\partial \Pi_D'(p_X + t_X, t_Y)}{\partial t_X} < 0$.

From the domestic firm's perspective, having the subsidiary as its supplier of X can be viewed as reducing its buying price in CIY's trade in two goods model, from w to m_F, and import tariff of X from t_X in CIY's trade model to zero. We know that decrease in w and t_X will both result in an increase in Π_D', actually to $\hat{\Pi}_D$ here. For the foreign firm it is obvious that its profit from selling the intermediate goods X will be lost, so its total profit decreases after the establishment of the subsidiary. At the same time, the domestic firm, having lower marginal cost now, will have an incentive to lower its price. Relatively, if the foreign firm wants to maintain its market share, it will follow to decrease its price. So we come to the following Lemma:

Lemma 1: *When the domestic firm takes the strategy of outsourcing, i.e. establishing a subsidiary in the foreign country, the domestic firm could have lower price level and higher profit.*

Under this kind of outsourcing, quality level remain the same, lower price of both the domestic and the foreign goods can result in an enlargement of consumer surplus. In addition, the domestic producer is gaining more profit under the establishment of the subsidiary. And since social welfare can be thought of as total surplus from consumer and producer, we can assert that under outsourcing, domestic social welfare would be raised.

We have proved that after the establishment of the subsidiary, the domestic firm enjoys more profit. While at the same time, the foreign firm will have a loss in profit. In the real world where the domestic firm needs to establish the subsidiary in the foreign country, the foreign government would always act first to protect its own firm. We consider two choices the foreign government may use: imposing an export tariff on the intermediate goods X, $\hat{t}_X$, or negotiating with the domestic country to have a lower import tariff on the final goods Y it sells to domestic market, $\hat{t}_Y$. We assume there would exist equilibrium in establishing the subsidiary, when the foreign firm is better off and the domestic firm no worse off, comparing to CIY's trade in two goods model. i.e. $\hat{\Pi}^*_F > \Pi'_F$, $\hat{\Pi}^*_D = \Pi'_D$. Comparing CIY's results with ours for related prices and quantities sold, we have

Lemma 2: *The domestic firm will prefer intra-industry trade on the intermediate goods than FDI* .

2.2 Basic outsourcing with export tariff

This is a two-stage game, in the first stage, the domestic firm, facing given conditions of lower foreign marginal cost in producing X, $m_F < m_D$, decides whether to build the subsidiary in the foreign country. Then in the second stage, two firms compete in domestic market for final goods Y. Since the foreign firm, fully aware of its competition with the domestic firm in the second stage, will always in the first stage, set up a $\hat{t}_X$, so as to ensure $\hat{\Pi}^*_{Ft_X} = \Pi'_F$ and $\hat{\Pi}^*_{Dt_X} > \Pi'_D$. Profits for both firms are:

$$\hat{\Pi}^*_{Dt_X} = \left[p_D - \left(m_F + \hat{t}_X \right) \right] q_D\left(p_{D,} p_F\right) \tag{11}$$

$$\hat{\Pi}^*_{Ft_X} = \left[p_F - \left(m_F + t_Y\right)\right] q_F\left(p_F, p_D\right) \tag{12}$$

Profits in CIY's trade model are:

$$\Pi'_D = \left[p_D - \left(p_X + t_X\right)\right] q_D\left(p_D, p_F\right) \tag{3}$$

$$\Pi'_F = \left[p_F - \left(m_F + t_Y\right)\right] q_F\left(p_{F,} p_D\right) + \left(p_X - m_F\right) q_D\left(p_{D,} p_F\right) \tag{4}$$

Since $\hat{\Pi}^*_{Ft_X} = \Pi'_F$, we have:

$$\left[p_F - \left(m_F + t_Y\right)\right] q_F\left(p_F, p_D\right) + m_F \cdot q_D\left(p_D, p_F\right) =$$

$$\left[p_F - \left(m_F + t_Y\right)\right] q_F\left(p_{F,} p_D\right) + \left(p_X - m_F\right) q_D\left(p_{D,} p_F\right)$$

Then, we obtain:

$$p_X = 2m_F \tag{13}$$

From $\hat{\Pi}^{*}_{Dt_X} > \Pi^{'}_{D}$, we have:

$$\left[p_D - \left(m_F + \hat{t}_X\right)\right] q_D\left(p_{D,} p_F\right) > \left[p_D - \left(w + t_X\right)\right] q_D\left(p_D, p_F\right)$$

Then,

$$\hat{t}_X < p_X + t_X - m_F \tag{14}$$

Substitute (14) into (13) we have: $\hat{t}_X < t_X + m_F$ if $t_X > 0$

Proposition 1*:* *Under the circumstance of production outsourcing with the domestic firm establishing a subsidiary in the foreign country, equilibrium is achieved when the foreign government charges an export tariff* $\hat{t}_X$ *, at the level of* $\hat{t}_X < p_X + t_X - m_F$ *, on the intermediate goods the domestic subsidiary sells to its home firm.*

Remark: Proposition 1 is the necessary condition that outsourcing would happen. That is, the foreign government allows the domestic firm to establish a subsidiary in the foreign country with the domestic firm no worse off and the foreign firm earns more profits comparing with CIY's trade in two goods model. We here, assume that the foreign government imposes the export tariff on the intermediate goods X and then uses the tax revenue as a subsidy to its firm. While if the tax revenue is not to be given to the foreign firm, it still could affect both firm's profits. Since the domestic firm now pays an export tax $\hat{t}_X$, its effective marginal cost now becomes $m_F + \hat{t}_X$. Comparing with m_F in (5), an increase in the cost will cause price p_D to increase and price increase will result in

a decrease in demand q_D. In domestic market, a reduction in q_D due to increase in price will lead to an increase in q_F since the final goods produced by the two firms are weak substitutes. Also, increase in domestic price will raise the price charged by the foreign firm. All in all, the foreign firm will have more profit with the domestic firm lose some. Of course, the foreign government can transfer part of its tax revenue from $\hat{t}_X$ to foreign firm. In that case, conclusions discussed above still hold.

On the domestic country's side, p_D increases, which will likely to be followed by an increase in p_F, and both will result in decrease in quantity demanded from domestic consumers. So consumers now gain less surplus with this export tariff $\hat{t}_X$. Total social surplus is composed of producer surplus and consumer surplus, i.e. TS = PS + CS, with both producer surplus unchanged and consumer surplus less than before, we know that the policy of imposing an export tariff on the intermediate goods X by the foreign government will undermine domestic social welfare. Thus, from both the domestic firm and domestic consumers' point, the domestic government will not support an export tariff imposed by the foreign government. Meanwhile, since in our model, the foreign firm only sells at domestic market, with profit of the foreign firm increased, the foreign government will favor this export tariff $\hat{t}_X$.

So now, the domestic government has to look for other option to reduce or offset the loss from levying the import tariff $\hat{t}_X$ on its social welfare. Here considering the resources it holds, lowering its import tariff t_Y on the foreign firm's final goods could be an attractive option. It can not only reduce its loss on social welfare, but also increase its bargaining power on further potential negotiation.

2.3 Basic outsourcing with lower import tariff

We first examine whether the domestic government has the incentive to practice trade liberalization on final goods imported from the foreign firm when there's no threat from the foreign government to impose the export tariff. Firms' profits under outsourcing are:

$$\hat{\Pi}_D = (p_D - (m_F + t_X))q_D(p_D, p_F) \tag{5}$$

$$\hat{\Pi}_F = [p_F - (m_F + t_Y)]q_F(p_F, p_D) + m_F q_D \tag{6}$$

We can see that, if the domestic government now lowers the import tariff to $\hat{t_Y}$, the foreign firm will have lower efficient marginal cost, which gives it the incentive to lower its price p_F. At the same time, the domestic firm, in order to maintain its market share, will lower its price p_D. Here, we have made the assumption that final goods Y produced by the two firms are weak substitutes in that the price change of one firm's final goods will be followed by that of the other's. This is however, different from strong substitutes, in which case, consumers will all turn to the cheaper one if the price change of one is not to be followed by the other. So decrease in the price of both firms' final goods will lead to an increase in domestic demand for the final goods, q_D and q_F. Obviously, domestic consumers now have more surplus, the reason being that with the decrease of both p_D and p_F, using the same disposable income, consumers now enjoy higher surplus from it. But things for the domestic firm is not very clear. Generally, with the same marginal cost m_F, a lower price will result in lower unit profit $p_D - m_F$. While at the same time, with

higher quantity demanded, firms will have more profit. Normally, we can assume that firms' profit will increase under this situation. The reason is from the foreign firm's reaction to a lower tariff $\hat{t_Y}$, i.e. to decrease its price p_F, we know that final goods Y must be elastic. This is to ensure that quantity increased will make the foreign firm more profitable, otherwise, if goods Y is inelastic, the foreign firm is better off to stay at its higher price level p_F. For the same reason, we know that the domestic firm will also have more profit if it lowers its price p_D. We now know that with consumers much better off, the domestic firms may also have more profit. This gives the domestic country an incentive to reduce t_Y even confronted with an export tariff $\hat{t_X}$, levied by the foreign government. It is the common information for both countries that a decrease in t_Y will increase domestic social welfare, but still, the domestic government may not exercise this trade liberalization automatically. Instead, it can use it to negotiate with the foreign government since the foreign government's goal is to maximize the foreign firm's profit Π_F.

Under this circumstance, will the domestic government pass the trade liberalizing policy, i.e. lowering its tariff on foreign final goods Y?

To discuss this, we need to specify the domestic country. If the domestic country is a developing country with the industry to produce Y being infant industry, it will not lower its t_Y. This is because a lower tariff will give the foreign firm more competitive edge to lower its p_F, and force the domestic firm to follow in this price competition. But then, the domestic firm will most likely to have less profit. This would probably mean they will invest less in R&D and thus stay further behind after its foreign competitor for a

longer time. If the domestic country is a developed country, it will, on one hand, care more for its consumer surplus and social welfare, but on the other hand, lobbied by domestic firms. So when these two forces are in conflict, the domestic government will make decisions that best balance the benefit of all and good for the long run development of the country. We conclude that if the domestic country is a developing country and focuses on protecting its own firms, or if it is a developed country, but firms have a say in the decision making process, it will not implement trade liberalization. It will however, if its priority is to maximize present social welfare and consumer surplus.

We now turn to the situation where the domestic country faces an export tariff charged by the foreign government.

Suppose the domestic government now agrees to lower its import tariff charged on Y to $\hat{t}_Y$. Profits for both firms are:

$$\hat{\Pi}^*_{Dt_Y} = (p_D - (m_F + t_X))q_D(p_D, p_F) \tag{15}$$

$$\hat{\Pi}^*_{Ft_Y} = \left[p_F - \left(m_F + \hat{t}_Y \right) \right] q_F(p_F, p_D) + m_F q_D \tag{16}$$

Since the foreign firm will be satisfied only if the lower tariff $\hat{t}_Y$ would allow it to have the same profit level as when it imposes the export tariff $\hat{t}_X$, where:

$$\hat{\Pi}^*_{Ft_X} = [p_F - (m_F + t_Y)]q_F(p_F, p_D) + \hat{t}_X \cdot q_D(p_D, p_F) + m_F q_D \tag{12}$$

we now have:

$$\hat{\Pi}^*_{Ft_Y} = \hat{\Pi}^*_{Ft_X}$$

Then, we get:

$$\frac{t_Y - \hat{t}_Y}{\hat{t}_X} = \frac{q_D}{q_F} \tag{17}$$

Proposition 2: *If the domestic government lowers its import tariff on the foreign final goods Y to the level that satisfies* $\frac{t_Y - \hat{t}_Y}{\hat{t}_X} = \frac{q_D}{q_F}$*, this will result in higher foreign firm profit, higher domestic firm profit, greater consumer surplus and greater social welfare.*

Remark: By trade liberalization in final goods, the foreign firm has the same level of profit as when it imposes the export tariff, which is more than its profit under outsourcing. The domestic firm, without paying the export tariff on the intermediate goods produced by its subsidiary, will definitely have more profit. Also, with lower import tariff $\hat{t}_Y$, the foreign firm will have the incentive to decrease its price, and again, this will likely to be followed by the domestic firm. Therefore, domestic consumer surplus will be raised and social welfare will increase. This is the Nash Equilibrium in this game.

3. Extended Production Outsourcing with Both Intermediate and Final goods

The domestic firm's subsidiary in the foreign country now continues to supply the domestic firm the key intermediate goods X at its marginal cost m_F, at the same time, it also produces its own final goods Y using the intermediate goods. It then exports the

final goods to domestic market and pays the import tariff t_Y. The subsidiary in this case, competes with the domestic firm and the foreign firm on the market for final goods Y.

3.1 Modeling new style of outsourcing

We have two different approaches to the definition of the final goods Y produced by the subsidiary.

The first is based on the assumption that domestic consumers are more brand-oriented than location-of-production-oriented. With this, we'll have consumers indifferent between goods Y produced by the domestic firm and by the subsidiary because they bear the same brand name. While goods Y produced by the foreign firm is viewed as differentiated goods. Profits for the two firms are:

$$\tilde{\Pi}_D = (p_D - m_F)\cdot\frac{1}{2}\cdot q_D(p_D, p_F) + [p_D - (m_F + t_Y)]\cdot\frac{1}{2}\cdot q_D(p_D, p_F) \tag{18}$$

$$\tilde{\Pi}_F = [p_F - (m_F + t_Y)]q_F(p_F, p_D) \tag{19}$$

The first term in equation (18) is the profit earned by the domestic firm and the second term is profit earned by the subsidiary. Base on the fact that the domestic firm wholly owns the subsidiary, we may be justified to add them up in calculating the domestic firm's total profit. And since the final goods Y produced by the subsidiary and the domestic firm is homogenous, we may let them have the same price p_D and assign half of total demand to each of them.

Rearranging (18) leads to:

$$\tilde{\Pi}_D = \left(p_D - m_F - \frac{1}{2}t_Y\right)q_D(p_D, p_F) \tag{20}$$

Comparing with the profit domestic firm earns under outsourcing, where:

$$\hat{\Pi}_D = (p_D - m_F) q_D(p_D, p_F) \tag{5}$$

We will have $\tilde{\Pi}_D < \hat{\Pi}_D$, given $t_Y > 0$

Thus we know that under this kind of final goods classification (categorized by brand), the domestic firm is better off if it produces Y alone and allows its subsidiary to be just the supplier of the intermediate goods X.

The second way to define the final goods Y assumes domestic consumers care more about where the final goods Y is produced, at home or abroad, rather than by which company it is produced. With this, we have domestic consumers indifferent between goods Y produced by the subsidiary and by the foreign firm, because they are all made in the same foreign country. That is, there is a strong substitution between goods produced by the domestic firm's subsidiary and by the foreign firm. Meanwhile, goods Y produced by the domestic firm is viewed as differentiated goods. Profits for both firms are:

$$\tilde{\Pi}_D^* = (p_D - m_F) q_D(p_D, p_F) + [p_F - (m_F + t_Y)] \cdot \frac{1}{2} \cdot q_F(p_F, p_D) \tag{21}$$

$$\tilde{\Pi}_F^* = [p_F - (m_F + t_Y)] \cdot \frac{1}{2} \cdot q_F(p_F, p_D) \tag{22}$$

The first term in equation (21) is still the profit gained by the domestic firm and the second is profit gained from its subsidiary. Since final goods Y produced by domestic firm is differentiated from Y produced abroad, domestic firm's quantity demanded remain the same. While based on the assumption that final goods Y produced abroad are all homogenous, it is reasonable to let the subsidiary and the foreign firm charge the same

price p_F and divide total quantity demanded for final goods Y made overseas, equally between them.

Compare with Equation (6), $\hat{\Pi}_F = [p_F - (m_F + t_Y)]q_F(p_F, p_D)$, we know that the foreign firm is worse off with the subsidiary as a competitor on the final goods market. We now come to the following proposition:

Proposition 3: *The domestic firm will be better off if it allows its foreign subsidiary to produce final goods Y and sell to domestic market, when the final goods Y produced by the domestic firm and its subsidiary are differentiated (weak substitutes) while goods Y produced by the subsidiary and the foreign firm are homogenous (strong substitutes), and vice versa.*

Remark: Holding both prices p_D and p_F constant, total quantity demanded for each firm's product Y will not change. Thus the foreign firm has a profit loss of $[p_F - (m_F + t_Y)] \cdot \frac{1}{2} \cdot q_F(p_F, p_D)$. While at the same time, the domestic firm earns more, which is equal to the amount the foreign firm loses.

Again, the foreign government now will bargain with the domestic government to try to improve the situation the foreign firm faces. Still, the foreign government can either impose an export tariff on the intermediate goods X exported from the subsidiary, or ask the domestic government to lower the import tariff it charges on the final goods Y exported from the foreign firm.

3.2 Extended outsourcing with export tariff

Similar to Section 2.3, the foreign firm here would again, set up the export tariff $\tilde{t}_X$, to ensure $\tilde{\Pi}^*_{Ft_X} > \Pi'_F$ and $\tilde{\Pi}^*_{Dt_X} = \Pi'_D$. Profits for these two firms are:

$$\tilde{\Pi}^*_{Dt_X} = \left[p_D - \left(m_F + \tilde{t}_X\right)\right] \cdot q_D\left(p_D, p_F\right) + \left[p_F - \left(m_F + t_Y\right)\right] \cdot \frac{1}{2} \cdot q_F\left(p_F, p_D\right) \tag{23}$$

$$\tilde{\Pi}^*_{Ft_X} = \left[p_F - \left(m_F + t_Y\right)\right] \cdot \frac{1}{2} \cdot q_F\left(p_F, p_D\right) + \tilde{t}_X q_D\left(p_D, p_F\right) \tag{24}$$

Compare with profits under CIY's model, where:

$$\Pi'_D = \left[p_D - \left(p_X + t_X\right)\right] q_D\left(p_D, p_F\right) \tag{3}$$

$$\Pi'_F = \left[p_F - \left(m_F + t_Y\right)\right] q_F\left(p_{F,} p_D\right) + \left(p_X - m_F\right) q_D\left(p_{D,} p_F\right) \tag{4}$$

We have $\tilde{\Pi}^*_{Ft_X} > \Pi'_F$, then, we get:

$$\tilde{t}_X > p_X - m_F + \frac{1}{2} \cdot \left[p_F - \left(m_F + t_Y\right)\right] \cdot \frac{q_F}{q_D} \tag{25}$$

Since $\tilde{\Pi}^*_{Dt_X} = \Pi'_D$, then, we get:

$$\tilde{t}_x = p_X - m_F + t_X + \frac{1}{2} \cdot \left[p_F - \left(m_F + t_Y\right)\right] \cdot \frac{q_F}{q_D} \tag{26}$$

Substitute (26) into (25) we have:

$$p_X - m_F + t_X + \frac{1}{2} \cdot \left[p_F - \left(m_F + t_Y\right)\right] \cdot \frac{q_F}{q_D} > p_X - m_F + \frac{1}{2} \cdot \left[p_F - \left(m_F + t_Y\right)\right] \cdot \frac{q_F}{q_D}$$

Proposition 4*:* *Under the extended production outsourcing with the subsidiary produces both the intermediate goods and the final goods, equilibrium will occur when the foreign*

government charges an export tariff on the intermediate goods X the domestic firm purchases from its subsidiary, at the level of $\tilde{t}_x = p_X - m_F + t_X + \frac{1}{2}\cdot\left[p_F - (m_F + t_Y)\right]\cdot\frac{q_F}{q_D}$.

Remark: Therefore, in equilibrium, the foreign firm is able to maintain its profit level by charging a high export tariff on the intermediate goods.

After $\tilde{t}_X$ has been imposed, effective marginal cost increases for the domestic firm. So the domestic firm will again, raise its price p_D, which will decrease demand for domestically produced Y. At the same time, the foreign firm will possibly increase its price p_F, thus also decrease demand for foreign produced Y. In this way, domestic consumer surplus will fall and so will domestic social welfare.

The domestic government then, may offer to lower its import tariff to $\tilde{t}_Y$, as a condition to bargain with the foreign government to remove or partially remove the export tariff $\tilde{t}_X$.

3.3 Extended outsourcing with lower import tariff

Firms' profits under this new import tariff are:

$$\tilde{\Pi}^{*}_{Dt_Y} = (p_D - m_F)q_D(p_D, p_F) + \left[p_F - (m_F + \tilde{t}_Y)\right]\cdot\frac{1}{2}\cdot q_F(p_F, p_D) \tag{27}$$

$$\tilde{\Pi}^{*}_{Ft_Y} = \left[p_F - (m_F + \tilde{t}_Y)\right]\cdot\frac{1}{2}\cdot q_F(p_F, p_D) \tag{28}$$

Again, the foreign government will only be satisfied when $\tilde{t}_Y$ provides it the same profit level as it would obtain from $\tilde{t}_X$, namely,

$$\tilde{\Pi}^*_{Ft_X} = [p_F - (m_F + t_Y)] \cdot \frac{1}{2} \cdot q_F(p_F, p_D) + \tilde{t}_X q_D(p_D, p_F) \tag{24}$$

Since $\tilde{\Pi}^*_{Ft_X} = \tilde{\Pi}^*_{Ft_Y}$, we have:

$$\frac{t_Y - \tilde{t}_Y}{\tilde{t}_X} = \frac{2q_D}{q_F} \tag{29}$$

Proposition 5: *There exists a Nash Equilibrium with lowering import tariff. Under the extended production outsourcing, the domestic government may lower its import tariff on final goods Y to the level that satisfies* $\frac{t_Y - \tilde{t}_Y}{\tilde{t}_X} = \frac{2q_D}{q_F}$*, to fully replace the export tariff the foreign government imposes on the intermediate goods. This will increase the domestic firm's profit, raise domestic consumer surplus and enlarge domestic country social welfare.*

Remark: While the foreign firm returns to the profit level, which is achieved when an export tariff is charged by the foreign government in Section 4.2, the domestic firm can also have more profit. This is because the subsidiary's profit, being exactly the same formation as that of the foreign firm, will also be increased under this lower import tariff $\tilde{t}_Y$. A lower import tariff will lead to a price reduction in both p_D and p_F, thus increase domestic demand for goods Y produced by both firms. Therefore, we know that the domestic government will be more willing to lower its import tariff on goods Y rather than let the foreign government charge an export tariff on the intermediate goods X.

4. Trade Liberalization

With the integration of world market, trade liberalization seems to become an irreversible trend. World Trade Organization as well as other international trade organizations all strive to promote free flow of goods and services among countries. Thus, lower tariff or even zero tariff has become an important topic for the research of international trade today. We now reexamine our results under the assumption of zero tariff, i.e. both the import tariff on final goods Y charged by the domestic government and the export tariff on intermediate goods X charged by the foreign government are assumed to be zero.

4.1 Free trade under basic outsourcing

We now turn to our model where the domestic firm builds a subsidiary in the foreign country to produce the intermediate goods. Both firms' profits under zero tariff policy are:

$$\underline{\hat{\Pi}_D} = (p_D - m_F) q_D(p_D, p_F) \tag{30}$$

$$\underline{\hat{\Pi}_F} = (p_F - m_F) q_F(p_F, p_D) \tag{31}$$

Compare with:

$$\hat{\Pi}^{*}_{Dt_X} = \left[p_D - \left(m_F + \hat{t}_X \right) \right] q_D(p_{D,} p_F) \tag{11}$$

$$\hat{\Pi}^{*}_{Ft_X} = [p_F - (m_F + t_Y)] q_F(p_F, p_D) + \hat{t}_X \cdot q_D(p_D, p_F) \tag{12}$$

We know that with zero tariff policy, i.e. $\hat{t}_X = 0$ and $t_Y = 0$, the domestic firm will have more profit since its effective marginal cost decreases from $m_F + \hat{t}_X$ to m_F. This will give the domestic firm the incentive to lower its price p_D, thus increase the quantity demanded. Domestic consumer then, will benefit from this tariff policy, the social welfare for the domestic country will increase. While things for the foreign firm is a little ambiguous. With $\hat{t}_X = 0$, it suffers a loss in the subsidy given by the foreign government, from the export tariff revenue. While at the same time, with $t_Y = 0$, its effective marginal cost is lowered, which will generate larger demand and higher profit. We then, come to the following lemma:

Lemma 3: *Under the situation of basic production outsourcing, trade liberalization for both the intermediate goods and the final goods, will result in higher domestic firm's profit, higher consumer surplus and greater social welfare compare to those when export tariff on the intermediate goods is charged by the foreign government. It will be Nash Equilibrium if and only if* $t_Y \cdot q_F \geq \hat{t}_X \cdot q_D$

Proof: Compare with (12) and (31), we know that the foreign firm is no worse off under trade liberalization if and only if:

$$(p_F - m_F) q_F(p_F, p_D) \geq [p_F - (m_F + t_Y)] q_F(p_F, p_D) + \hat{t}_X \cdot q_D(p_D, p_F)$$

Thus, we get $t_Y \cdot q_F \geq \hat{t}_X \cdot q_D$

Remark: Although the foreign firm's profit change is ambiguous after implementing the zero tariff policy, there is still possibility that it will be higher than or at least, the same as before. Under these conditions, we know that the zero tariff policy will be a Nash Equilibrium outcome for both countries since the domestic country is strictly better off without decreasing the foreign firm's profit.

We then, consider the other situation under zero tariffs with that when there is no export tariff and the import tariff is already lowered. Considering profits for both firms under the situation of lower import tariff charged by the domestic government on the final goods Y, firms' profits are:

$$\hat{\Pi}^{*}_{Dt_Y} = (p_D - m_F) q_D(p_D, p_F) \tag{15}$$

$$\hat{\Pi}^{*}_{Ft_Y} = \left[p_F - \left(m_F + \hat{t}_Y \right) \right] q_F(p_F, p_D) \tag{16}$$

Comparing (30) & (31) with (15) &(16), we know that zero tariff on these two goods will have no effect on the domestic firm's profit. However, it will increase the foreign firm's profit since the foreign firm now has a lower effective marginal cost m_F, comparing to $m_F + \hat{t}_Y$. This lower marginal cost will probably lead to a reduction on the price for the foreign final goods and will then, be followed by the domestic firm. All these will attribute to higher domestic consumer surplus and higher social welfare. We now come to the following proposition.

Proposition 6: *There is a Nash Equilibrium for the two countries under trade liberalization that will increase the profit the foreign firm earns. This will not affect the*

domestic firm's profit when a lower import tariff $\hat{t}_Y$ *has already been adopted to replace the export tariff* $\hat{t}_X$. *It will enlarge domestic consumer surplus and improve domestic country social welfare.*

4.2 Free trade under extended outsourcing

We now examine our extended production outsourcing model, where the domestic subsidiary in the foreign country also competes in the final goods market, with the zero tariff condition. Profits for the two firms are:

$$\underline{\hat{\Pi}_D^*} = (p_D - m_F) q_D(p_D, p_F) + (p_F - m_F) \cdot \frac{1}{2} \cdot q_F(p_F, p_D) \tag{32}$$

$$\underline{\hat{\Pi}_F^*} = (p_F - m_F) \cdot \frac{1}{2} \cdot q_F(p_F, p_D) \tag{33}$$

Compare with firms' profits under tariffs in Section 3, where:

$$\tilde{\Pi}_{Dt_X}^* = \left[p_D - (m_F + \tilde{t}_X)\right] \cdot q_D(p_D, p_F) + \left[p_F - (m_F + t_Y)\right] \cdot \frac{1}{2} \cdot q_F(p_F, p_D) \tag{23}$$

$$\tilde{\Pi}_{Ft_X}^* = \left[p_F - (m_F + t_Y)\right] \cdot \frac{1}{2} \cdot q_F(p_F, p_D) + \tilde{t}_X q_D(p_D, p_F) \tag{24}$$

We can see that with both $\tilde{t}_X = 0$ and $t_Y = 0$, effective marginal cost for the domestic firm reduces, to be more specifically, both the effective marginal cost for the domestic firm's final product and the effective marginal cost for the domestic subsidiary's final product reduce. This will lead to lower final goods price from both the domestic firm and the subsidiary. The foreign firm again, will have both a loss in tariff subsidy and a gain in unit profit. Domestic consumers now can enjoy more of goods Y with lower price, therefore, social welfare of domestic country will be raised.

Lemma 4: *Under extended production outsourcing, zero tariff trade policy will increase both the domestic firm's and the domestic firm's subsidiary's profit. Domestic price for final goods Y will be lowered and this will result in higher consumer surplus and higher social welfare compare to those when the foreign government charges the export tariff.*

Also compare the situation under zero tariff with that of lower import tariff. Firms' profits under lower import tariff are:

$$\tilde{\Pi}^{*}_{Dt_Y} = (p_D - m_F)q_D(p_D, p_F) + \left[p_F - \left(m_F + \tilde{t}_Y\right)\right] \cdot \frac{1}{2} \cdot q_F(p_F, p_D) \tag{27}$$

$$\tilde{\Pi}^{*}_{Ft_Y} = \left[p_F - \left(m_F + \tilde{t}_Y\right)\right] \cdot \frac{1}{2} \cdot q_F(p_F, p_D) \tag{28}$$

Compare with (32) and (33), we find that with zero tariff, i.e. $\tilde{t}_Y = 0$, both the foreign firm and the domestic subsidiary will be able to obtain higher profit due to a lowered effective marginal cost. This will decrease domestic market price and increase domestic demand for final goods Y. Thus, domestic social welfare will increase. We have the following Proposition:

Proposition 7: *Under zero tariff policy, profits for both the domestic firm and the foreign firm will increase compare to those under the circumstance of lower import tariff. Domestic consumer surplus and social welfare will both be raised.*

Remark: From the above analysis, we know that trade liberalization will bring more profit to both the domestic firm and the foreign firm. It is thus, a better state. This is also the Nash Equilibrium for the two countries. While at the same time, we observe that the foreign firm gains less, compare to the domestic firm's gain. That would explain why

non-tariff barrier, for instance, administrative interference, still exists and will continue to be in existence for a long period.

5. Conclusion

This paper uses a two-firm-and-two-country model to examine the firms' strategic choices on outsourcing and the effect of strategic tariff agreement and potential trade liberalization on their choices. Two kinds of outsourcing are considered in this paper: basic outsourcing with the domestic firm establishing a subsidiary in the foreign country to produce the intermediate goods, and the extended outsourcing with the domestic firm's foreign subsidiary also produces the final good. After establishing a subsidiary in the foreign country to produce the intermediate goods, the domestic firm could have lower marginal cost, lower price level and higher profit on domestic final good market, where it competes with the foreign firm. So, if the domestic firm faces the choice between buying the intermediate goods from the foreign firm and setting up a subsidiary in the foreign country to produce the intermediate goods, it will prefer to set up the subsidiary. However, this action would undermine the foreign firm's profit, since its revenue from selling the intermediate goods to the domestic firm disappears with the emergence of the subsidiary of the domestic firm. The paper then, finds out that, by using two types of tariff adjustment, production outsourcing equilibrium could be achieved. The first kind of tariff is that the foreign government levies an export tariff $\hat{t}_X$ on the intermediate goods the domestic subsidiary in the foreign country sells to its home firm. The paper

shows that this tariff will undermine domestic consumer surplus and decrease domestic country's social welfare with a higher profit earned by the foreign firm. The second one is that the domestic government lowers its import tariff $\hat{t}_Y$ on the foreign exported final good. This alternative tariffing will result in higher domestic firm's profit, greater domestic consumer surplus and greater domestic social welfare with higher foreign firm's profit. This is a Nash Equilibrium for both countries.

The paper then extends the outsourcing to new circumstance that the subsidiary also produces the final good while it still produces the intermediate goods for its home firm, and competes in domestic market with other firms. With a reasonable definition of the final good produced by the subsidiary, the paper finds that new equilibrium will also occur through the two tariff adjustment. Again, lowering import tariff will result in a Nash Equilibrium, in which higher profits for both firms as well as greater consumer surplus and social welfare for the domestic country could be achieved.

Finally, the paper examines the situation of trade liberalization. Using zero tariff policy for both the basic outsourcing and the extended outsourcing, the paper finds out that in each case, the policy will be a Nash Equilibrium for the two countries if a lower import tariff has already been adopted to replace the export tariff before the implementation of the policy. It means trade liberalization is possible since both sides have incentive to move on.

The paper also discusses the topics on political economy about under the condition countries will adopt the trade liberalizing policy. It is found that if the domestic country is a developing country and focuses on protecting its own firms, or if it is a developed country, and the government is lobbied by the group of firms, it will not implement trade

liberalization since trade liberalization will bring both consumer surplus and social welfare in domestic country to increase but not the domestic firm's profit. Since the existence of the import tariff charged by domestic government on the foreign exported final good will allow the domestic firm to charge a higher price and have a higher profit. The domestic government will promote trade liberalization if its priority is to maximize present social welfare and consumer surplus.

There are some possible extensions of this paper. First, instead of holding constant the price and quantity in the equations, it will be interesting to use dynamic price and quantity to describe changes from all sides. Second, habit formation for consumption could be added into the model. Most economists recognize today that habit formation has become an important factor that affects people's purchasing as well as saving behavior. Finally, competition and firms' bargaining power will all change if more than one firm in each country is considered in the framework.

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