

## INTERNATIONAL QUOTA EXCHANGE

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### ABSTRACT

*Trade barriers in the form of voluntary export restraints have become a common practice in international trade nowadays. Given the trade policies of the importing nations, it is shown that quota exchanges, either direct or indirect, between nations subject to similar quota restrictions are mutually beneficial if the ratio of profit margins differs among exporting countries. However the benefits may decrease or disappear if the importing countries take further actions to protect their domestic markets.*

### I. INTRODUCTION

Under the simplifying assumptions that (1) labor is the only factor needed

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in production, (2) cost of labor is constant, (3) labor is not allowed to move across nations, (4) there are only two goods and two countries in the world economy, (5) demand is positive for both goods, and (6) the sizes of these two countries are comparable, the classical theory of comparative advantage states that free trade is beneficial to all trading countries if the ratio of labor cost between those two goods differs across countries. Complete specialization is a necessary result, at least for the smaller of the two countries. (Ricardo [1817]).

With the prevalence of quota restrictions, complete specialization will not obtain. All countries suffer in terms of welfare losses (Holzman [1969], Lin [1986]). However, if the quota restrictions do not prohibit quota exchanges among exporting countries, then the theory of comparative advantage would still apply to a certain extent.

Lee [1989] shows that the internal value of quota to an exporter (i.g., the value of quota that is specific to the exporter) can be calculated by a valuation skill similar to that used by Black and Scholes [1973] in deriving option pricing model. Exporters should add the internal value of quota to the real production cost to determine the cost of export. It is unlikely that the ratio of the cost of exporting two different goods is equal across all exporting countries subject to similar restrictions. Therefore Section II shows that direct quota exchanges between two exporting countries are mutually beneficial while keeping the total volume of export unchanged.

Section III argues that even if direct quota exchange is explicitly prohibited, there still exist certain channels for indirect quota exchanges. Finally, possible reactions of the importing country are discussed in Section IV.

## II. THE BENEFITS OF DIRECT QUOTA EXCHANGES

Suppose there are several exporting countries subject to similar quota restrictions. Exporters from different countries are facing identical demand

curve in the market of the importing country, but their cost structure differ from one another. Suppose further that the purpose of the quota restrictions is to control total volume of import so that the market share of the import competing industry is protected. The origin of import is of minor concern if the goods are homogeneous.

For simplicity, we assume that there are two exporting countries e and f, two traded goods x and y and one importing country. Country e has agreed to restrict its export volume of x and y to  $Q_x^e$  and  $Q_y^e$  while country f has agreed to restrict its export volume of x and y to  $Q_x^f$  and  $Q_y^f$ . Let  $p_x$  and  $p_y$  denote the world prices of x and y, which are constant as the demand curves are assumed to be perfect elastic so that all exporters are price takers. The maximal total amount of exports equals

$$E^* = p_x(Q_x^e + Q_x^f) + p_y(Q_y^e + Q_y^f) \quad (1)$$

which is known for certain.

The unit cost (including the internal value of quota necessary for export) of exporting x and y in both exporting countries are summarized in Table 1.

Table 1. Cost structures of exporting countries

traded goods	exporting country	
	e	f
x	$c_x^e$	$c_x^f$
y	$c_y^e$	$c_y^f$

The producer surplus in each exporting country is

$$PS_i = (p_x - c_x^i)Q_x^i + (p_y - c_y^i)Q_y^i, \quad i = e, f. \quad (2)$$

Suppose  $c_x^e < c_x^f$  and  $c_y^f < c_y^e$ . Country e may offer to exchange one unit of its quota on y for  $[(p_y - c_y^e)/(p_x - c_x^e)]$  units of f's quotas on x until either e's quotas on y or f's quotas on x are exhausted. Suppose e's quotas on y get exhausted first, the producer surplus after the exchange for country e becomes

$$PS_e = (p_x - c_x^e)[Q_x^e + \left(\frac{p_y - c_y^e}{p_x - c_x^e}\right)Q_y^e] = (p_x - c_x^e)Q_x^e + (p_y - c_y^e)Q_y^e \quad (3)$$

Equation (3) is identical to equation (2) for country e, thus the producer surplus of country e is not affected by the exchange. The producer surplus of country f after the exchange becomes

$$\begin{aligned} PS_f &= (p_x - c_x^f)[Q_x^f - \left(\frac{p_y - c_y^e}{p_x - c_x^e}\right)Q_y^e] + (p_y - c_y^f)(Q_y^f + Q_y^e) \\ &= (p_x - c_x^f)Q_x^f + (p_y - c_y^f)Q_y^f + [(p_y - c_y^f) - (p_x - c_x^f)\left(\frac{p_y - c_y^e}{p_x - c_x^e}\right)]Q_y^e \end{aligned} \quad (4)$$

Since  $c_y^f < c_y^e$ , we have  $p_y - c_y^f > p_y - c_y^e$ . The term in the last bracket of (4) is greater than  $[(p_y - c_y^f) - (p_x - c_x^f)(p_y - c_y^f)/(p_x - c_x^e)] = (p_y - c_y^f)[1 - (p_x - c_x^f)/(p_x - c_x^e)]$ . As  $c_x^e < c_x^f$ , so  $(p_x - c_x^f)/(p_x - c_x^e) < 1$ . The last bracket of (4) which represents the net change in f's producer surplus is positive. Thus the quota swapping has made country f better off without harming country e. The new quota allocation is hence Pareto superior to the original one.

On the other hand country f may offer to exchange one unit of quota

on x for  $(p_x - c_x^f)/(p_y - c_y^f)$  units of e's quota on y. It can be shown by the similar fashion that producer surplus of f is unchanged while that of e has increased. This new quota allocation is also Pareto superior to the original one.

The exchange of quotas will be beneficial to both e and f if the exchange ratio is set between the two proposed ratios in the prededing analysis, which are the ratios of profit margins between products y and x in those two exporting countries. Note that the trade balance of the importing country has been kept intact throughout the discussion.

Actually, the condition that one of the countries is absolutely more efficient in producing one of the products while the other country is absolutely more efficient in producing the other product is not necessary (Jones [1980]). Even if one country is absolutely more efficient in producing both products, that is, unit costs of both products are less than those of the other country, the exchanges of quotas can still be mutually beneficial. Let's take the following example to demonstrate this assertion.

Suppose unit costs of and quota allotments on product x and y are tabulated in Table 2 along with market prices of both products.

Table 2. Cost, price and quota allotment of product x and y.

product	country e		country f		product price
	unit cost	quota	unit cost	quota	
x	\$10	100 units	\$ 9	100 units	\$16
y	\$15	100 units	\$10	100 units	\$20

We see that both x and y are less expensive to produce in country f in the absolute sense. For country e the cost-price ratio is 0.625 for x and

0.75 for y. Since 0.625 is smaller than 0.75, we see that country e is relatively more efficient in producing x. For country f the cost-price ratio is 0.56 for x and 0.5 for y. We see that f is relatively more efficient in producing y.

Under the quota allotments, country e will make a profit of  $(16-10)+(20-15)100 = \$1,000$ . Country f will make a profit of  $(16-9)100+(20-10)\times 100 = \$1,700$ . Suppose country e offers to exchange one quota on y for 1.25 quota on x and country f agrees. As f has 100 quotas on x it will give up all of its quotas on x and receive 80 quotas on y from e. After the change, country e has 200 quotas on x and 20 quotas on y. Its total profit becomes  $(16-10)200+(20-15)20 = \$1,300$ . Country f has no quota on x after the exchange but has 180 quotas on y. Its total profit becomes  $(20-10)180 = \$1,800$ . Country e has gained \$200 from the exchange while country f has gained \$100. For the importing country, total volume of import, either in terms of dollar amount or in terms of units has been kept unchanged.

The result is not surprising. It is just the classical theory of comparative advantage. Here we give it a new interpretation, that is, as long as the ratios of profit margins between exportables are different among exporting countries, the exchange of quotas will be beneficial to all exporting countries leaving the total volume of export unchanged.

Again the mutually acceptable terms of exchange fall between the ratios of profit margins of the traded goods in the participating exporting countries. In the previous example, profit margin ratio is  $(20-15)/(16-10) = 0.83$  in e and is  $(20-10)/(16-9) = 1.43$  in f. Our proposed terms of exchange is 1.25 which falls between 0.83 and 1.43. The closer the exchange ratio is to the profit margin ratio, the less benefits the country will gain. In our example, 1.25 is closer to 1.43 than to 0.83 so that country f gains only \$100 while country e gains \$200. The final exchange ratio depends on the bargaining power, the volume of quota allotments and the relative size of the exporting countries. If the value of quota to each exporting country can be calculated with reasonable accuracy (Lee [1989]), then the ratio

between the values of quotas to the exporting countries would be a good starting point for bargaining.

It is argued that production efficiency has been taken into consideration in setting initial quota limit for each exporting country so that further exchange of quotas among exporting countries may not be beneficial. Again the benefit of quota exchanges lies in the differential of profit margins which can not be determined without knowing the cost structure of the exporters. Initially, countries with lower production cost may receive higher quota allotments. Yet this does not necessarily eliminate the comparative advantage in its entirety, and hence the potential benefit of quota exchanges need not vanish.

Our analysis so far implicitly assumes that (1) exported goods are homogeneous, (2) unit production cost is constant and (3) export prices are constant. If (1) is not the case, then product  $x$  made in country  $e$  and product  $x$  made in country  $f$  may not substitute for each other without affecting consumer satisfaction of the importing country. The importers may therefore insist that product  $x$  be produced in a certain country even if it is cheaper to produce in other countries. Consequently, quotas on product  $x$  can not be transferred.

If (2) fails, unit production cost is not constant in the short run. On the contrary, unit cost is increasing under the existing scale (Firms can not maximize their profit if producing at a stage where unit cost is decreasing), then exporting countries should exchange quotas until the ratios between the marginal profit margins equalize among exporting countries. Complete specialization will not necessarily obtain as in the previous example, where country  $f$  is specialized in exporting product  $y$  after the proposed quota exchanged.

In the long run, if production technology displays constant return to scale, complete specialization will not obtain either.

If (3) does not hold, buyers do have monopsonistic power to depress

the price offered to exporters whose production cost is lower. This would not affect our conclusion that quota exchange is mutually beneficial as long as the ratios of profit margins still differ among exporting countries (Caves [1979]).

Note that quotas need not be exchanged physically to exploit the potential benefits. They can be bought and sold for prices. The internal values of quotas to the buyers would be a reasonable price if the sellers can figure out the buyers' cost structure and the export price of the underlying goods.

In practice, the importing countries may prohibit quota exchanges by requiring that all goods imported must have proof on the country of origin. We shall address this issue in the next section. In particular, we shall argue that it is still possible to realize the benefits of quota exchange without explicitly exchanging quotas.

### III. INDIRECT CHANNELS OF QUOTA EXCHANGES

When quota exchanges are prohibited by the importing countries, there are still two approaches to take advantage of the exchange benefits. The first approach is direct investment.

Suppose exporters in country *e* are more efficient in producing *x* relative to exporters of country *f*, but extra quotas on *x* can not be obtained from country *f* either for a price or by exchange. *e*'s exporters may consider setting up factories in country *f*. Though labor cost may be relatively higher in *f*, the relative efficiency in managerial skills can still beat up competitors in country *f*. Therefore higher prices can be offered for quotas on *x* in the quota market. On the other hand, exporters in country *f* who are more efficient in producing *y* may also set up plants in *e* and convert the relative efficiency into extra profit. Thus direct investment has taken the place of quota exchanges in exploiting potential profits without causing protests by the importing country. The accompanied political risk must be weighted against the



extra profits however.

One thing worth mentioning is that indirect quota exchanges through direct investment can not make the best out of relative production efficiency since some of the production factors are hired in the local market. Training, managerial skills and entrepreneurship are all that can generate extra benefits.

The second approach is OEM (original equipment manufacturer) subcontracting. The current practice of international trade recognizes a product to be made in a country if 35% or more of the value added is accomplished in that country. Suppose country e is relatively more efficient in producing x, the exporters can ship up to 65% finished products to f and subcontract the rest of the production to the manufacturers in country f. The finished goods can then be exported under the names of country f. While only up to 65% of the potential benefits are realized through OEM subcontracting, there is virtually no way to detect this international arrangement (Sanyal [1982]).

Political risk is smaller than direct investment. But quality control and production scheduling of the foreign subcontractors represent yet another type of risk. A hybrid of the above two approaches is proposed for compromise: the exporters of the more efficient country set up plants in the less efficient country mainly to finish the last 35% or more of the value added. The other 65% or less of the value added remains domestically made. Under this arrangement the efficient exporters are exposed to only 35% of the political risk involved in direct investment. The risk of substandard quality and possible delay which may be experienced by subcontracting is substantially eliminated if not in its entirety.

#### IV. POSSIBLE REACTIONS OF THE IMPORTING COUNTRIES

Most of the voluntary restraint agreements let exporting countries manage the quota system as the word voluntary suggests. For example, except for

Benelux, France and Ireland which choose to manage the quota system themselves, most of the importing countries who have bilateral agreements with Taiwan let Taiwan manage the textile export quota system. But quota exchanges as proposed in Section II and III may be undesirable from the importing country's point of view, even though the volume of total import is still under control. There are several reasons for this.

First of all, some of the quota restrictions are not really binding in the sense that the volume of export is the same with or without the restriction. When exporters exchange quotas with one another across national border, all the restricted goods would be imported to the maximum allowed. Consequently, total volume of import would be larger in the presence of quota exchanges.

Secondly, quota exchanges would make each exporting country more specialized and hence more competitive in certain products. Stronger monopolistic power enables the exporters to raise prices, making the consumers of the importing country worse off and the deadweight loss in welfare even greater.

Thirdly, goods produced in different countries are not homogeneous. If quotas are transferred to the most efficient country, consumers of the importing country would have less variety of goods to choose from.

Last but not the least, if the exporters are getting more competitive through quota exchanges, importing competing industries will be hurt even more especially when they are still at their infant stage.

Direct quota exchanges may be easy to guard against, but it would be rather difficult to detect indirect quota exchanges. The cost of monitoring may be huge enough to outweigh the benefits. The only way to eliminate quota exchanging activities is that the importing country manage the quota system by issuing import licenses.

In addition, the issuance of import licenses will generate cashflows with which the government can subsidize the import competing industries. The

effect of protection is therefore enhanced.

One other alternative that the importing countries may consider is to set up a global quota system. Importers with licenses are free to buy the restricted goods from all over the world. In particular, they will search for the source of supply with the lowest price given that a minimum level of quality is maintained. The possibility of quota exchanges would disappear under the global quota system as quotas are no longer controlled by the exporters.

Where there are benefits, there are costs associated with it. Global quota system is no exception. The cost of issuing, auctioning and monitoring import licenses, the efforts of guarding against smuggling (import without license) must be taken into consideration. Besides, possible retaliation or to a lesser degree, the charges of protectionism and the condemnation by the GATT represent yet another type of cost.

## V. FUTURE RESEARCH TOPICS

The classical theory of comparative advantage shows that free trade is beneficial to all trading countries. This paper takes the theory one step forward by showing that comparative advantage can be realized among exporting countries even in the presence of quota restrictions. Direct quota exchanges are prohibited explicitly in the quota agreements, but indirect quota exchanges through direct investment are very common nowadays. We are interested in knowing the volume of quotas that have been changed hand effectively this way. This empirical evidence would be a piece of valuable information to all countries involved in trade negotiations.

On the theoretical front, we think factor price equalization under free trade proposed by Heckscher, Ohlin and Samuelson would be also true among exporting countries if quota exchanges are made possible either directly or indirectly. This constitutes our second future research topic.

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# 跨國性配額交換

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## 摘 要

出口自動設限雖為一種貿易的障畧，但己成為當今國際貿易上常見的現象。在進口國貿易政策不變(即進口總量之上限固定)的前提下，若自動設限的諸出口國有機會互相交換配額，將對所有出口國均有利，其條件為各出口品出口毛利比值，在諸出口國間並不相等。出口配額可以在出口國間直接交換，也可以透過其他管道達到間接交換的目的，但進口國有可能因此採取進一步的保護政策，使得出口國間配額交換的利益降低，甚至消失。

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