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CUSTOMS UNIONS AMONG PRODUCING COUNTRIES WITH DIFFERENT COSTS

ABSTRACT

The effects of production cost asymmetries on the sustainability of customs unions among producing countries are investigated using a homogeneous-product Cournot oligopoly model, in which three producing countries subsidize exports of an homogeneous good to a consumer country that imposes a tariff on imports. It is found that the only sustainable customs union is the one formed by the three-member customs union. However, although the said customs union will be in equilibrium if utility transferences among member countries are allowed, it could not be in equilibrium if such transferences are not allowed.

Key Words: strategic trade policy and firms strategy, export subsidies, economic integration

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INTRODUCTION

Customs unions liberalize trade among member countries while erecting barriers to protect member countries against nonmember countries (Cooper and Massell 1965). In general, customs unions cannot be said to be either necessarily beneficial or necessarily detrimental to either member countries or world welfare. The increase in trade within the union derived from within-union trade liberalization making resource allocation more efficient and within-union trade more profitable is opposed in both respects by trade diversion (i.e., the reduction of trade between member and nonmember countries) derived from the relative increase in the barriers to non-union products, making global resource allocation less efficient (Viner 1950). Therefore, whether a customs union is beneficial or not depends on the specific characteristics of the member countries: supply and demand elasticities, existing tariffs, differences in production costs, etc. For example, a union containing the most efficient global producer will always be beneficial because there will be no trade diversion effect. Although the economics of preferential trade liberalization have since been investigated using models that are more sophisticated and/or more general than Viner's (see Baldwing and Venables (1995) and Lypsey (2003) for surveys of the literature and Abrego, Riezman, and Whalley (2005) for an analysis of the likelihood of various propositions related to the customs union literature using computational techniques), his dictum remains valid. Magee (2003) argues that two countries are more likely to be preferential trading partners if they have significant bilateral trade, are similar in size and are both democracies. Whalley (2008) discuss the growth and the variation in form of regional agreements all around the world and concludes that failed or weak multilateralism leads to an emphasis on regional agreements.

This paper analyses the influence of relative production costs on how the formation of customs unions affects the welfare generated by national industries producing identical goods sold with the aid of export subsidies that shift profits from foreign to domestic firms (Brander 1981, Brander and Krugman 1983, Brander and Spencer 1985). This is a common imperfectly competitive situation in which the effects of trade policy differ from those holding in perfectly competitive markets (Dixit 1984). More specifically, we consider the possibility of a union between at least two of three cost-differentiated producing countries, all of which subsidize exports of a homogeneous good to a single consumer country that extracts rent from the producers by means of import tariffs (Brander and Spencer 1984). Collie (1991) has shown that an importing country can always gain from a

foreign export subsidy. The influence of production cost asymmetries on commercial policy has previously been considered by Dixit and Grossman (1986), Spencer (1986), de Meza (1986) and Neary (1994), among others. Neary (1994), for example, argues somewhat counter intuitively that export subsidies should be higher for firms with lower costs. Collie (1996) shows that a country will gain from unilateral free trade if and only if the foreign firm has a significant cost advantage. Duval (2002) examines optimal strategic trade policies when there are asymmetries across countries.

A more basic question is the rationale or motivation for customs unions. This aspect was ignored in the formal literature until Cooper and Massell (1965) who consider that customs unions, due to the trade diversion effect, should be considered as an alternative commercial policy rather than a liberalizing mechanism. Based on the Cooper and Massell (1965) view, the purpose of this paper is to complement the existing literature by stressing the role played by production cost asymmetries in countries' incentives to form customs unions. To our knowledge, this question has not previously been subject to formal analysis and our paper fills this gap in the literature.

The following section describes the model used in the remainder of the paper. Then we derive national welfares and other variables of interest under the status quo (no customs union) and given the formation of various possible customs unions defined in terms of the relative efficiencies of the three countries. Next section uses the results thus obtained to deduce the circumstances under which the various unions will be more advantageous for their members than the status quo, the consequences of any union for non-member countries, and which union, if any, will be the expected final outcome. We finalize with our conclusions.

THE MODEL

The analysis is developed under the reciprocal dumping basic model stated by Brander (1981) and Brander and Krugman (1983), which uses an homogeneous product Cournot oligopoly model. It is assumed that production countries set optimal export subsidies on their exports and the consuming country sets countervailing tariffs on its imports. Countries set tariffs on imports to extract rent from foreign producers as in Brander and Spencer (1984) and producing counties use export subsidies to shift profits form foreign to domestic firms as in Brander and Spencer (1985). There are three producing countries, denoted by the subscript 1, 2 and 3 respectively, and each have a single firm identified by

the same index; the quantities sold by their firms in the single consumer country are x, y and z, respectively; the export subsidies they provide per unit of production are respectively s_1, s_2 and s_3; and the import tariff imposed by the consumer country is t. In order to simplify the analysis, aggregate consumer utility U is assumed to be additively separable and linear in a competitive numeraire good and is given by the concave quadratic function*

$$U(q) = aq - \tfrac{1}{2}bq^2 + Z \quad (1)$$

where $q = x + y + z$ is the total market quantity in the consumer country, a and b are positive parameters, and Z is the numeraire representing consumption of all other goods. The price of the numeraire is unity, and the price p of the homogeneous traded good is given by the inverse lineal demand function

$$p = a - bq \quad (2)$$

For simplicity, we assume that there are no fixed production costs. In this situation, the firms' profits are given by

$$\pi_1 = (p + s_1 - t - c_1)x$$
$$\pi_2 = (p + s_2 - t - c_2)y \quad (3)$$
and $$\pi_3 = (p + s_3 - t - c_3)z$$

for firms 1, 2 and 3, respectively. Without loss of generality, firm 3 is taken to be less efficient than 2, and that firm 2 is less efficient than firm 1, that is $c_1 < c_2 < c_3$, and in order to simplify the analysis, that firm 1 has zero marginal production costs, $c1=0$.

The well-known basic assumption about firms behaviour in the Cournot model is that firms compete in quantities, that is, each firm sets its output in order to maximize its own profit function. In this context, as the market price depends on the total market quantity and firms' profits depend on market price, there exist an interdependence on firms strategies which is modeled by means of game theory.

The welfare functions of the producing countries are the result of subtracting the cost of export subsidies from the firms' profits:

$$W_1 = \pi_1 - s_1x = (p - t)x$$
$$W_2 = \pi_2 - s_2y = (p - t - c_2)y \quad (4)$$
and $$W_3 = \pi_3 - s_3z = (p - t - c_3)z$$

* The main results of the paper are not affected by these simplifying assumptions.

The welfare function of the consumer country comprises consumer surplus and tariff income:

$$W = aq - \tfrac{1}{2}bq^2 - pq + tq \tag{5}$$

Although international trade agreements regulate countries' commercial policies limiting their ability to offer direct subsidies to exporting companies, countries may subsidize their exports indirectly by different means such as production subsidies or certain fiscal advantages, for example. Therefore, for any given tariff, whether regulated by international trade agreements or not, countries may choose how to subsidize their exports optimally. For the remainder of the paper we assume that, when export subsidies are set, producing (and subsidizing) countries know the whole game.

The behaviour of governments and firms is modeled as a three-stage game in which firms are the followers of the game: in the first stage, export subsidies are set by producing countries; in the second stage, the consumer country responds by setting a welfare-maximizing tariff on imports; and in the third stage, the firms engage in Cournot competition. The game is solved as usual by backward induction to find the sub-game perfect equilibrium: first, the firms' profit-maximizing production levels are found assuming tariffs and subsidies to be given; then the tariff maximizing the consumer country's welfare is found assuming that export subsidies are given and that the consumer country anticipates the behaviour of the firms; and finally the export subsidies maximizing the welfare of the producing countries (or of the customs union) is found assuming that these countries anticipate both the consumer country's reaction and the behaviour of the firms. Similarly, if a customs union is formed, it is assumed that member countries maximize their aggregated welfare by setting a common export subsidy.

The final stage of the above model has a solution in terms of given subsidies and tariff. Solving the first-order conditions for Cournot-Nash equilibrium,

$$\begin{aligned} \partial\pi_1/\partial x &= a - b(2x + y + z) + s_1 - t = 0 \\ \partial\pi_2/\partial y &= a - b(x + 2y + z) + s_2 - t - c_2 = 0 \\ \partial\pi_3/\partial z &= a - b(x + y + 2z) + s_3 - t - c_3 = 0 \end{aligned} \tag{6}$$

affords the equilibrium market quantities

$$\begin{aligned} x &= (1/4b)(a - t + 3s_1 - s_2 - s_3 + c_2 + c_3) \\ y &= (1/4b)(a - t - s_1 + 3s_2 - s_3 - 3c_2 + c_3) \\ z &= (1/4b)(a - t - s_1 - s_2 + 3s_3 + c_2 - 3c_3) \end{aligned} \tag{7}$$

Finally, throughout this paper it is assumed that $a > (175/21)c_3 – (77/21)c_2$ since this condition turns out to ensure that, in all the situations considered, the equilibrium output of every firm is positive.

WELFARE AND OTHER VARIABLES IN VARIOUS UNION SCENARIOS

The Status Quo

In the absence of any customs union, the behaviour of the four countries is modeled by the three-stage game described above. In the second stage of the game the consuming country sets tariffs in order to maximize its aggregated welfare, as follows

$$\partial W/\partial t = 0$$

The market quantities are given by eqs. (7), and the first-order conditions for Nash equilibrium in tariffs, affords the following reaction function:

$$t = (1/15)(3a + s_1 + s_2 + s_3 – c_2 - c_3) \quad (8)$$

The above equation reflects how, as producing countries increase their export subsidies to increase their firms' profits, so the consumer country increases its tariff to extract more rent from the increasingly profitable foreign firms.

In the first stage of the game, producing countries set their export subsidies in order to maximize its welfare as follows,

$$\partial(W_1)/\partial s_1 = 0$$
$$\partial(W_2)/\partial s_2 = 0$$
$$\partial(W_3)/\partial s_3 = 0$$

The first order conditions for Nash equilibrium in export subsidies can be re-written as the following reaction functions:

$$s_1 = (7/88)(3a - 4s_2 - 4s_3 + 4c_2 + 4c_3)$$
$$s_2 = (7/88)(3a - 4s_1 - 4s_3 - 4c_2 + 4c_3) \quad (9)$$
$$s_3 = (7/88)(3a - 4s_1 - 4s_2 + 4c_2 - 4c_3)$$

These equations reflect how the export subsidy of any producing country i is disincentivated by increases in the subsidies of the other producing countries, which reduce the welfare-increasing profits of country i's firm.

Solving eqs. (9) and substituting in (8) affords the equilibrium subsidies and tariffs

$$t = (11/144)(3a – c_2 - c_3)$$
$$s_1 = (1/144)(21a + 77c_2 + 77c_3)$$

$$s_2 = (1/144)(21a - 175c_2 + 77c_3) \quad (10)$$

and $$s_3 = (1/144)(21a + 77c_2 - 175c_3)$$

Hence the assumption that $a > (175/21)c_3 - (77/21)c_2$ implies that, in the absence of customs unions, producing countries set positive export subsidies (as in Brander and Spencer (1985)) and the consumer country sets a positive tariff. The market quantities are in fact

$$x = (11/144b)(3a + 11c_2 + 11c_3)$$
$$y = (11/144b)(3a - 25c_2 + 11c_3) \quad (11)$$

and $$z = (11/144b)(3a + 11c_2 - 25c_3)$$

so the condition $a > (175/21)c_3 - (77/21)c_2$ does indeed ensure positive outputs. The welfare levels of the producing countries are

$$W_1 = (11/5184b)(3a + 11c_2 + 11c_3)^2$$
$$W_2 = (11/5184b)(3a - 25c_2 + 11c_3)^2 \quad (12)$$

and $$W_3 = (11/5184b)(3a + 11c_2 - 25c_3)^2$$

Union Between the Countries with the Most Efficient Firms

If a customs union is formed by countries 1 and 2 (the most efficient), they set a common export subsidy ($s1 = s2 = s$) to maximize their aggregated welfare. The first stage of the game becomes

$$\partial(W_1 + W_2)/\partial s = 0$$
$$\partial(W_3)/\partial s_3 = 0$$

The outcome of competition among firms is, as before, given by eqs. (7), and the reaction function of the consumer country is again given by eq.8. The solution of the first-order conditions for maximization of the welfare of country 3 and the aggregated welfare of the members of the union, countries 1 and 2, affords

$$s = -(1/56)a + (1/24)c_2 - (11/168)c_3$$
$$s_3 = -(1/4)a + (7/24)c_2 - (5/6)c_3 \quad (13)$$

and $$t = (3/14)a - (1/24)c_2 - (11/84)c_3$$

Assuming as before that $a > (175/21)c_3 - (77/21)c_2$, eqs. (13) mean that country 3 (the most inefficient) sets a positive export subsidy and the consumer country sets a positive countervailing tariff, as in Collie (1991). However, the members of the customs union set a negative export subsidy, i.e. they tax exports, because the resulting decrease in the consumer country's tariff, together with the increase in prices resulting from the

reduction in market quantity, more than offsets the direct effect of the subsidy. Thus Brander and Spencer's (1985) argument for export subsidies does not hold in this situation.

Finally, national welfares are given by

$$W_1 = (1/1008b)(3a + 5c_2 + 11c_3)(6a + 7c_2 + 22c_3)$$
$$W_2 = (1/1008b)(3a - 19c_2 + 11c_3)(6a - 35c_2 + 22c_3) \quad (14)$$
and $$W_3 = (11/7056b)(- 6a - 7c_2 + 20c_3)^2$$

Union Between the Countries of the Most Efficient and the Least Efficient Firm

The customs union is formed by countries 1 and 3, and they set a common export subsidy ($s_1 = s_3 = s$) for maximizing their aggregated welfare, similarly to the above situation.

Backward solving as before affords the following results for national welfare.

$$W_1 = (1/1008b)(3a + 11c_2 + 5c_3)(6a + 22c_2 + 7c_3)$$
$$W_2 = (11/7056b)(6a - 20c_2 + 7c_3)^2 \quad (15)$$
and $$W_3 = (1/1008b)(3a - 19c_2 + 11c_3)(6a - 35c_2 + 22c_3)$$

Union Between the Countries of the Most Inefficient Firms

In this situation it is country 2 that forms a union with country 3 and, once more, the common export subsidy is set to maximize the aggregate welfare of the union. Solving as before affords the following national welfare levels.

$$W_1 = (11/7056b)(6a + 7c_2 + 7c_3)^2$$
$$W_2 = (1/1008b)(-3a + 19c_2 - 5c_3)(-6a + 35c_2 - 7c_3) \quad (16)$$
and $$W_3 = (1/1008b)(3a + 5c_2 - 19c_3)(6a + 7c_2 - 35c_3)$$

Union Between All Three Producing Countries

The corresponding welfare results are as follows.

$$W_1 = (1/144b)(3a + 7c_2 + 7c_3)(3a + c_2 + c_3)$$
$$W_2 = (1/144b)(3a - 17c_2 + 7c_3)(3a - 5c_2 + c_3) \quad (17)$$
$$W_3 = (1/144b)(3a + 7c_2 - 17c_3)(3a + c_2 - 5c_3)$$

COMPARATIVE ANALYSIS

The above findings allow us to analyze the stability of customs unions and to predict which customs unions, if any, will be formed. The analysis is developed for both the case in which no utility transferences between member countries are allowed and that in which such transferences are not allowed. The difference between the two situations is that in the first case, although member countries agree to set a common policy, each country gets the welfare level given by its individual welfare function. However, in the second case countries, in addition to setting a common export subsidy, agree inter-country transferences in order to compensate welfare loses of any member country. In this case, in order to decide whether to integrate or not, member countries take into account the aggregated welfare level.

Countries' Welfare without Utility Transferences

A customs union between countries 1 and 2 is not sustainable because, although for country 2 it could be more profitable than no cooperation, country 1 will never derive benefits from it. Country 2 derives benefits from the said customs union if the difference between c_3 and c_2 is quite minor or, in other words, if member countries production costs are asymmetric enough. However the non member producing country always benefits from the said union.

For the customs unions between countries 1 and 3 and between countries 2 and 3 something similar happens, because, in spite of the inefficient member country always deriving benefits from it, the efficient country never benefits from the union formation. Once more, the non member country always derives benefits from the union between the other two. These results are in contrast to those of Fung and Schneider (2005), who argues that the less efficient country may not always benefit from a trade agreement.

Finally, the union between all three countries is always more profitable for all three than no cooperation and therefore it is sustainable.

To sum up, it can be affirmed that without utility transferences among member countries the only sustainable customs union is that formed by all the three producing countries, suggesting multilateral rather than regional approaches to integration. However, the three member countries customs union will be in an equilibrium situation if and only if it is verified that, $a > 13.58c_3 - 6.29c_2$. On the other hand, if $8.33c_3 - 3.66c_2 < a < 13.58c_3 - 6.29c_2$, the less efficient countries, country 3 and/or country 2, will benefit from

leaving the customs union formed by all the three countries and, as remarked before, the remained two countries customs union will not be sustainable resulting in no customs union being formed.

Countries Welfare with Utility Transferences

In this context, the aggregated welfare of member countries is taken into account when analyzing the sustainability of customs unions.

Once more, it can be affirmed that the only sustainable customs union is that formed by all the three countries. However, in this context, the above customs union will be in equilibrium because the aggregated welfare is greater than in any other situation. This means that with the appropriated utility transferences among member countries, no country will have incentive to leave the customs union formed by all the three countries..

CONCLUSIONS

In a model situation in which three producing countries subsidize exports of an homogeneous good to a consumer country that imposes a tariff on imports, and in which production costs are asymmetric, the only sustainable customs union will be the three countries customs union, that is, the three members customs union is more profitable for all the three countries than no cooperation. However, if utility transferences among member countries are not allowed, the said customs union will be in equilibrium if and only if $a > 13.58c_3 - 6.29c_2$. If, $8.33c_3 - 3.66c_2 > a < 13.58c_3 - 6.29c_2$, then country 3 and/or country 2 will benefit from leaving the union and in this case the other two countries will benefit from leaving the two members customs union and therefore, no cooperation will be the only equilibrium situation.

If utility transferences among member countries are allowed, the three countries customs union is, once more, the only sustainable customs union. However, in this case, this customs union will always be an equilibrium because the aggregated welfare of producing countries is greater than in any other situation.

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