Customs Union, Delegation, Lobbying, and Export Subsidies

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Abstract

The recent bargaining between the United-States and the European Union on the agricultural problems leads to some questions about the representativeness of negotiators.

In the paper, we develop a model for such situation with a three steps game with, on one side, four representative firms from four countries, three of them are engaged in a customs union, and, on the other side, two negotiators, one for the custom union and one for the country outside the union, who try to negotiate a level of subsidies for their firms.

There are two key elements in this game, the marginal cost which is different for each firm, and the pressure of lobbies to increase subsidies in the customs union.

Mots clefs : Délégation, subvention à l’exportation, union douanière, groupes de pression
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1 Introduction

The recent negotiations between the United States (US) and the European Community (EC) concerning agricultural issues have raised the problem of the representativeness of negotiators, particularly those of the EC. During these negotiations, a single representative of the EC was the only interlocutor of the negotiator for the US. The Blair House agreement, which stemmed from this negotiation, has not been accepted by all the European Community members and runs the risk of not being applied if certain members, like France, persist in their position of refusal.

This example presents two characteristics which have motivated the writing of this paper. The first concerns the current system of delegation, a system by which member countries of the EC have delegated to their representative the power to negotiate on their behalf with the US. The problem of delegation in a negotiation has been studied in recent literature by Gatsios and Karp (1991,1995) for the determination of common tariff policy in a customs union, by Hagen (1992) for the conception of a common monetary policy in the European Monetary System, and by Jones (1989) who describes the consequences of a bilateral commitment obtained through delegation when the two parties settle a dispute through a third party. These different works have made evident the role delegation can play in conflict situations. In particular, they have posed the problem of the negotiators’ adoption of an objective function different from that of the parties directly concerned by the negotiation.

The second characteristic of this situation is that it shows the role that can be played by lobbying. In this case they render uncertain the final outcome of the negotiation. There again, some recent works have tried to represent the action of these lobby groups. For the applications determining the commercial policy of a state one can cite the works of S. P. Magee, W. A. Brock, and L. Young (1989), G. M. Grossman and E. Helpman (1992, 1994).

In this paper, we develop a model representing this situation by describing a role played on one hand, by four representative companies of four countries, three of which form a customs union, and, on the other hand, by two representatives of the governments from the customs union and from the country outside the union. These two representatives are responsible for negoti-
ing a subsidy level which will be granted by the two governments to their companies.

Two elements play a determining role in the solution which may be found. In the first place, the marginal costs of production play a primary role in this model. We assume that the technology used by the four companies is identical but of an increasing efficiency of scale. In other words, this hypothesis leads us to consider that the marginal cost of each company will depend, in the first place, upon the size of its market. To simplify, it is assumed that each company produces in a zone of constant cost which depends solely on the size of its domestic market.

In the second place, the role of lobbying is decisive for defining the set of all possible agreements. One can certainly suppose that the government of a country is sensitive to the action of lobby groups, for purely electoral reasons or simply by the fact that this action is a signal used to determine the governments policy in order to find a collective well-being.

The model that we develop in this paper is a game in two stages. In the first stage, the two representatives, the one of the customs union and the one of the country outside the union, negotiate an agreement on the level of subsidies to be granted to the companies native of the countries which they represent. In this stage, the chosen concept of equilibrium is that of the Nash cooperative equilibrium. It is assumed that at this stage, the agreement obtained between the negotiators takes into account the decision procedure in the customs union and in the country outside the union. One admits that each negotiator takes into account the rules of institutional functioning in effect in the geographical area that he represents in order to define the proposals that he will make during the negotiation. In other words, any proposals likely to be rejected by the governments will not be considered by the negotiators. In the second stage, the firms belonging to each of the countries involved in the negotiations find themselves in competition because of the quantities in the country’s market, denoted $D$, not concerned by this negotiation. The concept of equilibrium used in this stage is that of the non-cooperative Cournot-Nash equilibrium.

After having described, in section 2, the rules of institutional functioning within the customs union and in the country outside the union, we analyze, in section 3, a situation which will serve as a reference. In this situation, the international commercial system is totally neutral, that is to say there is no intervention from public authorities. This situation, which we define as "neutral free-trade", allows us to determine the obtainable results for each
firm in a competitive situation when only the production costs are factors in
the allotment of market share to each of them. It is considered, then, that
these results constitute the breaking point of the negotiations between the
two representatives. Sections 4 and 5 solve the second stage of the game by
first considering that only the firms of the customs union receive an export
subsidy, and later by considering that the country outside the union also
grants subsidies to its firms. Section 6 recapitulates the results of the three
preceding sections.

Section 7 considers the situation where the stage of fixing the subsidy
levels takes place in the form of a non-cooperative game. One shows that
in this case there is no solution which leads to a subsidy level and strictly
positive profits, whatever the voting system is in effect at the customs union
level.

The bargaining situation is tackled in section 8. The aim here is simply
to show that the set of negotiations is not empty and to identify the main
factors which define this set.

2 The institutional rules

It is assumed that the institutional rules are established once and for all,
indisdependently of the negotiations in progress. Consequently, the negotiators
know from the beginning of the negotiations the voting system to be used
to ratify the proposals they will make at the conclusion of the round. In
this section one presents the various possible systems that will be used later
at the end of the comparison. We also take the opportunity to set certain
notations.

Three countries, A, B, and C, members of the customs union, named X,
have decided, in a previous level of the negotiations\(^1\), the voting rules to be
used in order to adopt the solution which will be presented to them at the
conclusion of the negotiations with country Y, a country outside the customs
union.

2.1 The voting system of the customs union

At the customs union level, every proposition resulting from an international
negotiation must be approved by a higher authority in which every member

\(^1\)For example the signing of the treaty establishing the customs union.
country of the union is represented. One can then suppose that the attitude adopted by the negotiator will take into account the need to have his proposition approved in the negotiation. The approval system in effect within the union is then essential for determining the behavior of the negotiator. If the voting system in effect within the union is the unanimous one, the representative will be able to accept in the negotiation only solutions capable of satisfying all the members of the union. If, on the other hand, the voting system is that of the majority, he will be satisfied to look for the support of only two countries and then neglect the demands of the third, except if the majority vote is associated to the right to veto. We start with the example of the European Community to describe these voting systems.

2.1.1 The rule of decision in the customs union

Introduced by the Single Act of 1987, the new rule of decision in effect within the European Union for adopting certain proposals of the Commission is the "rule of decision to the qualified majority". Nevertheless, in certain cases the rule of decision remains the one of "unanimity". We define three rules inspired by the working of the European Union:

Definition 1 : The "rule of unanimity" implies that every decision must be approved by all the members.

Definition 2 : The "rule of the qualified majority" implies that every decision must be approved by at least two out of three members.

Definition 3 : The "rule of veto" implies that any one member can affix his right to veto to a decision even in the case where the decision has been approved by a qualified majority.

The rule of veto occurs only in the case where the adopted voting system is that of the qualified majority. It is not, however, equivalent to the rule of unanimity in so far as the right to veto is not used in a systematic manner by the countries. To understand the working of these three rules, we can take an example. Let the variable of appreciation of the negotiation outcome by each member be the profit \( v \) made by the representative company of this country. Each country of the union is going to define three thresholds, \( v_0, v_1 \) and \( v_2 \) with \( v_0 < v_1 < v_2 \), which are going to determine its attitude in the vote. Where \( v_0 \) is the value of the threshold beneath which the decision is rejected.
by the country\(^2\), \(v_2\) is the value of the threshold beyond which the country will adopt the outcome of the negotiation, without reserve\(^3\). The value \(v_1\) is particular in so far as it is placed in a bracket in which the reaction of the government is to reject the decision. This threshold value will depend upon the pressure exerted by the representative firm on the government so that the latter uses its right to veto. Depending on these three threshold values, we reach three situations represented in figure 1. We realize that in the case of a rule of the qualified majority with the possibility of applying the rule of veto, only a value of \(v\) contained between \(v_1\) and \(v_2\) leads to a negative vote without the decision being blocked by the country. Below \(v_1\) the veto is applied, it is only in this case that there is equivalence between the rule of unanimity and the rule of the qualified majority combined with that of the veto.

![Figure 1: Voting decision of a country in the customs union](image)

\(^2\)The value \(v_0\) corresponds for example to the profit that the company would make in the case when there would be a breakdown of the negotiations, in other words, when the company would find itself in competition on a market without receiving a subsidy. That is what we will define later under the label of "neutral free-trade world". It can be assumed, in this case, that the country will systematically use its right to veto.

\(^3\)This value may correspond to the result obtained by the firm representative of the country in the situation that it finds most favorable. One can imagine that this value corresponds to the one the government considers as being acceptable.
2.1.2 The breaking point

If the representatives of X and Y do not succeed in finding an agreement, or if all the members of the union do not approve the proposal made by their representative, there is a breakdown in negotiations. In this situation, no subsidy is paid to the companies and the profit made is considered the lowest that can be obtained since in this case the competition is maximum. Let \( \pi_i \ (i \in \{A, B, C, Y\}) \) be the minimum profit considered as being the breaking point of the negotiation, since in this case all the countries will reject the proposal whatever the voting system adopted.

2.1.3 Voting decision of the customs union members

On the customs union side, the outcome proposal from the negotiations regarding the amount of subsidies which will be paid must be, in order to be effective, accepted by a certain number of members, this number being determined by the rule of adopted decision. It is then assumed that one member will favor the proposal according to the following principle. Each member will weigh the gains for its firm if the proposition is adopted and those in the case where there is a complete breakdown of the union, that is to say when there is no subsidy. To be clearer, let \( \hat{S} = \{\hat{s}_x, \hat{s}_y\} \in R^2 \) be the proposal regarding the subsidies outcome of the negotiation, with \( \hat{s}_x \) being the uniform subsidy for each exported unit for all the customs union countries and \( \hat{s}_y \) being the subsidy given to the firm of country Y per exported unit. Let \( \hat{S} = \{0, 0\} \in R^2 \) be the solution which would be adopted if the proposal is not accepted, that is to say when the subsidy is nil for all countries. Let \( \pi_i \) and \( \pi_i \ (i \in \{A, B, C, Y\}) \) be the respective profits in both cases, the voting rule of each member will be defined in the following manner:

**Definition 4**: A member \( i \) of the union will approve the proposal made by the negotiator if \( \pi_i \geq \pi_i (1 + \varepsilon_i) \) pour \( i \in \{A, B, C\} \) with \( 0 < \varepsilon_i < 1 \).

One can give several meanings to \( \varepsilon_i \), it can represent the price that each member is willing to pay to preserve the unity of the customs union or to avoid its failure. So \( \varepsilon_i \) can be taken as a measure of the commitment of a country towards the customs union. Such a commitment will depend on the balance between those who favor the union and those who do not, let us note that \( \varepsilon_i \) can also be taken as a measure of the weight lobbying carries on the decision of the country. The larger is \( \varepsilon_i \), the weaker the commitment of
the country in the union will be, or the more it will be forced to satisfy the lobbying demand\textsuperscript{4}.

\section{A world of neutral free-trade}

In the first place we can examine the situation in which no subsidy is paid to the companies. These companies find themselves in competition on market $D$. It is assumed that they behave in the Cournot way.

On market $D$, the function of inverse demand is:

$$P = Z - a (q_a + q_b + q_c + q_y)$$  \hfill (1)

It is assumed that (1) is linear and that it satisfies the usual specifications, that is to say $\frac{\partial P}{\partial q_i} < 0$ and $\frac{\partial^2 P}{\partial q_i^2} = 0 \forall i \in \{A, B, C, Y\}$.

In each country, the domestic firm tries to maximize its profit:

$$\pi_i = Pq_i - c_i q_i \quad \forall i \in \{A, B, C, Y\}$$  \hfill (2)

where $c_i$ is the marginal cost and the constant average cost.

\textbf{Assumption 1 :} The countries $A, B, C, Y$ are ranked with respect to their marginal cost, $c_a > c_b > c_c > c_y$.

This hypothesis reflects an order in the size of the countries. The bigger a country is, and the more sizable its domestic market is, the lower its average production cost will be. We remind you that although the technology used in all the countries is the same and is of increasing efficiency, we assume that each representative firm produces a quantity directly tied to the size of the country where it is installed, and that the part of the exports in relationship to the production for the national market is not enough to induce new gains of economies of scale. Then, each firm is assumed to produce within a quantity range where the outputs are constant.

The solution to this problem of maximization is found by solving the system composed by the first order conditions when we assume that the firms play a game of Nash-Cournot.

\textsuperscript{4}In this paper, the information is assumed to be complete, that is to say that all $\varepsilon_i$ are known to all the participants. It could also be assumed that $\varepsilon_i$ is a random variable, continuously and uniformly distributed over the interval $[0, 1]$, with $h(\varepsilon_i)$ being the density function and $H(\varepsilon_i)$ being the cumulative distribution.
At equilibrium, the quantities offered by each firm on market $D$, since $S = \bar{S} = \{0, 0\}$, are given by:

$$\tilde{q}_i = \frac{-4c_i + \sum_{j \neq i} c_j + Z}{5a}$$ (3)

The respective quantities of each firm depend strongly on its average cost. In a world of neutral free-trade, that is to say a world without subsidies, the firms act on their own behalf even if their countries belong to a customs union.

To obtain strictly positive values for all the quantities, it should certainly be assumed that market $D$ is large enough to support the presence of four firms in viable conditions. This comes to pose that $Z > \max_{i \in \{A,B,C,Y\}} \left[ 4c_i - \sum_{j \neq i} c_j \right]$ or, given the hypothesis 1, that $Z > [4c_a - c_b - c_c - c_y]$

4 Subsidies to the firms of the customs union

We now assume that only firms of the customs union receive a uniform export subsidy. Let $s_x$ be the identical subsidy for all the firms from $A$, $B$, and $C$. The profit of these firms is from now on:

$$\pi_i = (P + s_x)q_i - c_iq_i \quad \forall i \in \{A, B, C\}$$ (4)

while the firm of country $Y$, that is not subsidized, has a profit of:

$$\pi_y = Pq_y - c_iq_y$$ (5)

The firms of the union take $s_x$ as a given factor and maximize their profit through a Cournot behavior. At equilibrium, the quantities offered by each firm are:

$$q_i = \frac{-4c_i + \sum_{j \neq i} c_j + 2s_x + Z}{5a} \quad \text{pour } i \in \{A, B, C\}$$ (6)

and

$$q_y = \frac{-4c_Y + \sum_{j \neq Y} c_j - 3s_x + Z}{5a}$$ (7)
As expected, the firms of the union obtain an additional benefit with the subsidy, while the firm from country $Y$ sees its market share reduced. There is then, a strong motivation for country $Y$ to take retaliation measures. Here also, to obtain strictly positive values for the quantities, we assume that market $D$ is large enough, that is

$$Z > \max \left[ \max_{i \in \{A,B,C\}} \left[ 4c_i - \sum_{j \neq i} c_j - 2s_x \right], 4c_Y - \sum_{j \neq Y} c_j + 3s_x \right]$$

or, given hypothesis 1,

$$Z > \max \left[ 4c_a - c_b - c_c - c_y - 2s_x, 4c_Y - \sum_{j \neq Y} c_j + 3s_x \right]$$

5 Subsidies to all the firms

The preceding situation was modeled according to the now classic case of rivalry between Airbus and Boeing. If only the firms of the customs union receive a subsidy, the possibility of retaliation is high. We assume now that $Y$ decides to give also a subsidy to its firm. In this case we obtain a new equilibrium in which the quantities given by each firm are:

$$\hat{q}_i = \frac{-4c_i + \sum_{j \neq i} c_j + 2s_x - s_y + Z}{5a} \quad \text{pour} \quad i \in \{A, B, C\} \quad (8)$$

and

$$\hat{q}_y = \frac{-4c_Y + \sum_{j \neq Y} c_j - 3s_x + 4s_y + Z}{5a} \quad (9)$$

where $s_y$ is the export subsidy granted by $Y$.

Obtaining the positive quantities given by each firm on market $D$, assumes, there again, that

$$Z > \max \left[ \max_{i \in \{A,B,C\}} \left[ 4c_i - \sum_{j \neq i} c_j - 2s_x + s_y \right], 4c_Y - \sum_{j \neq Y} c_j + 3s_x - 4s_y \right]$$

or, given hypothesis 1,

$$Z > \max \left[ 4c_a - c_b - c_c - c_y - 2s_x + s_y, 4c_Y - \sum_{j \neq Y} c_j + 3s_x - 4s_y \right]$$
6 Profit comparison

The three situations that were just described in the three preceding sections are summarized in the following table comparing the profits obtained by each firm in the different situations.

<table>
<thead>
<tr>
<th>Firm of the union</th>
<th>Firm Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\pi_i$ $(i \in {A, B, C})$</td>
<td>$\pi_Y$</td>
</tr>
<tr>
<td>$\left(-\frac{4c_i + \sum_{j \neq i} c_j + Z}{25a}\right)^2$</td>
<td>$\left(-\frac{4c_Y + \sum_{j \neq Y} c_j + Z}{25a}\right)^2$</td>
</tr>
</tbody>
</table>

Neutral free trade

Subsidies to the firms of the union

Subsidies to all the firms

If we assume that $2s_x > s_y$, then the free trade situation is the worst for the firms of the union.

7 Setting of subsidies in a non-cooperative game

It is clear that the setting of an amount of subsidies for the countries of the union represents a coordination problem. It is well known that in the oligopoly theory this problem becomes gradually more difficult to solve as the number of firms increases. The major difficulty here is to define the objective function of the representatives of the union.

In the game between $X$ and $Y$, each one knows the decision system in effect within the union. Then, each decision system will have its corresponding set of admissible solutions, let us say $\bar{S} = \{s_x, s_y\}$. $\bar{S}$ can be empty or it can contain various solutions. We examine how this set in the different decision systems.
7.1 Subsidies in a system of unanimity

7.1.1 Well-being

We assume, for the moment, that the negotiator from the union is not aware of the role of lobbying, that is, we assume that the national governments are "benevolent" and we consider the joint profit obtained by the firms of the union. When the decision system of the union is one of unanimity, the negotiator of the union should satisfy all the members and maximize their joint profit reduced by the total amount of subsidies given. For the country $Y$, the objective function will be the profit of the domestic firm net of subsidies. Let $W^u_x$ and $W^u_y$ be the functions of well-being or objective functions of $X$ and $Y$.

\[
W^u_x [s_x, s_y] = \sum_{i \in \{A, B, C\}} \pi_i - s_x \sum_{i \in \{A, B, C\}} q_i
\]  
(10)

\[
W^u_y [s_x, s_y] = \pi_y - s_y q_y
\]  
(11)

7.1.2 Best response functions

From (10) and (11), using the equilibrium values of the given quantities by (8) and (9), we can write the better response functions of $X$ and $Y$, $\Phi^u_x (s_y)$ and $\Phi^u_y (s_x)$:

\[
s_x = \Phi^u_x (s_y) = \frac{2 \sum_{i \in \{A, B, C\}} c_i - 3c_y + 3s_y - 3Z}{36}
\]  
(12)

\[
s_y = \Phi^u_y (s_x) = \frac{3 \sum_{i \in \{A, B, C\}} c_i - 12c_y - 9s_x + 3Z}{8}
\]  
(13)

It is observed, from (12) and (13), that the better response function of the union has a positive slope while that of country $Y$ has a negative one. This means that $X$ will have a more aggressive behavior than its partner in the negotiation.

7.1.3 Subsidies to export

Solving for the system formed by the two first order conditions obtained from (10) and (11) we have the following solution:
Proposition 5 : With a decision system based on unanimity, there is no solution that will allow to obtain only positive quantities for all the firms with only positive subsidies.

Proof. By substituting \( s_x^u \) and \( s_y^u \) in (8) and (9) by the values given by (14) and (15), we can show that no value of \( c_a, c_b, c_c, c_y \) and \( Z \) can satisfy the condition of strict positiveness of quantities and of subsidies. This can be done by solving the system formed by (8), (9), (14) and (15).

Such a result can be an argument for those who defend the idea according to which the unanimity vote system makes the system unmanageable. This result is similar to the one obtained by Salant S.W., Switzer S. and Reynolds R.J. (1983) in a merger situation. As some countries form a coalition and a country stays outside the coalition, the outside country gains from the cooperative strategy followed by the coalition. This result is developed in Peguin (1995).

7.1.4 The role of lobbying

The fact of introducing the role of lobbying in the union would result in making the representative of the union weigh the profits to determine its objective function. We can easily show that this does not change the result obtained, or that it leads us into the situation described in the following section.

7.2 Subsidies in a system of qualified majority

In this case, it is enough for \( X \) to obtain two favorable votes for its proposal to be accepted by the union. This decision is composed of two steps. In the first step, the negotiator of \( X \) chooses the subsidy \( s_x \) in a Cournot game with \( Y \) by using an objective function that corresponds to the joint profit maximization of two members, this profit being reduced by the total subsidy given to all the
firms of the union. In the second step, each member determines his position regarding this proposition by using the rule given in definition 4. One can then obtain one of the four following situations:
- the proposition receives two votes and there is no veto
- the proposition receives two votes and the third member imposes a veto
- the proposition receives less than two votes
- the proposition receives three votes

7.2.1  Well-being

The following is the objective function of $X$:

$$W^m_x [s_x, s_y] = \pi_k + \pi_l - s_x \sum_{i \in \{A,B,C\}} q_i$$

avec $k \in \{A,B,C\}$ et $l \in \{\{A,B,C\} - \{k\}\}$

(16)

The representative of $Y$ has always had the same objective function

$$W^m_y [s_x, s_y] = \pi_y - s_y q_y$$

(17)

7.2.2  Best response function

From (16) and (17) and using the equilibrium values for the quantities given by (8) and (9), the functions of best response $\Phi^m_x (s_y)$ and $\Phi^m_y (s_x)$ are:

$$s_x = \Phi^m_x (s_y) = \frac{18c_j \neq \{k,l\} - 2 \sum_{i \in \{k,l\}} c_i - 7c_y + 7s_y - 7Z}{44}$$

(18)

$$s_y = \Phi^m_y (s_x) = \frac{3 \sum_{i \in \{A,B,C\}} c_i - 12c_y - 9s_x + 3Z}{8}$$

(19)

The same observation can be made for the slopes of the best response functions.

7.2.3  Subsidies

By solving the system formed by the two first order conditions drawn from (16) and (17) the following result is obtained:

$$s^*_x = \frac{33c_j + c_k + c_l - 28c_y - 7Z}{83}$$

(20)
Proposition 6: With a decision system based on qualified majority, there is no solution that allows to obtain strictly positive quantities for all the firms with strictly positive subsidies.

The proof is identical to that of proposition 1.

There is then no need to examine the voting behavior of the member countries.

8 Bargaining

We just finished seeing that if the agents play a non-cooperative game, there is no internal solution, that is, a solution that through positive subsidies allows all the firms to sell a positive quantity in the market $D$. The need for a negotiation is evident.

Bargaining is a dynamic process through which the countries present at the negotiation attempt to reach an agreement on the terms of a contract\(^5\). Usually a sequence of offers and counter-offers that should converge towards an agreement that concludes the bargaining is observed. As pointed out by Selten (1988b, p. 217): "... In a bargaining situation with complete information it is difficult to understand why there is a bargaining process...". In this case, each party should be ready to anticipate the final result and achieve it in only one step. It is then the theory of bargaining with incomplete information that can justify the existence of the dynamics of a negotiation.

In our model, the information is complete since it is assumed that the value $\varepsilon_i$ of is known from the beginning.

In this section we simply attempt to see if an agreement is possible once the two parties decide to take part in bargaining and to study the role played by the parameter $\varepsilon$. We will limit ourselves to the definition of the set of possible agreements. The definition of the set of possible issues that we propose lies on the following hypotheses:

Assumption 2: It is assumed that the voting system in the union is that of the qualified majority vote with the possibility to veto.

\(^5\)Refer to J. Kennan and R. Wilson (1993) for a presentation of the bargaining.
Assumption 3: The offer made by one party during the process of bargaining concerns the level of subsidies \((\hat{s}_x, \hat{s}_y)\) granted by both parties to their respective firms.

Assumption 4: A country of the customs union will exercise its right to veto if the profit obtained by its firm at the end of the negotiation is inferior to the one it could obtain in a situation of neutral free-trade, in other words if \(\hat{\pi}_i \geq \tilde{\pi}_i\), where \(\hat{\pi}_i\) is the profit obtained by the firm \(i\) once the subsidies given are \((\hat{s}_x, \hat{s}_y)\) and where \(\tilde{\pi}_i\), as defined by equation (2), is the profit obtained by the firms in a situation of neutral free-trade, that is, without subsidy.

Assumption 5: The agreement will be definitive if for at least two firms of the customs union \(\hat{\pi}_i \geq \tilde{\pi}_i (1 + \varepsilon_i)\) and if \(\hat{\pi}_i \geq \tilde{\pi}_i (1 + \varepsilon_i)\) for \(i = Y\).

Assumption 6: It is assumed that \(\varepsilon_i = 0\) for \(i = Y\).

From the point of view of the negotiator of the union, the problem posed can then be defined in the following manner:

Definition 7: For the negotiator of the customs union \((\hat{s}_x, \hat{s}_y)\) will be a feasible solution if:
\[
\hat{\pi}_i \geq \tilde{\pi}_i (1 + \varepsilon_i) \quad \forall i \in \{A, B, C\}
\]

For the negotiator of country \(Y\) the problem is the following:

Definition 8: For \(Y\), \((\hat{s}_x, \hat{s}_y)\) will be a possible solution if \(\hat{\pi}_y \geq \tilde{\pi}_y\)

8.1 Set of acceptable solutions for a country

8.1.1 Case of countries of the customs union

If we take the case of a firm in the customs union, \(i\), its profit function given in table 1 is
\[
\hat{\pi}_i = \left( -4c_i + \sum_{j \neq i} c_j + 2s_x - s_y + Z \right)^2 / 25a \quad (22)
\]

From the view point of this firm \(i\) (and its government), the agreement will be acceptable if it corresponds to the values of \(s_x\) and \(s_y\) contained between
two lines of the plane \((s_x, s_y)\) that can be found by solving \(\hat{\pi}_i = \bar{\pi}_i (1 + \varepsilon_i)\). The slope is obtained directly from the second derivatives of (22):

\[
slope = -\frac{\hat{s}_{xy}}{\hat{s}_{xx}} = 2
\]

This slope is independent of the model parameters, and in particular, of the action of lobbying:

The ordinate at the origin is obtained by solving \(\hat{\pi}_i = \bar{\pi}_i (1 + \varepsilon_i)\) with respect to \(s_y\) and is equal to:

\[
ordinate_i = -4c_i + \sum_{j\neq i} c_j + Z \pm \sqrt{-4c_i + \sum_{j\neq i} c_j + Z} (1 + \varepsilon_i)
\]

The two lines determine an area containing the acceptable solutions by the country (or the firm) \(i\), which will be wider or narrower depending on the country and the value of the parameter \(\varepsilon_i\). If we have \(C_i = -4c_i + \sum_{j\neq i} c_j\), the ordinate of these two lines for the country \(i\) become:

\[
ordinate_i = C_i + Z \pm \sqrt{(C_i + Z) (1 + \varepsilon_i)}
\]

**Proposition 9**: For a given level of action of lobbying in country \(i\), the set of possible agreements will be larger as the marginal cost of the representative firm is smaller.

**Proof.** We can measure the extent of the area by the difference between the two ordinates, we obtain:

\[
2\sqrt{(C_i + Z) (1 + \varepsilon_i)}
\]

According to hypothesis 1, an order on \(C_i\) can also be established, giving then:

\[
C_A < C_B < C_C
\]
Proposition 10  Whichever is the marginal cost of the representative firm from country $i$, a strengthened action of lobbying has as effect an increase of the set of possible agreements.

Proof. It is enough to retake the previous demonstration observing that the extent of the area limiting the space of the acceptable solutions by country $i$ depends of $\varepsilon_i$, and that the derivative of this variable with respect to $\varepsilon_i$ is positive.

8.1.2 Case of country $Y$

In the same way for $Y$ we obtain in the plane $(s_x, s_y)$ a limited space that contains all the acceptable solutions by this country. This space is defined by the condition given in definition 6, in other words $\pi_y \geq \tilde{\pi}_y$. It can be shown in the same way, that it exists an area containing the acceptable solutions for $Y$.

These two results are represented by figures 2 and 3. They show that it is the presence of disparities among the production conditions of the member countries of the union that constrains the negotiation. The small countries with a high marginal cost influence the negotiations by reducing the possible set of agreements as they constrain the search of an agreement to a less profitable zone for the countries with higher efficiency in production.

Figure 2: Effect of a variation of $\varepsilon_i$
8.2 The set of negotiations

The set of negotiations that will result from this situation depends on the voting system adopted by the customs union. In the case of a qualified majority vote with the possibility to veto, this set will be defined by the intersection of four sets of acceptable solutions by each country as we have defined them in the previous paragraph. It is then important to know whether this intersection is an empty set or not.

From the viewpoint of this firm $Y$ (and its government), the agreement will be acceptable if it corresponds to the values of $s_x$ and $s_y$ contained between two lines of the plane $(s_x, s_y)$ that can be determined by solving $\pi_{\hat{Y}} = \pi_Y$. The two lines have as equations:

$$s_y = \frac{3}{4}s_x$$

and

$$s_y = 8c_Y - 2 \sum_{j \neq Y} c_j - 2Z + \frac{3}{4}s_x$$

The two lines determine a range containing the acceptable solutions by the country (or the firm) $Y$.

In figure 4, we have represented the intersection for country $Y$ and any one country of the union. The existence of a "non-empty" intersection (shaded
area of the figure) will be obtained for the values of the parameters:

\[ C_i + Z - \sqrt{(C_i + Z) (1 + \varepsilon_i)} < 0 \]

and

\[ 8c_Y - 2 \sum_{j \neq Y} c_j - 2Z < 0 \]

Figure 4: Negotiation space

9 Conclusion

Two considerations motivated the writing of this paper: in the first place, the desire to represent in a simple model a concrete situation, that of the negotiations between the United States and Europe in the agricultural sector; and in the second place, the desire to propose a first exploration of not highly developed phenomena in literature such as the problem of the delegation of authority in the negotiations, or the intervention of lobbying, or yet, the presence of asymmetric situations.

The proposed analysis is still at an exploratory level and it needs to be developed further. Nevertheless, what has been shown, is that taking into account concrete phenomena (delegation, lobbying, asymmetry) complicates seriously the analysis of a game of subsidies as it was proposed by Brander and Spencer (1985).
The result obtained may seem paradoxical. Nevertheless, if one comes back to the concrete case that motivated this paper; one can infer that a country like France, who has a lower marginal production cost than its partners in the union, can be in a more difficult situation because the search is for an agreement that satisfies also the countries having higher marginal production costs. Therefore, the actions of lobbying in the countries of the union will be a way to compensate for the reduction in the negotiation space due to the presence of firms having higher marginal costs.

References


