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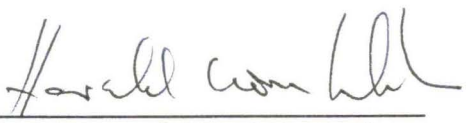

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GRADUATE SCHOOL

Agricultural Policy Decisions in the Uruguay Round:

A Game-Theoretic Examination

A THESIS
SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL
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To my parents

ABSTRACT

During the Uruguay Round of the GATT negotiations, emphasis has been placed on the reduction of agricultural protection and trade distorting policies. The difficulty in reaching a compromise, particularly between the United States and the European Community, raises the question as to the existence of a negotiated settlement such that both the U.S. and EC can be made better off. This paper, by means of a weighted Political Payoff Function (PPF), attempts to identify such compromises.

Through the use of Modèle Internationale Simplifiè de Simulation (MISS), the U.S. and EC PPF weights are estimated for base years 1986 and 1990. Simulations are performed based on Uruguay Round proposals and using across-the-board reductions in protection levels. Because of the importance of domestic prices in the PPF and their dependence on exchange rates, shocks to the model are introduced by varying the exchange rate levels for both the 1986 and 1990 base periods. These simulations are conducted both with and without the possibility of providing budget compensation to sectors made worse off as a result of the policy change.

The results of the analysis show that reductions in protection levels are likely if the liberalization is multilateral and sectors can be compensated for welfare losses. In addition, the simulations suggest that in the case of the U.S., incentive to reduce protection levels increases as the dollar is devalued and decreases as the dollar is revalued.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE: INTRODUCTION

Since the beginning of the Uruguay round of the General Agreement on Tariffs and Trade (GATT) negotiations the importance of investigating the implications of agricultural trade liberalization has become increasingly apparent[1]. A late 1986 Ministerial Declaration at Punta del Este emphasized agricultural trade as a major issue. The declaration identified the need to "bring more discipline and predictability to world agricultural trade by correcting and preventing restrictions and distortions"[2]. It went on to state that "negotiations shall aim to achieve greater liberalization of trade in agriculture and bring all measures affecting import access and export competition under strengthened and more operationally effective GATT rules and disciplines". This was a dramatic shift from the emphasis of previous GATT rounds in which domestic agricultural policies were considered non-negotiable.

The first country to set forth a negotiating position in the Uruguay Round was the United States. Their proposal called for the phasing out of all forms of trade distorting support, including health and sanitary trade barriers, over a ten year period. Under this plan an agreement as to the measure of protection and the elimination of protection would be negotiated, followed by the identification and monitoring of individual country progress toward this goal. The U.S.

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[1] A more complete overview of the agricultural trade negotiations in the Uruguay round can be found in Hine, Insursent, and Rayner (1989) and Guyomard, Mahè, Munk, and Roe (1993).

[2] Hine et al. (1989).

proposal specifies that decoupled payments are not to be included in the discussion.

In contrast to the U.S. position, the proposal made by the European Community concentrated on the maintenance of domestic policies. Their recommendation included short-term market management for commodities such as cereals, sugar, and dairy products, which were in surplus in the Community. In the longer term the EC expressed a willingness to discuss multilateral reductions in support levels, but not a complete phasing out of protection.

At the end of 1991 the General Director of the GATT, Arthur Dunkel, set forth a possible compromise[3]. Although not completely agreed upon, the Dunkel compromise or Draft Final Act provided a starting point for negotiations which would result in a bilateral agreement between the U.S. and EC. Basic points of the compromise included; a 36% decrease in budget expenditures for export subsidies combined with a 24% decrease in subsidized exports; a 20% reduction in the Aggregate Measure of Support (AMS); the tariffication of border restrictions combined with a 36% reduction from current levels; and a 5% guaranteed minimum import access. This bilateral agreement was made possible, in part, by the adoption of major reforms to the Common Agricultural Policy by the EC.

The purpose of this dissertation is the identification of treaty spaces such that a negotiated settlement made by the United States and the European Community leaves both countries at least as well off as they were prior to the agreement. The use of a non-weighted preference

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[3] Guyomard et al. (1993).

function can be used in the examination of trade negotiations. In such an examination all sectors are weighted equally, thus a one dollar gain to consumers would counterbalance a one dollar loss to producers, as viewed by policy-makers. An examination conducted in this manner would indicate that countries are made better off through the elimination of protectionist measures. However, as shown through the differing proposals made by the U.S. and EC in the GATT negotiations and the difficulty in coming to a compromise, the non-weighted preference function does not accurately represent the decision process of governments in valuing the welfare of various sectors of society.

A major tool used in this analysis is a Political Payoff Function (PPF). This PPF is a weighted, additive function of producer quasi-rents, consumer utility, and government budget expenditures. In order to model the political pressure which specific interest groups exert in the determination of public policy, sector weights are estimated for six agricultural production sectors, the consumption sector and the budget sector. These weights are utilized within the Political Payoff Function as a means of representing the net benefit resulting from policy changes.

Once the Political Payoff Function is identified, a framework is needed which accurately represents the negotiation process within the GATT. The General Agreement on Tariffs and Trade can be described as an instrument through which countries attempt to achieve negotiated settlements regarding trade controversies. Member countries are sovereign, thus agreements are binding only within the framework of the GATT. Failure to comply with some part of the agreement can result in

retaliation through the GATT rules and organization, but countries can withdraw from the agreement at any time. Signatories are bound to particular parts of the agreement not by force, but by the wider context of the agreement and the advantages of compliance.

Just as countries will continue as GATT members only if it is in their best interest, so also do they weigh the advantages and disadvantages of new treaties. If a member country is to agree to some negotiated settlement it must afford a net benefit to that country. Because of the independent nature of these sovereign countries the trade negotiation process is modelled by means of a two-player, normal-form, noncooperative, game-theoretic framework. A two-player game is chosen as it allows the interdependence of the main countries involved, the United States and the European Community, to be directly analyzed. Through the use of a normal-form game representation, each player receives a payoff which is a function of the policy action choices made by both countries. A noncooperative game structure is used in order to model the sovereignty of the countries involved and the lack of enforceability.

The initial investigation is a continuation of work done by Johnson (1990). Modèle Internationale Simplifiè de Simulation (MISS), a simplified world trade model which simulates in a comparative static framework the effects of various policy actions, is used to simulate the effects of policy changes[4]. The MISS model is also used to estimate the weights for the Political Payoff Function. This is accomplished utilizing the assumption that the actual policies chosen by the

[4] See Mahè et al. (1988).

governments for any year maximize their Political Payoff Functions. The political weights are derived by differentiating the PPF with respect to the policy actions employed and setting the resulting equation equal to zero.

Once the PPF weights are known, simulations are conducted using various policy liberalizations for the United States and the European Community. Payoffs are examined in a game-theoretic framework, using the two-player, normal-form, noncooperative game. In order to investigate how action choices differ due to changes in PPF weights over time, four variations of the game are simulated: 1986 data using 1986 weights, 1986 data using 1990 weights, 1990 data using 1986 weights, and 1990 data using 1990 weights. In addition to the simulations which merely involve changes in policy actions, a variation of the game is simulated in which budget compensation is given to sectors of the economy made worse off due to the policy changes in a manner which maximizes the governments' Political Payoff Functions. The unique Nash equilibrium solution for each game is found for the combinations of the two base years and the two sets of PPF weights.

This thesis also examines the stability of these Nash equilibria given exchange rate shocks to the economy. Extreme fluctuations in the exchange rate are obtained from past data and employed within the context of the MISS model in order to analyze the effect of these shocks on policy choices. Once again, the unique Nash equilibrium solution for each game is found for the combinations of the two base years using the two sets of PPF weights, although in this case solutions are found for both a devaluation and revaluation of the dollar.

CHAPTER TWO: THEORY

2.1 Review of the Literature

The existing literature in the area of agricultural trade policy within a political-economic framework provides a starting point for analyzing agricultural trade negotiations within the Uruguay round of the GATT. Determinants of agricultural price policy intervention are analyzed and their implications for the reform of the international agricultural trade regime discussed by von Witzke and Hausner (1993). Runge, von Witzke and Thompson (1989) examine agricultural protectionism in a game-theoretic framework. They argue that gains from trade liberalization through policy coordination are, to the largest extent, a public good. Hagedorn (1985) shows that there exist public goods and externalities in agriculture which are provided in competitive markets at levels which are less than optimal. As a result, agricultural policies provide a superior allocation of the public good or impute the full social costs of externalities in market prices as determined through the political process. As opposed to social policy which is a one-way transfer to the needy, agricultural policy is a two-way transfer in which there is an exchange of public benefits.

Olson (1965) shows that individuals band together in lobbies in order to obtain through the government what they could not obtain in the market. Public goods and externalities are deceptions which are used to achieve economic rents through the political process. The policies which agricultural lobbies promote affect the welfare of other groups which act in opposition to the agricultural lobby.

This process is modelled by Roe and Yeldan (1988) who develop a

formal model of governments' economic decisions as influenced by private agents within the context of neoclassical political economy. The government is assumed to form preferences over interest groups within the economy. These preferences or weights are influenced by the rent-seeking behavior of the interest groups. In addition, Becker (1983) presents a theory of competition among pressure groups for political influence. Through the use of a political budget equation, equilibrium depends on the efficiency of each group in producing pressure, the effect of additional pressure on their influence, the number of people in the various groups, and the deadweight cost of taxes and subsidies.

In Thompson (1989) a non-cooperative dynamic game between the United States' and the European Community's governments and wheat producers is used to examine the consequences of different sequences of decision making and various incentive structures. The question of policy coordination by the two governments is also addressed.

Gardner (1987) models the objective of agricultural policy as the constrained maximization of public choice considerations which is a function of producer rents and buyer surplus. Johnson, Mahè and Roe (1993), Mahè and Roe (1993), Guyomard, Mahè and Roe (1992), Johnson (1990), Johnson, Roe, and Mahè (1989), Mahè and Tavèra (1988), Rausser and Freebairn (1986), and Riethmueller and Roe (1986) have modelled the objective of agricultural policy as the unconstrained maximization of a weighted additive social welfare function whose arguments are producer welfare, consumer welfare, government net treasury position, or other related measures. The latter approach is adopted in this analysis, with the social welfare function being referred to as the political payoff

function.

Computable general equilibrium (CGE) models have been used to analyze the effects of policy reform. In particular, Kehoe et al. (1991), (1986), and (1985) construct a static applied general equilibrium model of the Spanish economy which is used to analyze the entry of Spain into the European Community and the accompanying fiscal reform of 1986. Because the agricultural sector is a relatively small component of the economies of the United States and European Community, the analysis undertaken in this study views the effects of policy changes in the agricultural production and consumption sectors using a partial equilibrium framework. The model used in this analysis holds prices and quantities in non-agricultural sectors constant and is perhaps better described as a "sectoral" equilibrium model as agricultural policy changes impact agricultural production and consumption exclusively.

Harrison, Rutstrom and Wigle (1989), through the use of a global numerical general equilibrium model, apply the concept of Nash equilibria to evaluate the outcome of a strategic trade war in agriculture between the United States and the European Community. Unlike the approach taken in this analysis, their search for Nash equilibria and social welfare treaties does not require that the current policies result in a Nash equilibrium.

Various authors have addressed the issue of strategic interaction of governments in agricultural trade. Karp and McCalla (1983) use a dynamic Nash noncooperative difference game to analyze the world corn market while Sarris and Freebairn (1983) model international prices as

Nash equilibrium interactions of national excess demand functions, which are arguments of weighted domestic optimization problems. The approach taken in this analysis will also require that the game solutions are Nash equilibria.

Paarlberg and Abbot (1986), Tyers (1989), and Beghin (1990) use models which treat public policies as endogenous in the examination of policy preference functions. This paper takes that approach, with the addition that governments' beliefs as to their abilities to influence world prices are consistent with and implied by world market equilibrium.

2.2 The Theoretical Framework

The theoretical framework upon which this analysis is based is described as follows. In the model, N commodities are produced, consumed, and traded by two main countries and the rest of the world. Vectors of supply, demand, and excess demand are used to describe the levels of aggregate production, consumption, and trade for each country. The supply sector in country k produces some combination of the N commodities in order to maximize producer quasi-rents given prices, technology, and endowments. Aggregate production of the N commodities is described by the vector of supply functions,

$$(2.1) \qquad S_k(P_k^S;X_k^S) = [S_{1k}(P_k^S;X_k^S), S_{2k}(P_k^S;X_k^S), \ldots, S_{Nk}(P_k^S;X_k^S)],$$

where $P_k^S = (P_{1k}^S, P_{2k}^S, \ldots, P_{Nk}^S)$ is the vector of prices observed by the supply sector and X_k^S is a vector of exogenous variables, such as

technology, input prices and endowments for the supply sector of country k. Aggregate consumption of the N commodities is described by the vector of demand functions:

$$(2.2) \qquad Q_k(P_k^Q;X_k^Q) = [Q_{1k}(P_k^Q;X_k^Q), Q_{2k}(P_k^Q;X_k^Q), \ldots, Q_{Nk}(P_k^Q;X_k^Q)],$$

where $P_k^Q = (P_{1k}^Q, P_{2k}^Q, \ldots, P_{Nk}^Q)$ is the vector of prices observed by the final demand sector and X_k^Q is a vector of exogenous variables for country k. The aggregate level of trade in the N commodities for country k is described by the excess demand functions:

$$(2.3) \qquad M_k(P_k^S, P_k^Q; X_k^S, X_k^Q) = Q_k(P_k^Q;X_k^Q) - S_k(P_k^S;X_k^S)$$

where $M_k = (M_{1k}, M_{2k}, \ldots, M_{Nk})$ and $M_{ik} > 0$ indicates net imports and $M_{ik} < 0$ indicates net exports of commodity i for $i = 1,2,\ldots,N$.

The governments of both countries intervene in their domestic markets either through the use of price (π) or supply/demand shift (θ) instruments. Price instruments, denoted as $A_{ik}^{\pi S}$ for producers and $A_{ik}^{\pi Q}$ for consumers of commodity i in country k affect the prices observed by the supply and final demand sectors. With the world price of commodity i represented as P_i^W the domestic price functions for country k are:

$$(2.4) \qquad P_{ik}^S = P_{ik}^S(A_{ik}^{\pi S}, P_i^W) \text{ and } P_{ik}^Q = P_{ik}^Q(A_{ik}^{\pi Q}, P_i^W)$$

for $i = 1,2,\ldots,N$.

Supply/demand shift instruments, shown as $A_{ik}^{\theta S}$ for producers and

$A_{ik}^{\theta Q}$ for consumers of commodity i in country k, are implicit elements of vectors X_k^S and X_k^Q which shift supply and demand functions by modifying non-price elements of the producers or consumers decision process. Supply/demand shift instruments could include policy such as acreage reduction programs, subsidization schemes, and food stamp/giveaway programs. In order to make these shifters explicit the vectors X_k^S and X_k^Q are defined as follows:

$$(2.5) \qquad X_k^S = X_k^S(A^{\theta S}_k, \tilde{X}_k^S) \text{ and } X_k^Q = X_k^Q(A^{\theta Q}_k, \tilde{X}_k^Q).$$

The aggregate supply (2.1), demand (2.2), and excess demand (2.3) equations are expressed as functions of world price, policy instruments, and exogenous variables by substituting the domestic price functions (2.4) and the function of explicit variables (2.5), thus obtaining;

$$(2.1^*) \qquad S_k(P_k^S(A_k^{\pi S}, P^W), A_k^{\theta S}; \tilde{X}_k^S),$$

$$(2.2^*) \qquad Q_k(P_k^Q(A_k^{\pi Q}, P^W), A_k^{\theta Q}; \tilde{X}_k^Q), \text{ and}$$

$$(2.3^*) \qquad M_k(P_k^S(A_k^{\pi S}, P^W), P_k^Q(A_k^{\pi Q}, P^W), A_k^{\theta S}, A_k^{\theta Q}; \tilde{X}_k^S, \tilde{X}_k^Q)$$

where $P^j(A^{\pi j}, P^W) = (P_1^j(A_1^{\pi j}, P_1^W), P_2^j(A_1^{\pi j}, P_1^W), \ldots, P_N^j(A_N^{\pi j}, P_N^W)$ for $j = S,Q$.

Let the main countries be denoted as countries 1 and 2 and the rest of the world as country 3. The vector of excess demand functions for the rest of the world is shown as $M_3(P^W, X_3)$ where X_3 is the vector of exogenous variables for the rest of the world. Through the adjustment of world prices, world markets are assumed to clear, i.e. world markets are competitive. Therefore,

$$(2.6) \qquad M_1(P_1^S(A_1^{\pi S}, P^W), P_1^Q(A_1^{\pi Q}, P^W), A_1^{\theta S}, A_1^{\theta Q}; \tilde{X}_1^S, \tilde{X}_1^Q) +$$

$$M_2(P_2^S(A_2^{\pi S}, P^W), P_2^Q(A_2^{\pi Q}, P^W), A_2^{\theta S}, A_2^{\theta Q}; \tilde{X}_2^S, \tilde{X}_2^Q) + M_3(P^W, X_3) = 0$$

where the right-hand side of the equation is an N × 1 vector of zeros. In order for the game to be well defined it is necessary that world prices be defined as functions of the actions of the two main countries. Therefore, the world price vector is shown as the function

$$(2.7) \qquad P^W = P^W(A_1^{\pi S}, A_1^{\pi Q}, A_1^{\theta S}, A_1^{\theta Q}, A_2^{\pi S}, A_2^{\pi Q}, A_2^{\theta S}, A_2^{\theta Q}; \tilde{X}_1^S, \tilde{X}_1^Q, \tilde{X}_2^S, \tilde{X}_2^Q, X_3).$$

Throughout the process of agricultural policy formulation the welfare effects of various actions are taken into account by the government. Policy-makers behave as though they are using a weighing system to compare the gains of certain groups versus the losses of others. In order to model this behavior a political payoff function (PPF) is used. The PPF, a weighted, additive function of producer quasi-rents, consumer utility, and budget costs, is the objective function which, through their policy choices, policy-makers behave as though they seek to maximize.

Let -k signify the other main country and $A_k = (A_k^{\pi S}, A_k^{\pi Q}, A_k^{\theta S}, A_k^{\theta Q})$ represent the actions of country k. In addition, let exogenous factors $X = (\tilde{X}_1^S, \tilde{X}_1^Q, \tilde{X}_2^S, \tilde{X}_2^Q, X_3)$ be suppressed. Producers are grouped according to commodities with their welfare defined as the quasi-rents obtained through the production and marketing of that commodity. Assuming differentiability, the quasi-rents of the group producing commodity i is shown as the line integral:

$$(2.8) \qquad \Pi_{ik}(P_k^S;X_k^S) = \int_0^{P_i} S_{ik}(P_k^S;X_k^S)\ dP_{ik}^S.$$

The vector

$$(2.9) \qquad \Pi_k(P_k^S;X_k^S) = (\Pi_{1k}(P_k^S;X_k^S),\Pi_{2k}(P_k^S;X_k^S),\ldots,(\Pi_{Nk}(P_k^S;X_k^S))$$

signifies quasi-rents over the N producer groups. In addition the utility function is shown as:

$$(2.10) \qquad U_k(P_k^Q;X_k^Q) = \Sigma_{i=1}^N \int_{P_i}^{\infty} Q_{ik}(P_k^Q;X_k^Q)\ dP_{ik}^Q.$$

In order to express producer quasi-rents (2.9) as a function of government policies, equation (2.4) is substituted for P_k^S, equation (2.5) is substituted for the exogenous variable X_k^S, and equation (2.7) replaces the world price P^W, thus obtaining:

$$(2.11) \qquad \tilde{\Pi}_k(A_k,A_{-k}) = \Pi_k(P_k^S(A_k^{\pi S},P^W(A_k,A_{-k})),A_k^{\theta S}).$$

In the same manner, by substituting equations (2.4), (2.5), and (2.7) into equation (2.10) consumer utility is expressed as a function of government policies, obtaining:

$$(2.12) \qquad \tilde{U}_k(A_k,A_{-k}) = U_k(P_k^Q(A_k^{\pi Q},P^W(A_k,A_{-k})),A_k^{\theta Q}).$$

In order to express the budget function let a transpose of an N × 1 vector be denoted by T. Producer receipts are $P_k^S \cdot S_k^T$, consumers spend

$P_k^Q \cdot Q_k^T$, and excess demand/supply is purchased/sold in the world market at price P^W for a total monetary value of $P^W \cdot M_k^T$. Using equations (2.1), (2.2), and (2.3) the budget is shown as:

$$(2.13) \qquad B_k(P_k^S, P_k^Q, P^W; X) = (P_k^Q - P^W) \times Q_k^T(P_k^Q; X_k^Q) - (P_k^S - P^W) \times S_k^T(P_k^S; X_k^S).$$

Substituting for P_k^S, P_k^Q and P^W and suppressing X as before, the budget of country k, as a function of government policies, is shown as:

$$(2.14) \qquad \tilde{B}_k(A_k, A_{-k}) = \tilde{B}_k(P_k^S(A_k^{\pi S}, P^W(A_k, A_{-k})), P_k^Q(A_k^{\pi Q}, P^W(A_k, A_{-k})), P^W(A_k, A_{-k}), A_k^{\theta S}, A_k^{\theta Q}).$$

Having expressed producer quasi-rents, consumer utility, and the budget as functions of government policies, the budget weight is normalized to one and the PPF, as a function of government policies, is shown as:

$$(2.15) \qquad V_k(A_k, A_{-k}) = \tilde{\Pi}_k(A_k, A_{-k}) \cdot \lambda_{Sk} + \tilde{U}_k(A_k, A_{-k}) \cdot \lambda_{Qk} + \tilde{B}_k(A_k, A_{-k})$$

where λ_{Sk} is a strictly positive $N \times 1$ vector which represents the relative political weights of the producer groups in country k and λ_{Qk} is a strictly positive scaler representing the relative political weight of the consumer group in country k.

If the policy decision process of interdependent countries is to be modelled, a Nash equilibrium occurs where each country chooses its policy which maximizes its PPF given the policy choice of the other.

This equilibrium is defined using a best response correspondence. For a given A_{-k}, government k chooses A_k^*, one possible best response to A_{-k}, such that:

$$V_k(A_k^*, A_{-k}) \geq V_k(A_k, A_{-k}), \text{ for all } A_k \in \mathbf{A}_k, \tag{2.16}$$

where $\mathbf{A}_k$ is the set of all possible actions which can be employed by government k. Every A_{-k} element of $\mathbf{A}_{-k}$ has at least one A_k^* element of $\mathbf{A}_k$ which is a best response for country k. A Nash equilibrium is defined as the set of actions (A_k^*, A_{-k}^*) where A_k^* is a best response to A_{-k}^* for country k, and A_{-k}^* is a best response to A_k^* for country -k.

Differentiating equation (2.15) with respect to A_k^S and A_k^Q, the first order necessary conditions for a maximum are:

$$\begin{bmatrix} \frac{\delta V_k}{\delta A_k^S} \\ \frac{\delta V_k}{\delta A_k^Q} \end{bmatrix} = \begin{bmatrix} \frac{\delta \tilde{\Pi}_k}{\delta A_k^S} & \frac{\delta \tilde{U}_k}{\delta A_k^S} \\ \frac{\delta \tilde{\Pi}_k}{\delta A_k^Q} & \frac{\delta \tilde{U}_k}{\delta A_k^Q} \end{bmatrix} \cdot \begin{bmatrix} \lambda_{Sk} \\ \lambda_{Qk} \end{bmatrix} + \begin{bmatrix} \frac{\delta \tilde{B}_k}{\delta A_k^S} \\ \frac{\delta \tilde{B}_k}{\delta A_k^Q} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} \tag{2.17}$$

Under the assumption that V_k is concave in A_k given A_{-k}, any A_k^* which solves equation (2.16) maximizes V_k. Thus, by definition, A_k^* is a best response to A_{-k}. (A_k^*, A_{-k}^*) is a Nash equilibrium if

$$(2.18) \qquad \begin{bmatrix} \dfrac{\delta V_k}{\delta A_k^S} \\ \\ \dfrac{\delta V_k}{\delta A_k^Q} \end{bmatrix} \Bigg|_{(A_k^*, A_{-k}^*)} = \begin{bmatrix} 0 \\ \\ 0 \end{bmatrix}.$$

In the situation where the two main countries negotiate with one another, no agreement will be reached or kept unless both countries are made at least as well off as they were prior to the agreement. A necessary condition for a treaty is that there exist at least one pair of actions (A_k^+, A_{-k}^+) which satisfy:

$$(2.19) \qquad V_k(A_k^+, A_{-k}^+) \geq V_k(A_k^*, A_{-k}^*) \text{ and } V_{-k}(A_k^+, A_{-k}^+) \geq V_{-k}(A_k^*, A_{-k}^*).$$

Actions (A_k^+, A_{-k}^+) satisfying equation (2.19) are called treaty actions. The <u>treaty action space</u> is the set of all treaty actions. In order to achieve an agreement in which both governments are made at least as well off as prior to negotiations, the settlement must lie within the treaty action space.

In the situation where the two main countries do not cooperate with one another, a necessary condition for a Nash equilibrium is that there exist a set of actions (A_k^*, A_{-k}^*) where A_k^* is a best response to A_{-k}^* for country k, and A_{-k}^* is a best response to A_k^* for country -k. The <u>solution action space</u> is the set of Nash equilibria. The solution to a non-cooperative game must lie within the solution action space.

CHAPTER THREE: EMPIRICAL ANALYSIS

3.1 Overview of the MISS Model

Modèle Internationale Simplifiè de Simulation (MISS) is a simplified world trade model which simulates in a comparative static framework the effects of various policy actions[5]. This analysis is conducted using seven commodity groups, consisting of cereals, oilmeals, feed grain substitutes, beef, pork and poultry, milk, and sugar.

In the MISS model the world is divided into as many zones as desired. For the purposes of this examination it is divided into three areas, consisting of the European Community (EC), the United States (US), and the rest of the world (ROW).

3.2 Notation Used in the MISS Model

The following is a description of the notation used in the model;

i,j : commodity index : $i,j = 1,\ldots,I$ in this case $I = 7$

k : country index : $k = 1,\ldots,K$ in this case $K = 3$

$\bar{S}_{ik}$, $\bar{D}_{ik}$, $\bar{Q}_{ik}$: production, derived demand, and final demand respectively for commodity i in country k for the base year

P^{S}_{ik}, P^{D}_{ik}, P^{Q}_{ik} : domestic prices for production, derived demand, and final demand respectively for commodity i in country k

E^{*}_{ijk}, (E^{**}_{ijk}) : matrices of supply elasticities with respect to output (input) prices

F^{*}_{ijk}, (F^{**}_{ijk}) : matrices of derived demand elasticities with respect to output (input) prices

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[5] For a more detailed description of MISS see Mahè, Tavèra, and Trochet (1988).

G_{ijk} : matrices of final demand elasticities with respect to consumer prices

P_i^W : world price of commodity i

P_{ik}^B : border price of commodity i for country k

W_k : margin coefficient representing transportation costs, e.g. freight, insurance,... such that $P_{ik}^B = P_{ik}^W \cdot W_k$

T_{ik}^S , T_{ik}^D , T_{ik}^Q : protection coefficients for production, derived demand, and final demand respectively such that $T_{ik}^N = P_{ik}^N \div P_{ik}^W$ for N = S, D, Q.

C_k : currency exchange rate, represents number of currency units in country k which can be exchanged for one European Currency Unit (ECU)

$\bar{I}_{ik}$: initial stock of commodity i in country k

σ_{ik}, δ_{ik}, ζ_{ik} : quantity shifters for production, derived demand, and final demand respectively for commodity i in country k

Upper case letters represent variables of amount, while lower case letters denote a percentage change in the respective quantity variable. A variable with a bar indicates a base year value.

3.3 Description of the MISS Model

The MISS model uses several identities in order to derive the effects of policy changes on the sectors of production, derived demand, and final demand for the three zones used in this example. The model operates on the principle of Walrasian equilibrium. Any policy changes undertaken by either country cause an adjustment in the world price levels, resulting in changes in supply and demand and a rebalancing of world trade.

Initial equilibrium in the model is shown as

$$\Sigma_k \bar{S}_{ik} = \Sigma_k \bar{D}_{ik} + \Sigma_k \bar{Q}_{ik} + \Sigma_k \bar{I}_{ik} \tag{3.1}$$

for all $i = 1,\ldots,I$.

Change in Supply is shown as

$$s_{ik} = \Sigma_j \left(E^{*}_{ijk} \cdot p^{S}_{jk} + E^{**}_{ijk} \cdot p^{D}_{jk} \right) + \sigma_{ik} \tag{3.2}$$

for all $i = 1,\ldots,I$ and $k = 1,\ldots,K$.

Change in derived demand is shown as

$$d_{ik} = \Sigma_j \left(F^{*}_{ijk} \cdot p^{S}_{jk} + F^{**}_{ijk} \cdot p^{D}_{jk} \right) + \delta_{ik} \tag{3.3}$$

for all $i = 1,\ldots,I$ and $k = 1,\ldots,K$.

Change in final demand is shown as

$$q_{ik} = \Sigma_j G_{ijk} \cdot p^{Q}_{jk} + \zeta_{ik} \tag{3.4}$$

for all $i = 1,\ldots,I$ and $k = 1,\ldots,K$.

The domestic/world price linkage is shown by the equation

$$P^{N}_{jk} = P^{W}_{j} \cdot C_k \cdot T^{N}_{jk} \cdot W_k \tag{3.5}$$

or, in logarithmic terms where W_k is fixed

$$p^{N}_{jk} = p^{W}_{j} + c_k + t^{N}_{jk} \tag{3.6}$$

for N = (S, D, Q).

Final equilibrium for the model, using the previous equations, is shown as

$$(3.7) \qquad \Sigma_k \bar{S}_{ik} \cdot s_{ik} = \Sigma_k \bar{D}_{ik} \cdot d_{ik} + \Sigma_k \bar{Q}_{ik} \cdot q_{ik}$$

for all $i = 1, \ldots I$.

Net budget costs for zone k are shown as

$$(3.8) \qquad BC_k = \Sigma_i (P^S_{ik} - P^B_{ik}) \cdot S_{ik} - \Sigma_i (P^D_{ik} - P^B_{ik}) \cdot D_{ik} - \Sigma_i (P^Q_{ik} - P^B_{ik}) \cdot Q_{ik}.$$

Net budget costs for country k when the government of that country uses a variable levy or tariff ($P^S = P^D = P^Q = \hat{P} > P^B$) are shown as

$$(3.8.1) \qquad BC_k = \Sigma_i (\hat{P}_{ik} - P^B_{ik}) \cdot (S_{ik} - D_{ik} - Q_{ik})$$

Net budget costs for country k when the government of that country uses a deficiency payment ($P^S > P^D = P^Q = P^B$) are shown as

$$(3.8.2) \qquad BC_k = \Sigma_i (P^S_{ik} - P^B_{ik}) \cdot S_{ik}$$

Net budget costs for country k when the government of that country uses a co-responsibility levy and tariff ($P^S > P^D = P^Q = P^B$) are shown as

$$(3.8.3) \qquad BC_k = \Sigma_i (P^S_{ik} - P^B_{ik}) \cdot S_{ik} - \Sigma_i (P^D_{ik} - P^B_{ik}) \cdot (D_{ik} + Q_{ik}),$$

or

$$(3.8.4) \qquad BC_k = \Sigma_i(P^S_{ik} - P^D_{ik})\cdot S_{ik} \qquad + \Sigma_i(P^D_{ik} - P^B_{ik})\cdot(S_{ik} - D_{ik} - Q_{ik}).$$

Using the net budget costs as computed in equations 3.8.1, 3.8.2, 3.8.3, and/or 3.8.4, the net budget savings are shown by the equation

$$(3.9) \qquad BS_k = BC^I_k - BC^F_k$$

where $BC^I_k \equiv$ Initial Budget Costs in k, and

$BC^F_k \equiv$ Final Budget Costs in k.

3.4 Data and Model Specification

The data used in the MISS model for the analysis undertaken in this paper include a balance sheet of production, derived demand, and final demand for each of the three zones over each of the seven sectors for the 1986 and 1990 base years, the US and EC protection levels for each commodity, world price levels, and elasticities. Section 3.4.1 presents the quantity data for the 1986 and 1990 base years, section 3.4.2 describes the policy instruments used and summarizes the protection coefficients and world prices for the base periods, while section 3.4.3 presents matrices of the elasticities used in the model.

3.4.1 Quantity Data

Commodity data for the three zones and seven production sectors for the base years 1986 and 1990 is presented in table 3.4.1. This data set, shown in million metric tonnes (MMT), consists of the quantities of the commodity produced, the quantities of the commodity demanded by the

Table 3.4.1 Quantity Data for Base Years 1986 and 1990.

1986: Cereals	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	1358.00	---	---	1358.00	0.00
EC	138.00	70.00	38.00	108.00	30.00
US	310.00	154.00	58.00	212.00	98.00
ROW	910.00	---	---	1038.00	-128.00

Source: Mahe, Tavera, and Trochet (1988).

1990: Cereals	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	1427.02	---	---	1393.79	33.23
EC	168.77	83.23	59.53	142.76	26.01
US	305.21	150.98	64.99	215.97	89.24
ROW	953.04	---	---	1035.06	-82.02

Source: USDA.

1986: Oilmeals	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	106.10	---	---	106.10	0.00
EC	8.50	28.00	0.00	28.00	-19.50
US	46.40	20.70	0.00	20.70	25.70
ROW	51.20	---	---	57.40	-6.20

Source: Mahe, Tavera, and Trochet (1988).

1990: Oilmeals	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	120.97	---	---	122.61	-1.64
EC	13.11	33.31	0.00	33.31	-20.20
US	46.28	23.40	0.00	23.40	22.88
ROW	61.58	---	---	65.90	-4.32

Source: USDA.

Table 3.4.1 Quantity Data for Base Years 1986 and 1990, continued.

1986: FGS	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	63.00	---	---	63.00	0.00
EC	15.58	28.97	0.00	28.97	-13.39
US	12.30	7.82	0.00	7.82	4.48
ROW	35.12	---	---	26.21	8.91

Source: Mahe, Tavera, and Trochet (1988).

1990: FGS	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	65.00	---	---	65.00	0.00
EC	15.58	34.00	0.00	34.00	-18.42
US	12.30	7.88	0.00	7.88	4.42
ROW	37.12	---	---	23.12	14.00

Source: USDA, FAO, AgraEurope, EC.

1986: Beef	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	46.60	---	---	46.60	0.00
EC	7.80	0.00	6.60	6.60	1.20
US	10.90	0.00	11.55	11.55	-0.65
ROW	27.90	---	---	28.45	-0.55

Source: Mahe, Tavera, and Trochet (1988).

1990: Beef	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	51.15	---	---	51.02	0.13
EC	8.02	0.00	7.58	7.58	0.44
US	10.46	0.00	10.82	10.82	-0.36
ROW	32.67	---	---	32.62	0.05

Source: FAO.

Table 3.4.1 Quantity Data for Base Years 1986 and 1990, continued.

1986: Pork & Poultry	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	85.40	---	---	85.40	0.00
EC	14.90	0.00	14.30	14.30	0.60
US	14.40	0.00	14.60	14.60	-0.20
ROW	56.10	---	---	56.50	-0.40

Source: Mahe, Tavera, and Trochet (1988).

1990: Pork & Poultry	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	109.32	---	---	109.19	0.13
EC	19.25	0.00	18.73	18.73	0.52
US	17.81	0.00	17.42	17.42	0.39
ROW	72.26	---	---	73.04	-0.78

Source: FAO.

1986: Milk	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	448.20	---	---	448.20	0.00
EC	102.00	10.00	72.00	82.00	20.00
US	66.20	1.20	61.00	62.20	4.00
ROW	280.00	---	---	304.00	-24.00

Source: Mahe, Tavera, and Trochet (1988).

1990: Milk	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	475.51	---	---	475.51	0.00
EC	109.02	10.31	80.00	90.31	18.71
US	67.39	0.95	63.01	63.96	3.43
ROW	299.10	---	---	321.24	-22.14

Source: USDA, FAO, EC.

Table 3.4.1 Quantity Data for Base Years 1986 and 1990, continued.

1986: Sugar	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	75.50	---	---	70.86	4.64
EC	11.70	0.00	9.50	9.50	2.20
US	5.17	0.00	6.86	6.86	-1.69
ROW	75.50	---	---	70.86	4.13

Source: Mahe, Tavera, and Trochet (1988).

1990: Sugar	Production	Animal Feeds	Other Demand	Total Uses	Total Surplus
World	113.18	---	---	109.38	3.80
EC	17.01	0.00	12.82	12.82	4.19
US	6.28	0.00	7.96	7.96	-1.68
ROW	89.89	---	---	88.60	1.29

Source: USDA.

livestock sector, other domestic demand for the commodity, total domestic demand for the commodity, and total surplus of the commodity for the base year. The numbers shown as total surplus for the world indicate a change in total world stocks of that commodity, e.g., in 1990 world cereal stocks increased by 33.23 MMT.

3.4.2 Policies, Prices, and Protection Levels

In order to model the game as closely as possible to that actually played by the United States and the European Community the actual rates of protection and policy instruments must be approximated as accurately as possible. The agricultural pricing policy for the United States is summarized as follows. Cereals are supported by means of a target price combined with a set-aside program and the Export Enhancement Program. Oilmeal production is supported by the Commodity Credit Corporation loan rate for oilseed producers. The price of beef is supported through a beef import tariff. No support program exists for pork and poultry. The producer price for milk is supported at a level slightly higher than the supported consumer price. A fixed domestic price for sugar is obtained by means of an import quota. In total, seven relevant policy instruments exist for the United States.

In the European Community a coresponsibility levy results in the producer price of cereals being slightly lower than the consumer cereal price, which is fixed by a variable levy. A GATT agreement binds EC tariffs for oilmeal and feed grain substitutes at zero, thus consumer prices are equal to world prices. The EC also subsidizes the production of oilmeals. Beef, pork and poultry, milk, and sugar are supported

through the variable levy system. Milk is also protected by means of a production quota. Thus, the European Community also employs seven policy instruments in its agricultural policy.

The protection coefficients for the base years 1986 and 1990 are shown in table 3.4.2, along with world price levels for both years. A summary of the calculations used to derive the coefficients for 1990 can be found in tables 3.4.3 - 3.4.6. As an example of how protection coefficients are derived refer to table 3.4.3. The EC production protection coefficient for cereals is derived by taking EAGGF expenditures divided by exports in order to obtain the export restitution rate. The export restitution rate is then subtracted from the observed producer price in order to obtain the derived border price. Dividing the producer price by the derived border price results in the estimated protection coefficient.

3.4.3 Elasticities

The elasticities used in the model are derived by Mahe, Tavera, and Trochet (1988) from a review of estimates used in other studies and adjusted to this particular model. Supply and derived demand elasticities satisfy profit maximization conditions for a firm with multi-output production technology, e.g., homogeneity and symmetry conditions, while final demand elasticities satisfy the implications of utility maximization. The supply and derived demand elasticities for the US and EC are presented in table 3.4.7, with direct and cross price elasticities of final demand and supply and final demand elasticities for the rest of the world, as well as world price levels for 1986 and

Table 3.4.2 Summary of Protection Coefficients

1986 PROTECTION COEFFICIENTS AND WORLD PRICES							
	EUROPEAN COMMUNITY			UNITED STATES			WORLD
	PR	LS	HC	PR	LS	HC	PRICE
Cereals	1.78	1.80	1.80	1.56	1.10	1.10	100.00
Oilmeals	1.95	1.00	1.00	1.10	1.00	1.00	164.00
FGS	1.00	1.00	1.00	1.00	1.00	1.00	120.00
Beef	1.75	1.75	1.75	1.05	1.05	1.05	2000.00
Pork/Pol.	1.20	1.20	1.20	1.00	1.00	1.00	1280.00
Milk	1.94	0.96	1.80	1.80	1.80	1.69	143.00
Sugar	2.70	2.70	2.70	2.20	2.20	2.20	200.00

Note: PR≡Production, LS≡Livestock Sector, and HC≡Human Consumption.
Source: Mahe, Tavera, and Trochet (1988).

1990 PROTECTION COEFFICIENTS AND WORLD PRICES							
	EUROPEAN COMMUNITY			UNITED STATES			WORLD
	PR	LS	HC	PR	LS	HC	PRICE
Cereals	1.78	1.80	1.80	1.60	1.10	1.10	90.67
Oilmeals	2.30	1.00	1.00	1.00	1.00	1.00	168.22
FGS	1.00	1.00	1.00	1.00	1.00	1.00	120.00
Beef	1.65	1.65	1.65	1.05	1.05	1.05	2069.71
Pork/Pol.	1.25	1.25	1.25	1.00	1.00	1.00	1204.34
Milk	1.90	0.90	1.80	1.95	1.95	1.74	164.09
Sugar	2.70	2.70	2.70	2.30	2.30	2.30	204.88

Note: PR≡Production, LS≡Livestock Sector, and HC≡Human Consumption.
Source: Calculated in tables 3.4.3 - 3.4.6. 1990.

Table 3.4.3 EC Producer Protection Coefficients, 1990.

	Grains	Oilmeal & Veg. Protein	Beef	Pork & Poultry	Milk	Sugar
Exports (million tonnes)	26.01	13.105 (a)	0.816	1.005	18.715	4.198
Producer price (ECU per tonne)	161.55 (c)	360	3430	1522	221	551
EAGGF Expenditures (mill. ECU)	1844	2674	1110	319.4	1947	1451
Export Restitution Rate (ECU/tonne)	70.9	204	1360 (b)	317.8	104	346
Derived Border Price (ECU/tonne)	90.7	155.9	2070	1204	117	205
Protection Coefficient Estimated	1.782	2.309	1.657	1.264	1.889	2.687
Protection Coefficient Used	1.78	2.30	1.65	1.25	1.90	2.70

(a) Oilmeal Production
(b) Production Subsidy Rate
(c) Intervention Price minus Coresponsibility Levy (4.45 ECU/tonne)

Note: The EC producer protection coefficient for cereals is derived by taking EAGGF expenditures divided by exports to obtain the export restitution rate. The producer price minus the export restitution rate equals derived border price. Producer price divided by derived border price equals estimated protection coefficient, or,

$$161.55 \div (161.55 - (1844 \div 26.01)) = 1.782.$$

Source: EUROSTAT, The Agricultural Situation in the Community.
USDA/ESS, Agricultural Outlook.
USDA/ERS, Dairy Situation and Outlook Yearbook.
USDA/ERS, Sugar and Sweetener Situation and Outlook.
USDA/ERS/FAS, World Agricultural Supply an Demand Estimates.
USDA/FAS, World Oilseed Situation and Outlook Yearbook.

Table 3.4.4 EC Consumer Protection Coefficients, 1990.

	Grains	Oilmeal & Veg. Protein	Beef	Pork & Poultry	Milk		Sugar	
Domestic Uses (Mill. tonnes)					(a) 80.0	(b) 10.3		
Domestic Price (ECU/tonne)	166				221	221		
EAGGF Expenditure (mill. ECU)					1059	1241		
Subsidy Rate (ECU/tonne)					13.24	120.43		
Subsidized Price (ECU/tonne)					207.76	100.57		
Border Price (ECU/tonne)	90.7				117	117		
Protection Coefficient Estimated	1.833				1.776	0.86		
Protection Coefficient Used	1.80	1.00	1.65	1.25	1.80	0.90	2.70	

(a) Human Consumption
(b) Animal Feed
Note: See table 3.4.3 regarding calculation of protection coefficients.

Source: EUROSTAT, The Agricultural Situation in the Community.
USDA/ESS, Agricultural Outlook.
USDA/ERS, Dairy Situation and Outlook Yearbook.
USDA/ERS, Sugar and Sweetener Situation and Outlook.
USDA/ERS/FAS, World Agricultural Supply an Demand Estimates.
USDA/FAS, World Oilseed Situation and Outlook Yearbook.

Table 3.4.5 US Producer Protection Coefficients, 1990.

	Grains	Oilmeal & Veg. Protein	Beef	Pork & Poultry	Milk	Sugar
Production (million tonnes)		46.275				
Exports (million tonnes)					3.425	
Producer price (US$ per tonne)	146.98	187 (a)			303.6	1963
CCC Expenditure (mill. US$)		5.90			504.8	
Restitution Rate (US$/tonne)		0.127			147.4	
Derived Border Price (US$/tonne)		186.9			156.2	
Observed Border Price (US$/tonne)	92.58				850	
Protection Coefficient Estimated	1.587	1.001			1.944	2.31
Protection Coefficient Used	1.60	1.00	1.05	1.00	1.95	2.30

(a) Target Price

Note: See table 3.4.3 regarding calculation of protection coefficients.

Source: USDA/ESS, Agricultural Outlook.
USDA/ERS, Dairy Situation and Outlook Yearbook.
USDA/ERS, Sugar and Sweetener Situation and Outlook.
USDA/ERS/FAS, World Agricultural Supply an Demand Estimates.
USDA/FAS, World Oilseed Situation and Outlook Yearbook.

Table 3.4.6 US Consumer Protection Coefficients, 1990.

	Grains	Oilmeal & Veg. Protein	Beef	Pork & Poultry	Milk	Sugar
Domestic Uses	215.97				63.005	
Domestic Support Price (US$/tonne)	100.75				275.75	
CCC Expenditures (Million US$) per tonne)	1763.7				252.4	
Consumer Subsidy Rate (US$/tonne)	8.166				4.006	
Derived Consumer Price (US$/tonne)					271.74	
Border Price (US$/tonne)	92.58				156.19	
Protection Coefficient Estimated	1.088				1.74	
Protection Coefficient Used	1.10	1.00	1.05	1.00	1.74	2.30

Note: See table 3.4.3 regarding calculation of protection coefficients.

Source: USDA/ESS, Agricultural Outlook.
USDA/ERS, Dairy Situation and Outlook Yearbook.
USDA/ERS, Sugar and Sweetener Situation and Outlook.
USDA/ERS/FAS, World Agricultural Supply an Demand Estimates.
USDA/FAS, World Oilseed Situation and Outlook Yearbook.

Table 3.4.7 Summary of Elasticities

EC Supply and Derived Demand Elasticities

		Output Prices								Variable Input Prices		
		CER	OIL	FGS	BEF	P&P	MIL	SUG	ROA	CER	OIL	FGS
Output	CER	0.73	-0.01	0.00	-0.06	-0.04	-0.06	-0.07	-0.23	0.01	0.00	0.00
	OIL	-0.20	0.89	0.00	-0.06	-0.04	-0.09	-0.07	-0.15	0.00	0.00	0.00
	FGS	-0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	BEF	-0.08	0.00	0.00	0.76	-0.04	0.19	-0.02	-0.15	-0.11	-0.05	-0.05
	P&P	-0.04	0.00	0.00	-0.03	1.93	-0.04	-0.01	-0.13	-0.83	-0.11	-0.18
	MIL	-0.06	0.00	0.00	0.14	-0.04	0.97	-0.01	-0.26	-0.11	-0.06	-0.06
	SUG	-0.32	-0.01	0.00	-0.06	-0.04	-0.04	0.90	-0.14	0.00	0.00	0.00
	ROA	-0.12	0.00	0.00	-0.06	-0.06	-0.15	-0.01	0.69	0.00	0.00	0.00
Input	CER	-0.02	0.00	0.00	0.13	1.05	0.17	0.00	0.00	-0.97	0.02	0.02
	OIL	-0.02	0.00	0.00	0.19	0.53	0.32	0.00	0.00	0.06	-0.62	-0.08
	FGS	-0.02	0.00	0.00	0.19	0.84	0.34	0.00	0.00	0.06	-0.08	-0.81

US Supply and Derived Demand Elasticities

		Output Prices								Variable Input Prices		
		CER	OIL	FGS	BEF	P&P	MIL	SUG	ROA	CER	OIL	FGS
Output	CER	0.46	-0.03	0.00	-0.04	-0.01	-0.02	0.00	-0.06	0.00	0.00	0.00
	OIL	-0.28	0.71	0.00	-0.04	-0.01	-0.04	-0.02	-0.09	0.00	0.00	0.00
	FGS	-0.11	0.00	0.27	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
	BEF	-0.06	-0.01	0.00	0.60	-0.05	-0.02	0.00	-0.12	-0.10	-0.01	0.00
	P&P	-0.03	0.00	0.00	-0.08	1.09	-0.06	0.00	-0.11	-0.36	-0.13	-0.02
	MIL	-0.06	-0.01	0.00	-0.04	-0.08	0.84	0.00	-0.22	-0.16	-0.02	-0.01
	SUG	-0.07	-0.06	0.01	-0.08	-0.05	-0.04	0.64	-0.11	0.00	0.00	0.00
	ROA	-0.11	-0.02	0.00	-0.16	-0.09	-0.15	-0.01	0.74	0.00	0.00	0.00
Input	CER	0.00	0.00	0.00	0.21	0.47	0.17	0.00	0.00	-0.51	0.01	0.00
	OIL	0.00	0.00	0.00	0.06	0.65	0.08	0.00	0.00	0.04	-0.49	-0.01
	FGS	0.00	0.00	0.00	0.14	0.49	0.25	0.00	0.00	0.04	-0.05	-0.52

SOURCE: Mahe, Tavera, and Trochet (1988).

CER = Cereals
OIL = Oilmeals
FGS = Feed Grain Substitutes
BEF = Beef
P&P = Pork and Poultry
MIL = Milk
SUG = Sugar

Table 3.4.7 Summary of Elasticities, Continued.

EC Direct and Cross Price Elasticities of Final Demand

		Prices						
		CER	OIL	FGS	BEF	P&P	MIL	SUG
	CER	-0.40	0.00	0.00	0.02	0.02	0.02	0.01
O	OIL	0.00	0.00	0.00	0.00	0.20	0.10	0.00
u	FGS	0.00	0.00	0.00	0.10	0.20	0.10	0.00
t	BEF	0.01	0.00	0.00	-0.70	0.20	0.04	0.00
p	P&P	0.01	0.00	0.00	0.23	-0.60	0.00	0.00
u	MIL	0.01	0.40	0.00	0.05	0.00	-0.28	0.00
t	SUG	0.01	0.00	0.00	0.00	0.00	0.00	-0.33

US Direct and Cross Price Elasticities of Final Demand

		Prices						
		CER	OIL	FGS	BEF	P&P	MIL	SUG
	CER	-0.40	0.00	0.00	0.02	0.02	0.02	0.01
O	OIL	0.00	0.00	0.00	0.00	0.20	0.10	0.00
u	FGS	0.00	0.00	0.00	0.10	0.20	0.10	0.00
t	BEF	0.01	0.00	0.00	-0.70	0.30	0.04	0.00
p	P&P	0.01	0.00	0.00	0.20	-0.60	0.00	0.00
u	MIL	0.01	0.04	0.00	0.05	0.00	-0.40	0.00
t	SUG	0.01	0.00	0.00	0.00	0.00	0.00	-0.25

SOURCE: Mahe, Tavera, and Trochet (1988).

CER = Cereals
OIL = Oilmeals
FGS = Feed Grain Substitutes
BEF = Beef
P&P = Pork and Poultry
MIL = Milk
SUG = Sugar

Table 3.4.7 Summary of Elasticities, Continued.

Rest of World Price Elasticities

	Supply	Demand
CER	0.45	-0.60
OIL	0.55	-0.20
FGS	0.17	-0.13
BEF	0.50	-0.60
P&P	0.50	-0.50
MIL	0.45	-0.35
SUG	0.55	-0.20

SOURCE: Mahe, Tavera, and Trochet (1988).

CER = Cereals
OIL = Oilmeals
FGS = Feed Grain Substitutes
BEF = Beef
P&P = Pork and Poultry
MIL = Milk
SUG = Sugar

3.5 PPF Weight Estimation

Equation (2.17) shows the first order necessary conditions for maximizing the political payoff function. Assume that MISS approximates this equation for differentiable political payoff functions. Since there are as many policy instruments as PPF weights, the weights can be estimated using approximations of equation (2.17) such that the actual policies observed in the base year result in a Nash equilibrium. Equation (2.17) is reintroduced below.

$$(2.17)\qquad \begin{bmatrix} \frac{\delta V_k}{\delta A_k^S} \\ \frac{\delta V_k}{\delta A_k^Q} \end{bmatrix} = \begin{bmatrix} \frac{\delta \tilde{\Pi}_k}{\delta A_k^S} & \frac{\delta \tilde{U}_k}{\delta A_k^S} \\ \frac{\delta \tilde{\Pi}_k}{\delta A_k^Q} & \frac{\delta \tilde{U}_k}{\delta A_k^Q} \end{bmatrix} \cdot \begin{bmatrix} \lambda_{Sk} \\ \lambda_{Qk} \end{bmatrix} + \begin{bmatrix} \frac{\delta \tilde{B}_k}{\delta A_k^S} \\ \frac{\delta \tilde{B}_k}{\delta A_k^Q} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

The envelope theorem allows the inference of differentiable producer quasi-rent and consumer utility functions from the observable changes in supply and demand. These estimates are provided through the MISS model. In addition, the agricultural budget savings are observable in MISS.

The partial derivatives are approximated by evaluating small changes in the observed policies from their base year levels. The resulting changes in producer quasi-rents, consumer utility, and the agricultural budget are substituted into equation (2.17) to obtain

$$(3.13)\qquad \begin{bmatrix} \frac{\Delta V_k}{\Delta A_k^S} \\ \frac{\Delta V_k}{\Delta A_k^Q} \end{bmatrix} \approx \begin{bmatrix} \frac{\Delta \tilde{\Pi}_k}{\Delta A_k^S} & \frac{\Delta \tilde{U}_k}{\Delta A_k^S} \\ \frac{\Delta \tilde{\Pi}_k}{\Delta A_k^Q} & \frac{\Delta \tilde{U}_k}{\Delta A_k^Q} \end{bmatrix} \times \begin{bmatrix} \lambda_{Sk} \\ \lambda_{Qk} \end{bmatrix} + \begin{bmatrix} \frac{\Delta \tilde{B}_k}{\Delta A_k^S} \\ \frac{\Delta \tilde{B}_k}{\Delta A_k^Q} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

The matrix of changes in producer quasi-rents and consumer utility with respect to policy changes is square. If the inverse of this matrix is well defined the following equation solves for the political weights.

$$(3.14)\qquad \begin{bmatrix} \lambda_{Sk} \\ \lambda_{Qk} \end{bmatrix} \approx - \begin{bmatrix} \frac{\Delta \tilde{\Pi}_k}{\Delta A_k^S} & \frac{\Delta \tilde{U}_k}{\Delta A_k^S} \\ \frac{\Delta \tilde{\Pi}_k}{\Delta A_k^Q} & \frac{\Delta \tilde{U}_k}{\Delta A_k^Q} \end{bmatrix}^{-1} \times \begin{bmatrix} \frac{\Delta \tilde{B}_k}{\Delta A_k^S} \\ \frac{\Delta \tilde{B}_k}{\Delta A_k^Q} \end{bmatrix}.$$

The political payoff function weights are estimated in this manner, through the use of the MISS model. The estimated weights for 1986 and 1990 are presented in tables 3.5.1 and 3.5.2 respectively.

Table 3.5.1 Political Payoff Function Weights and Their Ranking by Interest Group for the U.S. and the EC, Based on 1986 Data.

Interest Group	United States		European Community	
	Rank	Weight	Rank	Weight
Sugar	1	1.56	1	1.57
Milk	2	1.29	2	1.46
Oilmeals	3	1.23	4	1.32
Cereals	4	1.15	3	1.34
Budget	5	1.00	6	1.00
Beef	6	0.92	4	1.32
Consumers	7	0.87	8	0.83
Pork & Poultry	8	0.85	7	0.95

Source: Johnson, Roe, and Mahè (1989).

Table 3.5.2 Political Payoff Function Weights and Their Ranking by Interest Group for the U.S. and the EC, Based on 1990 Data.

Interest Group	United States		European Community	
	Rank	Weight	Rank	Weight
Sugar	1	1.32	1	1.49
Milk	2	1.31	2	1.41
Cereals	3	1.15	3	1.37
Oilmeals	4	1.04	4	1.35
Budget	5	1.00	7	1.00
Beef	6	0.89	5	1.29
Consumers	7	0.85	8	0.90
Pork & Poultry	8	0.84	6	1.01

Source: Computed.

These weights represent the political influence of various producer groups, the consumer group, and the taxpayers in the formulation of United States and European Community agricultural policies.

CHAPTER FOUR: GAME SIMULATIONS USING BASE PERIOD EXCHANGE RATES

4.1 Game Theory

The normal-form representation of a game specifies: the players in the game, the actions available to each player, and the payoffs corresponding with each action combination. In this case there are two players in the game: the United States (US) and the European Community (EC). Let $\mathbf{A}_k$ denote the set of actions available to player k, for k = US,EC, and let A_k denote an arbitrary member of this action set. Let (A_{US},A_{EC}) denote a combination of actions, and let P_k denote player k's payoff function where $P_k(A_{US},A_{EC})$ is player k's payoff resulting from actions (A_{US},A_{EC}). More formally

Definition: The normal-form representation of a two-player game specifies the player's action spaces $\mathbf{A}_1,\mathbf{A}_2$ and their payoff functions P_1,P_2. This game is denoted by $G = (\mathbf{A}_1,\mathbf{A}_2;P_1,P_2)$.

The solution to each game will involve the concept of elimination of strictly dominated strategies.

Definition: In the normal-form game $G = (\mathbf{A}_1,\mathbf{A}_2;P_1,P_2)$ let $\tilde{A}_k$ and $\hat{A}_k$ be feasible strategies for player k, i.e., $\tilde{A}_k$ and $\hat{A}_k$ are members of $\mathbf{A}_k$. Action $\tilde{A}_k$ is strictly dominated by $\hat{A}_k$ if for all actions available to the other player, k's payoff from playing $\tilde{A}_k$ is strictly less than k's payoff from playing $\hat{A}_k$, such that:

$$P_k(\tilde{A}_k,A_{-k}) < P_k(\hat{A}_k,A_{-k}) \quad \text{for all } A_{-k} \in \mathbf{A}_{-k}.$$

situation such as this arises the problem as to which equilibrium solves the game must be addressed. It then becomes necessary to refine the concept of Nash equilibrium for normal form games due to the fact that an equilibrium of such a game is not necessarily robust. Different methods for the refinement of the Nash equilibrium concept are discussed in van Damme (1987).

4.2 Game One

Game One approximates the outcome of trade liberalization, similar to proposals made in the Uruguay round by the United States, through the use of the MISS model. In order to examine how action choices differ due to changes in political payoff function weights over time, four variations of the game are simulated: 1986 data using 1986 weights, 1986 data using 1990 weights, 1990 data using 1986 weights, and 1990 data using 1990 weights.

In this two-player, normal-form, noncooperative game, defined by $G = \{ \mathbf{A}_{US}, \mathbf{A}_{EC}; P_{US}, P_{EC} \}$, each country k chooses some action $A_k \in \mathbf{A}_k$ in order to maximize its political payoff function given the action choices of the other country. The action space $A_k = \{ SQ_k, EX_k, PF_k, FT_k \}$ for $k = US, EC$.

The actions of the US and EC in Game One are status quo (SQ), no export related subsidies (EX), partial free trade (PF), and free trade (FT). For the U.S. the action definitions are as follows;

SQ_{US}: Status Quo.

EX_{US}: Free trade in grains, oilmeals, cereal substitutes, and pork and poultry, status quo in beef and sugar, and uniform

Rational players will not play strictly dominated strategies, a concept which is useful in finding solutions to bimatrix games.

If a unique solution to a two-player normal-form noncooperative game is to be found, it must be self-enforcing. Each player's predicted action must be that player's best response to the predicted action of the other player. This is the concept of Nash equilibrium.

Definition: In the two-player normal-form game $G = \{A_1, A_2; P_1, P_2\}$, the actions (A_1^*, A_2^*) are a Nash equilibrium if, for each player $k = 1,2$, A_k^* is player k's best response to the actions specified for the other player, -k, such that:

$$P_k(A_k^*, A_{-k}^*) \geq P_k(A_k, A_{-k}^*) \quad \text{for all } A_k \in A_k.$$

In a two-player, normal-form, noncooperative game a unique Nash equilibrium is the game solution. The majority of solutions in this analysis result from strictly dominant actions on the part of both players. However, in a few cases only one player has a strictly dominant strategy. Gibbons (1992) states that if iterated elimination of strictly dominated strategies eliminates all but the strategies (A_1^*, A_2^*), then these actions are the unique Nash equilibrium of the game. Thus in these situations a unique Nash equilibrium solution is still present. A more detailed discussion of game theory can be found in Kreps (1990) and Gibbons (1992).

Because of the fact that binding agreements are not possible in noncooperative games, the game solution must be a Nash equilibrium. However, in certain situations multiple Nash equilibria exist. When a

reductions of dairy prices to autarky.

PF_{US}: Free trade in grains, oilmeal, cereal substitutes, beef, and pork and poultry, and status quo dairy and sugar policies.

FT_{US}: Free Trade.

For the EC the action definitions are as follows;

SQ_{EC}: Status Quo.

EX_{EC}: Uniform reduction of grain, beef, pork and poultry, dairy, and sugar prices to autarky, and status quo oilmeal producer policies.

PF_{EC}: Twenty percent ad valorem tariffs on grain and beef, twenty percent oilseed cake producer subsidy above world price, free trade in pork, and status quo dairy and sugar policies.

FT_{EC}: Free Trade.

The bimatrices containing the political payoff functions from these four simulations are presented in tables 4.2.1 - 4.2.4. Percentage changes in world prices and changes in producer quasi-rents, consumer utility and budget savings for these simulations are listed in the appendix to this chapter, Appendix 4.1.1 and 4.2.1. In all four scenarios it is found that the strictly dominant strategy for both the United States and the European Community is to retain the status quo.

This can be shown using table 4.2.1 as an example. The United States action choice determines the matrix row while the European Community action choice determines the matrix column. The payoff (P_{US}, P_{EC}) resulting from this row-column intersection shows the US political payoff function value P_{US} and the EC political payoff function value P_{EC}. In the SQ_{US} row all US payoffs are non-negative, while each

Table 4.2.1 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1986 weights.

US Actions	GAME ONE EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	0,0*	96,-1891	285,-1281	237,-5989
EX_{US}	-503,276	-428,-1883	-185,-1020	-322,-5676
PF_{US}	-684,240	-429,-1915	-239,-1113	-113,-5733
FT_{US}	-2077,749	-1943,-1833	-1652,-565	-1653,-5348

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US}, SQ_{EC}).

Table 4.2.2 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1990 weights.

US Actions	GAME ONE EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	0,0*	100,-680	291,-560	237,-3626
EX_{US}	-398,276	-256,-666	-52,-291	-148,-3332
PF_{US}	-520,240	-205,-700	-68,-383	94,-3336
FT_{US}	-1908,748	-1694,-605	-1470,192	-1424,-3060

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US}, SQ_{EC}).

Table 4.2.3 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1986 weights.

US Actions	GAME ONE EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	0,0*	119,-1588	505,-1515	457,-6693
EX_{US}	-355,369	-319,-1482	108,-1130	-30,-6247
PF_{US}	-545,325	-455,-1481	6,-1204	81,-6292
FT_{US}	-1827,850	-1813,-1389	-1337,-623	-1407,-5911

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

Table 4.2.4 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1990 weights.

US Actions	GAME ONE EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	0,0*	122,-578	514,-773	461,-4174
EX_{US}	-345,365	-246,-465	134,-384	38,-3743
PF_{US}	-486,321	-340,-464	67,-458	174,-3748
FT_{US}	-1675,844	-1603,-364	-1186,138	-1216,-3479

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

US payoff value in the other three rows is strictly negative. Thus, action SQ_{US} strictly dominates all other US action choices. Likewise, column SQ_{EC} contains only non-negative payoff values for the European Community, while EC payoff values in each of the other three columns are strictly negative, resulting in a strictly dominant action choice of SQ_{EC}. Therefore, a strictly dominant action choice of SQ by both countries results in a unique Nash equilibrium solution to the game.

4.3 Game Two

Game Two is identical to Game One with respect to players, actions, and the four variations which are simulated. However, the political payoff function is modified, allowing each government to provide compensation from budget savings to those sectors of the economy made worse off by the policy liberalization.

The rules for budget compensation are as follows;

(1) Only those sectors of the economy suffering a decrease in welfare as a result of the action will be compensated.

(2) Budget compensation given to a sector will not exceed the amount of that sector's welfare loss.

(3) Because the weight of budget savings in the political payoff function is one, a sector must have a PPF weight greater than one in order to receive compensation.

(4) Budget compensation will be given in the order of welfare weights, from highest to lowest.

(5) Total budget compensation will not exceed total budget savings.

The following is an example of the budget compensation principle for a country with a single production sector. The political payoff function for country k is shown as $PPF_k = \lambda_P QR + \lambda_C CU + BS$, where QR represents change in quasi-rents, CU represents change in consumer utility, BS represents budget savings, with λ_P and λ_C representing the PPF weights for the producer and consumer groups respectively.

Originally country k supports the producer and consumer prices at an artificially high level of P° through some sort of price guarantee. As shown in Figure 4.3.1, at this price level domestic consumption is D° while domestic production is S°. The government of country k exports quantity $S^\circ - D^\circ = ES^\circ$ at price P_W° which is lower than domestic support price P°.

Suppose country k liberalizes its trade policy, removing all price support from this product. As a result, domestic production decreases to quantity S^*, domestic consumption increases to quantity D^*, and exports decrease to $S^* - D^* = ES^*$ at a higher world price P_W. The increased consumption at a lower domestic price causes consumer utility to increase by an amount represented by the area A+B. The decreased production at a lower domestic price results in a producer quasi-rents loss of an amount represented by the area A+B+C. Since the government no longer buys the product at the support price in order to dump it on the world market, budget savings are represented by the area B+C+D+E+F+G+H+I.

Without budget compensation the new political payoff function is shown as

(1) $PPF_k = -\lambda_P \cdot (A+B+C) + \lambda_C \cdot (A+B) + (B+C+D+E+F+G+H+I)$.

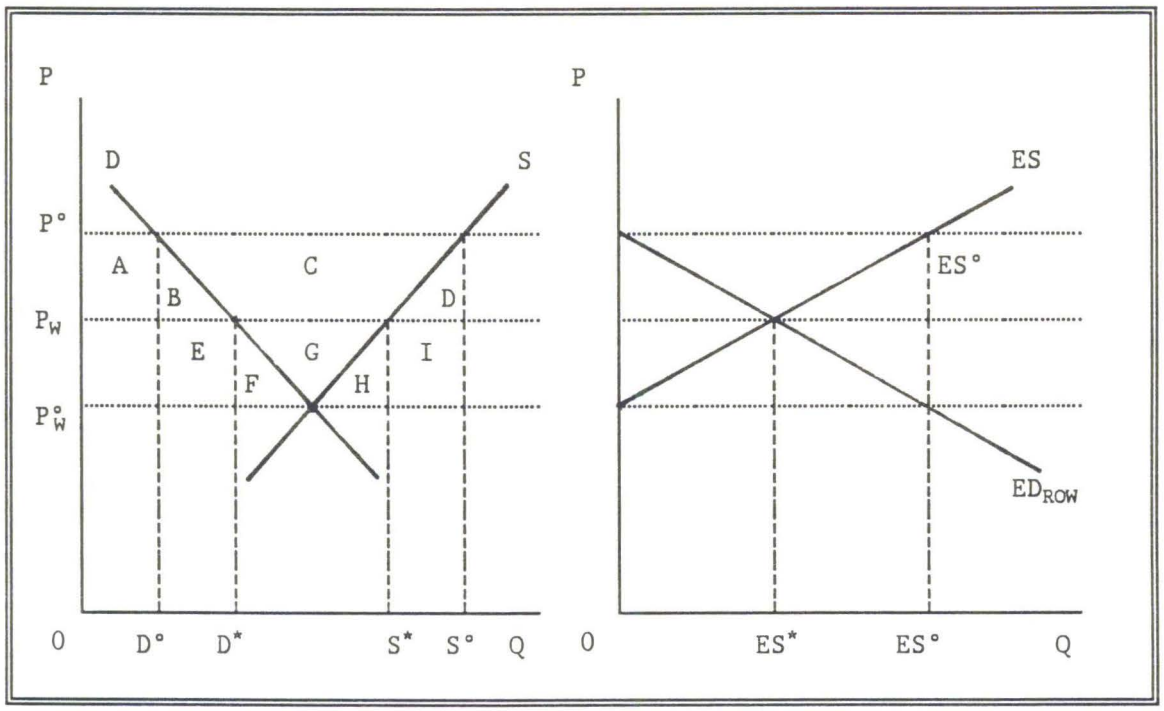


Figure 4.3.1 Budget Compensation, An Example

If $\lambda_P < 1$ there is no change in the PPF through the use of budget compensation. If $\lambda_P \geq 1$ budget compensation could occur in two possible scenarios;

(2.1) If $A \geq D+E+F+G+H+I$, then

$$PPF_k = \lambda_P \cdot (D+E+F+G+H+I-A) + \lambda_C \cdot (A+B),$$

i.e., if the budget savings are less than the decrease in producer quasi-rents then all budget savings are transferred to the production sector.

(2.2) If $A < D+E+F+G+H+I$, then

$$PPF_k = \lambda_C \cdot (A+B) + (D+E+F+G+H+I-A),$$

i.e., if the budget savings are more than the decrease in producer quasi-rents then budget savings are transferred to the production

sector up to the amount of quasi-rents lost as a result of the policy liberalization. The remaining budget savings are retained by the government.

The bimatrices containing the budget compensated political payoff functions from the four simulations are presented in tables 4.3.1 - 4.3.4. Percentage changes in world prices and changes in producer quasi-rents, consumer utility and budget savings for these simulations are listed in the appendix to this chapter, Appendix 4.1.2 and 4.2.2. In all four scenarios a unique Nash equilibrium solution occurs where both countries adopt the actions of export subsidy elimination (EX_{US}, EX_{EC}).

In this case not all simulations produced an outcome where EX was a strictly dominant strategy for both countries. However, in all four cases it was a strictly dominant strategy for at least one country. Thus, through the iterative elimination of strictly dominated strategies a unique Nash equilibria is found in all four cases at (EX_{US}, EX_{EC}).

4.4 Game Three

Game Three approximates the outcome of across-the-board trade liberalization of various percentages through the use of the MISS model. Once again, in order to examine how action choices differ due to changes in political payoff function weights over time, four variations of the game are simulated.

This two-player, normal-form, noncooperative game is defined by $G = \{ \mathbf{A}_{US}, \mathbf{A}_{EC}; P_{US}, P_{EC} \}$. Each country k chooses some action $A_k \in \mathbf{A}_k$ in

Table 4.3.1 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1986 data and 1986 weights.

US Actions	GAME TWO EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	0,0	97,1755	320,653	251,-456
EX_{US}	2059,295	2124,1765*	2290,901	2190,1222
PF_{US}	1582,258	1796,1720	1916,820	2076,-233
FT_{US}	1631,788	1688,1833	2045,1543	1893,38

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (EX_{US}, EX_{EC}).

Table 4.3.2 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1986 data and 1990 weights.

US Actions	GAME TWO EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	0,0	102,2719	328,1545	253,1348
EX_{US}	2018,297	2089,2734*	2258,1799	2151,1618
PF_{US}	1580,260	1794,2687	1912,1720	2056,1596
FT_{US}	1589,793	1699,2814	2010,2485	1899,1837

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (EX_{US}, EX_{EC}).

Table 4.3.3 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1990 data and 1986 weights.

US Actions	GAME TWO EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	0,0	119,1496	550,400	484,-1405
EX_{US}	1893,441	1955,1643*	2265,761	2163,-987
PF_{US}	1476,396	1579,1645	1922,671	2000,-1072
FT_{US}	1845,956	1815,1766	2363,1444	2145,-774

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (EX_{US},EX_{EC}).

Table 4.3.4 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1990 data and 1990 weights.

US Actions	GAME TWO EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	0,0	122,2202	563,1312	490,493
EX_{US}	1857,444	1923,2362*	2243,1674	2134,907
PF_{US}	1474,399	1580,2366	1922,1582	1987,847
FT_{US}	1745,961	1758,2497	2265,2387	2087,1112

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (EX_{US},EX_{EC}).

order to maximize its payoff function given the action of the other country. The action space $A_k = \{ SQ_k, 75_k, 50_k, 25_k, FT_k \}$ for k = US, EC.

The actions of the US and EC in Game One are status quo (SQ), protection at seventy-five percent of the status quo (75), protection at fifty percent of the status quo (50), protection at twenty-five percent of the status quo (25), and free trade (FT). In the case of both countries the actions are defined as follows;

SQ_k: Status Quo.

75_k: Twenty-five percent reduction in protection levels.

50_k: Fifty percent reduction in protection levels.

25_k: Seventy-five percent reduction in protection levels.

FT_k: Free Trade.

The bimatrices containing the political payoff functions from these simulations are presented in tables 4.4.1 - 4.4.4. Percentage changes in world prices and changes in producer quasi-rents, consumer utility and budget savings for these simulations are listed in Appendix 4.1.3 and 4.2.3. Unique Nash equilibrium solutions are found for all four simulations. However, there is a distinct shift in the strictly dominant strategy for the European Community between the simulations using 1986 weights and those using 1990 weights.

In all four simulations the dominant strategy of the United States is to choose action 75_{US}, with protection reduced by 25% for all commodities. The European Community, on the other hand, has a dominant strategy, SQ_{EC}, to retain its status quo protection in simulations using 1986 weights, but has a dominant strategy of 75_{EC} in simulations using 1990 weights. Thus, according to this simulation, the European

Table 4.4.1 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with 1986 data and 1986 weights.

US Actions	GAME THREE EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	0,0	51,-313	107,-1264	168,-3001	237,-5989
75_{US}	270,159*	356,-157	487,-1177	664,-3004	911,-6052
50_{US}	-135,323	-44,44	64,-958	244,-2801	507,-5856
25_{US}	-902,525	-835,339	-703,-699	-551,-2512	-311,-5682
FT_{US}	-2077,749	-1991,652	-1943,-355	-1819,-2208	-1653,-5348

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(75_{US},SQ_{EC})$.

Table 4.4.2 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with 1986 data and 1990 weights.

US Actions	GAME THREE EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	0,0	51,245	107,-150	169,-1282	237,-3626
75_{US}	311,158	416,366*	561,-50	758,-1252	1022,-3638
50_{US}	-46,322	59,508	186,111	388,-1096	662,-3469
25_{US}	-768,524	-705,729	-547,304	-376,-863	-119,-3345
FT_{US}	-1908,748	-1823,958	-1753,581	-1611,-620	-1424,-3060

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(75_{US},75_{EC})$.

Table 4.4.3 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with 1990 data and 1986 weights.

US Actions	GAME THREE EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	0,0	96,-468	208,-1637	320,-3558	457,-6693
75_{US}	388,169*	496,-307	628,-1516	792,-3527	1031,-6751
50_{US}	47,362	150,-38	283,-1277	442,-3293	678,-6534
25_{US}	-657,581	-557,261	-451,-952	-294,-3002	-96,-6254
FT_{US}	-1827,850	-1694,624	-1648,-603	-1561,-2616	-1407,-5911

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(75_{US},SQ_{EC})$.

Table 4.4.4 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with 1990 data and 1990 weights.

US Actions	GAME THREE EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	0,0	97,120	210,-441	323,-1716	461,-4174
75_{US}	434,168	545,242*	683,-335	854,-1662	1093,-4181
50_{US}	132,359	239,453	378,-150	548,-1469	791,-4004
25_{US}	-521,577	-442,680	-320,116	-151,-1238	56,-3772
FT_{US}	-1675,844	-1552,957	-1486,392	-1384,-915	-1216,-3479

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(75_{US},75_{EC})$.

Community appears to have adopted policy weights for 1990 which are more favorable towards trade liberalization than those weights used in 1986.

4.5 Game Four

Game Four is identical to Game Three with respect to players, actions, and the four variations which are simulated. Just as in Game Two, the political payoff function is modified, allowing each government to provide compensation from budget savings to those sectors made worse off due to the new policy. The rules for the budget compensation are given in section 4.3.

Simulation results for game four are presented in bimatrix form in tables 4.5.1 - 4.5.4. Percentage changes in world prices and changes in producer quasi-rents, consumer utility and budget savings for these simulations are listed in Appendix 4.1.4 and 4.2.4. The solution for all four scenarios is achieved with a unique Nash Equilibrium at action $(25_{US}, 50_{EC})$. In other words, the US and EC would reduce their levels of protection to 25% and 50% of their original levels respectively. These actions are self-enforcing since neither country has any incentive to change its strategy given the action choice of the other.

Table 4.5.1 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1986 data and 1986 weights.

US Actions	GAME FOUR EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	0,0	53,1916	112,2823	177,2151	251,-456
75_{US}	1410,168	1365,1954	1269,2868	1182,2207	1335,-513
50_{US}	1995,339	2045,1936	2032,2950	2052,2316	1991,-401
25_{US}	2107,551	2135,1908	2204,3779*	2245,2492	2385,-216
FT_{US}	1631,788	1718,1979	1754,3110	1811,2651	1893,38

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(25_{US},50_{EC})$.

Table 4.5.2 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1986 data and 1990 weights.

US Actions	GAME FOUR EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	0,0	54,2392	113,3739	179,3516	253,1348
75_{US}	1392,169	1338,2403	1248,3803	1172,3607	1338,1332
50_{US}	1975,340	2038,2346	2010,3862	2000,3697	1949,1436
25_{US}	2078,553	2106,2269	2196,4683*	2252,3849	2361,1601
FT_{US}	1589,793	1677,2270	1729,3966	1801,3986	1899,1837

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(25_{US},50_{EC})$.

Table 4.5.3 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1990 data and 1986 weights.

US Actions	GAME FOUR EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	0,0	100,1746	219,2365	337,1468	484,-1405
75_{US}	1555,191	1489,1815	1402,2487	1328,1503	1349,-1460
50_{US}	2162,407	2224,1851	2239,2610	2230,1711	2170,-288
25_{US}	2351,654	2421,1939	2456,2758*	2536,1908	2652,-1053
FT_{US}	1845,956	1956,2064	2003,2954	2060,2124	2145,-774

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(25_{US},50_{EC})$.

Table 4.5.4 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1990 data and 1990 weights.

US Actions	GAME FOUR EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	0,0	101,2235	221,3331	341,2911	490,493
75_{US}	1522,191	1463,2287	1383,3455	1320,2969	1354,479
50_{US}	2112,409	2182,2306	2203,3557	2178,3169	2129,1636
25_{US}	2280,657	2348,2343	2399,3681*	2495,3339	2610,853
FT_{US}	1745,961	1852,2399	1915,3856	1989,3532	2087,1112

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(25_{US},50_{EC})$.

CHAPTER FIVE: GAME SIMULATIONS USING EXCHANGE RATE VARIATIONS

5.1 Trade Negotiations and the Exchange Rate

In the previous chapter a Political Payoff Function is utilized within a game-theoretic framework in order to identify Nash equilibrium solutions to trade negotiations between the U.S. and EC in the Uruguay Round of the GATT. The existence of these Nash equilibria is of value in showing that there exist bilateral treaty action spaces, making possible a compromise which is beneficial to both countries. If these results are to be of use to policy-makers it is important not only that the solutions exist but that they possess some degree of stability.

Through the MISS model, policy alternatives are examined by utilizing the concept that any policy change will cause an adjustment of world prices, resulting in the rebalancing of world markets. Thus, the world price as a function of domestic policies and the exchange rate is at the heart of the analysis. The domestic-world price linkage is shown by the following equation,

$$(5.1) \qquad P_A = P_W \times C_A \times T_A \times W_A$$

where P_A represents domestic commodity price in domestic currency, P_W represents world price in European Currency Units (ECU), C_A is the exchange rate expressed in domestic currency per ECU, T_A signifies a protection coefficient, and W_A represents a margin coefficient such as transportation costs. In order to provide a shock to domestic prices by some means other than policy action choices the exchange rate is adjusted. The resulting game solutions are then examined and compared

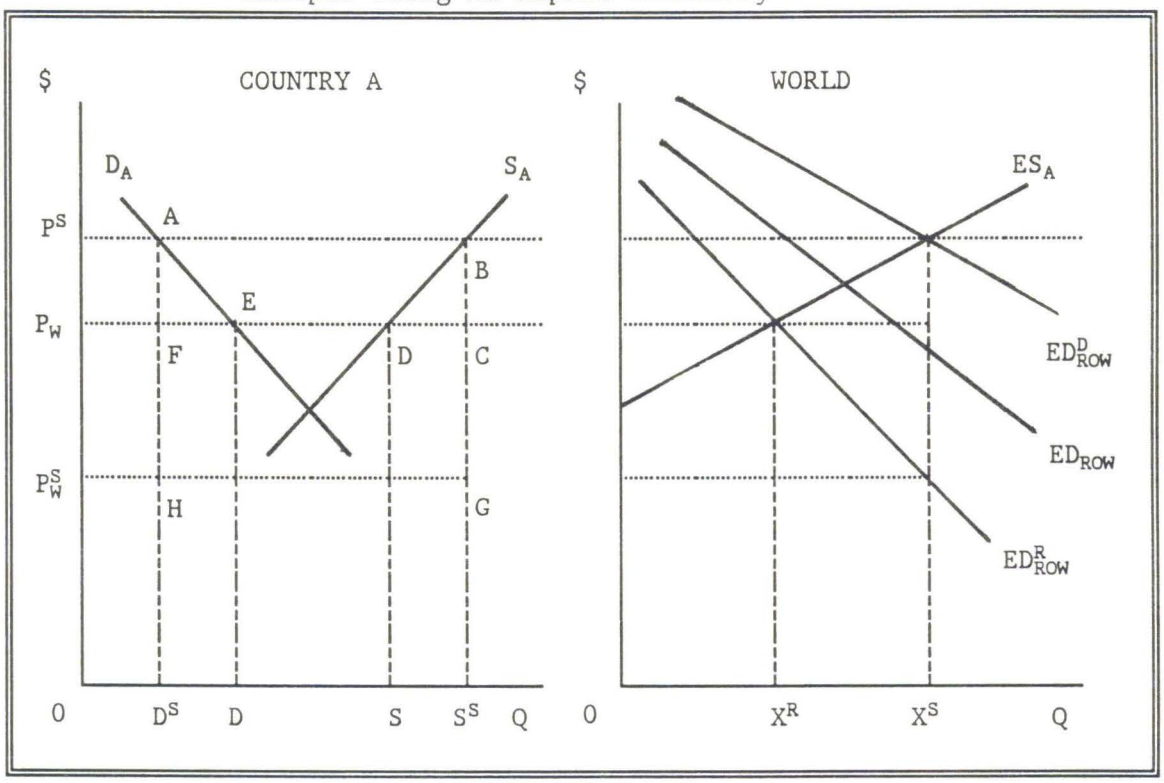
to the scenarios which use the base period exchange rates.

Exchange rate data in U.S. Dollar (US$) per ECU was obtained for the years 1978 through 1992 from the International Monetary Fund. During this period the US$ achieved its highest value in 1985 when 1.00 ECU was worth 0.76 US$. The lowest yearly average for the dollar occurred in 1980 when 1.00 ECU was equal to 1.39 US$. The actual commodity data for base years 1986 and 1990 included exchange rates of 1.00 ECU = 0.90 US$ and 1.00 ECU = 1.27 US$ respectively. Thus, in order to simulate the extreme exchange rate values, the 1986 dollar is devalued by 54.4% and revalued by 15.6% while the 1990 dollar is devalued by 9.4% and revalued by 40.2%.

The effects of trade liberalization in an exporting country given various currency exchange rates is illustrated in graph 5.1.1. Demand in Country A for an export commodity is represented by the line D_A while supply is represented by the line S_A. Country A maintains a domestic support price of P^S, resulting in quantity S^S of the commodity being supplied and quantity D^S being demanded in country A. The domestic surplus production, $S^S - D^S$, is exported with the aid of an export subsidy. The original rest-of-world (ROW) excess demand, ED_{ROW}, indicates that in order for country A to export its surplus production, $S^S - D^S$ or X^S, it must do so at some price lower than the support price p^S.

Country A now experiences a revaluation of the dollar, its domestic currency. Although the underlying ROW excess demand does not change, the decreased dollar value of other currencies results in a

Figure 5.1.1 Trade Liberalization Given Exchange Rate Fluctuations, An Example Using An Export Commodity



shift in ED_{ROW} as measured in dollars. Thus, ROW excess demand rotates clockwise from ED_{ROW} to ED^R_{ROW}. Similarly a devaluation of the dollar will result in a counter-clockwise rotation of ROW excess demand from ED_{ROW} to ED^D_{ROW}.

Suppose Country A chooses to eliminate all price support policies following a revaluation of the dollar. The domestic price, which had been supported at P^S, goes to P_W. Decreased domestic production S minus increased domestic consumption D results in a decreased exportable surplus X^R which is demanded by the rest of the world at price P_W. This move to free trade following a revaluation causes the quasi-rents received by producers in country A to decrease by the area P^SBDP_W in graph 5.1.1. Consumer utility increases by P^SAEP_W while budget savings

are represented by the area ABGH.

The effect of these changes on Country A is illustrated by recalling the Political Payoff Function from Chapter Two,

$$(2.15) \qquad PPF_k(A_k,A_{-k}) = \tilde{\Pi}_k(A_k,A_{-k})\cdot\lambda_{Sk} + \tilde{U}_k(A_k,A_{-k})\cdot\lambda_{Qk} + \tilde{B}_k(A_k,A_{-k}),$$

where $\tilde{\Pi}_k(A_k,A_{-k})$ represents producer quasi-rents, $\tilde{U}_k(A_k,A_{-k})$ represents consumer utility, and $\tilde{B}_k(A_k,A_{-k})$ budget savings. The decrease in producer quasi-rents of P^SBDP_W, increased consumer utility of P^SAEP_W, and budget savings of ABGH are substituted into equation (2.15) to obtain the change in the PPF of Country A,

$$(5.2) \qquad \Delta PPF_A = -(P^SBDP_W)\cdot\lambda_{Sk} + (P^SAEP_W)\cdot\lambda_{Qk} + ABGH$$

If the producer weight λ_{Sk} is less than the consumer weight λ_{Qk} the PPF will increase due to this switch from protection to free trade. However, if λ_{Sk} is sufficiently large in relation to λ_{Qk}, such as the weights derived in Chapter Three, then it is likely that the weighted loss to producers will overshadow the gains to consumers and the budget sector. This would result in a net decrease in the PPF without budget compensation and possibly even in the case where budget compensation is allowed when full compensation is not possible.

Suppose Country A now experiences a devaluation of its dollar, resulting in a shift in the excess demand of the rest of the world from ED_{ROW} to ED^D_{ROW}. In this case the equilibrium world market price of P^S is identical to the support price of Country A. This devaluation of the

dollar causes Country A to adopt a free trade policy. Because the levels of protection have been eliminated due to the devaluation, a formal shift to free trade will have no effect on producers, consumers, or the budget. If the policy maker compares the benefit to that received prior to the devaluation the resulting net budget savings combined with no change in producer quasi-rents or consumer surplus will result in an increased PPF due to the adoption of free trade under a devalued currency.

5.2 Game One

The outcome of trade liberalization based on proposals made by the United States is approximated using the MISS model in Game One. In order to examine how action choices differ due to changes in PPF weights over time, eight variations of the game are simulated: 1986 data using 1986 weights with a devaluation of the dollar, 1986 data using 1986 weights with a revaluation of the dollar, 1986 data using 1990 weights with a devaluation of the dollar, 1986 data using 1990 weights with a revaluation of the dollar, 1990 data using 1986 weights with a devaluation of the dollar, 1990 data using 1986 weights with a revaluation of the dollar, 1990 data using 1990 weights with a devaluation of the dollar, and 1990 data using 1990 weights with a revaluation of the dollar.

In this two-player, normal-form, noncooperative game, defined by $G = \{ ER_C, A_{US}, A_{EC}; P_{US}, P_{EC} \}$, each country k chooses some action $A_k \in \mathbf{A}_k$ in order to maximize its political payoff function given the action choices of the other country and the exchange rate ER_C for C = R,D where ER_D

represents a devalued dollar and ER_R represents a revalued dollar. The action space $A_k = \{ SQ_k, EX_k, PF_k, FT_k \}$ for k = US, EC.

The actions of the US and EC in Game One are status quo (SQ), no export related subsidies (EX), partial free trade (PF), and free trade (FT). For the U.S. the action definitions are as follows;

SQ_{US}: Status Quo.

EX_{US}: Free trade in grains, oilmeals, cereal substitutes, and pork and poultry, status quo in beef and sugar, and uniform reductions of dairy prices to autarky.

PF_{US}: Free trade in grains, oilmeal, cereal substitutes, beef, and pork and poultry, and status quo dairy and sugar policies.

FT_{US}: Free Trade.

For the EC the action definitions are as follows;

SQ_{EC}: Status Quo.

EX_{EC}: Uniform reduction of grain, beef, pork and poultry, dairy, and sugar prices to autarky, and status quo oilmeal producer policies.

PF_{EC}: Twenty percent ad valorem tariffs on grain and beef, twenty percent oilseed cake producer subsidy above world price, free trade in pork, and status quo dairy and sugar policies.

FT_{EC}: Free Trade.

The bimatrices containing the political payoff functions from these eight simulations are presented in tables 5.2.1 - 5.2.8. Percentage changes in world prices and changes in producer quasi-rents, consumer utility and budget savings for these simulations are listed in Appendix 5.1.1 - 5.1.4 and Appendix 5.2.1 - 5.2.4. Additionally, the

Table 5.2.1 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1986 weights.

US Actions	GAME ONE: 1.00 ECU = 1.39 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	14551,-218*	15408,-1634	16633,-833	17641,-5219
EX_{US}	14524,-36	15714,-1676	16719,-607	17805,-5199
PF_{US}	14422,-182	15392,-1682	16642,-827	17571,-5139
FT_{US}	14267,-12	15459,-1653	16489,-582	17693,-5167

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US}, SQ_{EC}).

Table 5.2.2 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1990 weights.

US Actions	GAME ONE: 1.00 ECU = 1.39 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	14234,-190	15166,-390	16329,235	17394,-2450
EX_{US}	14141,-7	15428,-406	16333,461	17544,-2436
PF_{US}	14111,-154	15147,-419	16345,241*	17324,-2381
FT_{US}	14005,16	15275,-385	16230,484	17506,-2410

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (PF_{US}, PF_{EC}).

Table 5.2.3 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1986 weights.

US Actions	GAME ONE: 1.00 ECU = 1.39 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	-3821,152*	-3388,-1499	-2728,-1519	-2058,-6508
EX_{US}	-4559,493	-4178,-1406	-3210,-1005	-3191,-6163
PF_{US}	-4507,395	-4045,-1429	-3012,-1120	-2857,-6187
FT_{US}	-4597,852	-4208,-1305	-3083,-591	-3014,-5849

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

Table 5.2.4 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1990 weights.

US Actions	GAME ONE: 1.00 ECU = 1.39 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	-3832,156*	-3386,-498	-2652,-742	-2022,-3890
EX_{US}	-4603,492	-4118,-395	-3196,-231	-3148,-3564
PF_{US}	-4438,394	-3920,-418	-2960,-307	-2758,-3560
FT_{US}	-4454,851	-4002,-281	-2957,229	-2831,-3329

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

Table 5.2.5 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1986 weights.

US Actions	GAME ONE: 1.00 ECU = 0.76 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	1512,261*	1393,-1937	1921,-1125	1517,-5887
EX_{US}	-3458,361	-3403,-2000	-3073,-1059	-3270,-5684
PF_{US}	-3822,489	-3731,-2008	-3388,-1023	-3489,-5750
FT_{US}	-4053,1077	-4243,-1894	-3762,-312	-3945,-5118

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

Table 5.2.6 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1990 weights.

US Actions	GAME ONE: 1.00 ECU = 0.76 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	1462,260*	1347,-728	1875,-484	1465,-3631
EX_{US}	-3266,359	-3159,-797	-2871,-391	-3036,-3395
PF_{US}	-3599,487	-3455,-805	-3156,-410	-3233,-3486
FT_{US}	-3847,1074	-3969,-684	-3551,324	-3695,-3021

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

Table 5.2.7 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1986 weights.

US Actions	GAME ONE: 1.00 ECU = 0.76 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	8663,92*	8143,-1718	9280,-1248	8734,-6520
EX_{US}	-8569,-307	-9470,-1932	-8548,-1345	-8564,-6474
PF_{US}	-8305,-65	-9088,-1817	-8214,-935	-8496,-6243
FT_{US}	-7417,858	-8559,-1629	-7454,-38	-8040,-5308

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

Table 5.2.8 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1990 weights.

US Actions	GAME ONE: 1.00 ECU = 0.76 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	8412,93*	7900,-720	9041,-760	8484,-4330
EX_{US}	-8364,-289	-9197,-943	-8338,-787	-8337,-4145
PF_{US}	-8115,-55	-8843,-830	-8028,-618	-8293,-4146
FT_{US}	-7105,862	-8178,-633	-7139,307	-7700,-3452

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

percentage changes in domestic quantities and prices resulting from a change in the exchange rate at the status quo are shown for both the U.S. and the EC in Appendix 5.3.1 - 5.3.4.

In the four scenarios where the dollar is devalued to 1 ECU = 1.39 US$, three result in a unique Nash Equilibrium where both countries choose to retain their status quo policies. In the fourth case, 1986 data with 1990 weights, the solution occurs at the point where both countries choose the actions representing partial free trade. This result appears to occur because of the changes in policy weights from 1986 to 1990, in particular the increased weight placed on consumer interests in the EC.

The cases in which the dollar is revalued to 1 ECU = 0.76 US$ all result in unique Nash Equilibria where the action choice of both countries is the status quo. In addition, the status quo policy is the strictly dominant strategy for both the United States and the European Community.

5.3 Game Two

Game Two is identical to Game One with respect to players, actions, and the eight variations which are simulated. The difference between the two games lies in the political payoff function. In Game Two the PPF is modified, allowing each government to provide compensation from budget savings to those sectors of the economy made worse off by the policy liberalization. The rules for budget compensation and an example are provided in section 4.3.

The bimatrices containing the budget compensated political payoff

functions from the eight simulations are presented in tables 5.3.1 - 5.3.8. The percentage changes in world prices, changes in producer quasi-rents, consumer utility and budget savings prior to compensation, and changes in domestic prices and quantities for these scenarios are identical to those for Game One.

In the four scenarios where the dollar is devalued to 1 ECU = 1.39 US$ the EC always chooses the strictly dominant strategy of eliminating export subsidies. The U.S. will also choose to liberalize its policies, but to different levels for the 1986 and 1990 years. The choice made by the U.S. in 1986 is the strategy EX, the elimination of export subsidies, while in 1990 the U.S. chooses free trade. This could be due to the fact that the devaluation in 1986 was of a much greater magnitude than that simulated in 1990. Thus, increased losses to the consumer in 1986 overshadow gains to producers and taxpayers resulting in less incentive to liberalize in 1986 than in 1990.

The simulations of Game Two in which the dollar is revalued to 1 ECU = 0.76 US$ all result in unique Nash Equilibria where the EC chooses to eliminate export subsidies while the U.S. retains the status quo. These situations all result in strictly dominant strategies for the U.S.

All eight game variations show the EC choosing the elimination of export subsidies as its strategy. Thus, the European Community will choose freer trade, but not free trade, when it is allowed to provide losers with budget compensation. The actions of the United States suggest that when budget compensation is allowed, a devaluation of the dollar gives the U.S. incentive to choose free trade while a revaluation of the dollar will reinforce the practice of protectionist policies.

Table 5.3.1 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1986 data and 1986 weights.

US Actions	GAME ONE: 1.00 ECU = 1.39 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	14551,-218	15408,2090	16633,1089	17641,331
EX_{US}	15493,-36	16241,2080*	17462,1386	17917,352
PF_{US}	14686,-182	15458,2057	16675,1094	17571,429
FT_{US}	15539,-12	16239,2096	17581,1438	18014,353

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (EX_{US}, EX_{EC}).

Table 5.3.2 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1986 data and 1990 weights.

US Actions	GAME ONE: 1.00 ECU = 1.39 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	14234,-190	15166,3097	16329,2327	17394,2520
EX_{US}	15158,-7	15983,3103*	17125,2630	17664,2539
PF_{US}	14375,-154	15214,3076	16379,2331	17324,2613
FT_{US}	15190,16	15962,3120	17235,2682	17750,2536

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (EX_{US}, EX_{EC}).

Table 5.3.3 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1990 data and 1986 weights.

US Actions	GAME ONE: 1.00 ECU = 1.39 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	-2986,190	-2329,1607	-1507,394	-800,-1225
EX_{US}	-876,600	-398,1761	537,924	562,-886
PF_{US}	-1124,493	-610,1738	387,802	614,-930
FT_{US}	476,983	777,1893*	1956,1469	1903,-629

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (FT_{US}, EX_{EC}).

Table 5.3.4 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1990 data and 1990 weights.

US Actions	GAME ONE: 1.00 ECU = 1.39 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	-2968,197	-2323,2314	-1487,1341	-813,769
EX_{US}	-895,610	-381,2482	534,1869	559,1105
PF_{US}	-1105,501	-559,2458	392,1785	638,1073
FT_{US}	374,997	724,2634*	1842,2470	1844,1334

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (FT_{US}, EX_{EC}).

Table 5.3.5 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1986 data and 1986 weights.

US Actions	GAME ONE: 1.00 ECU = 0.76 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	1512,294	1393,1692*	1921,815	1517,-369
EX_{US}	-1187,414	-1080,1600	-800,898	-966,-138
PF_{US}	-1649,528	-1515,1589	-1173,856	-1273,-232
FT_{US}	-469,1079	-716,1726	-208,1780	-475,187

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},EX_{EC}).

Table 5.3.6 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1986 data and 1990 weights.

US Actions	GAME ONE: 1.00 ECU = 0.76 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	1462,290	1347,2652*	1875,1344	1465,1344
EX_{US}	-1104,406	-965,2551	-710,1595	-860,1595
PF_{US}	-1540,522	-1374,2541	-1060,1634	-1150,1466
FT_{US}	-504,1075	-705,2686	-239,2601	-471,1834

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},EX_{EC}).

Table 5.3.7 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1990 data and 1986 weights.

US Actions	GAME ONE: 1.00 ECU = 0.76 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	10232,92	9711,1277*	10847,701	10302,-1319
EX_{US}	-5328,-307	-6220,997	-5310,551	-5351,-1196
PF_{US}	-4682,-65	-5460,1129	-4585,842	-4894,-958
FT_{US}	-2142,949	-3286,1371	-2185,2044	-2835,-264

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},EX_{EC}).

Table 5.3.8 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with Budget Compensation using 1990 data and 1990 weights.

US Actions	GAME ONE: 1.00 ECU = 0.76 US$ EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	9791,93	9279,1960*	10418,1360	9863,296
EX_{US}	-5430,-289	-6272,1665	-5403,1277	-5440,498
PF_{US}	-4758,-55	-5496,1800	-4659,1315	-4963,518
FT_{US}	-2324,944	-3411,2056	-2359,2574	-2982,1145

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},EX_{EC}).

5.4 Game Three

The simulations performed in Game Three approximate the outcome of across-the-board trade liberalization of various percentages through the use of the MISS model. Just as in Game One, eight variations are simulated in order to examine how action choices differ due to changes in political payoff function weights over time, given changes in the exchange rate.

In this two-player, normal-form, noncooperative game, defined by $G = \{ ER_C, A_{US}, A_{EC}; P_{US}, P_{EC} \}$, each country k chooses some action $A_k \in \mathbf{A}_k$ in order to maximize its political payoff function given the action choices of the other country and the exchange rate ER_C for C = R,D where ER_D represents a devalued dollar and ER_R represents a revalued dollar. The action space $\mathbf{A}_k = \{ SQ_k, 75_k, 50_k, 25_k, FT_k \}$ for k = US,EC.

The actions of the US and EC in Game One are status quo (SQ), protection at seventy-five percent of the status quo (75), protection at fifty percent of the status quo (50), protection at twenty-five percent of the status quo (25), and free trade (FT). In the case of both countries the actions are defined as follows;

SQ_k: Status Quo.

75_k: Twenty-five percent reduction in protection levels.

50_k: Fifty percent reduction in protection levels.

25_k: Seventy-five percent reduction in protection levels.

FT_k: Free Trade.

The bimatrices containing the political payoff functions from these eight simulations are presented in tables 5.4.1 - 5.4.8. Percentage changes in world prices and changes in producer quasi-rents,

Table 5.4.1 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1986 weights.

US Actions	GAME THREE: 1.00 ECU = 1.39 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	14551,-218*	15059,-394	15638,-875	16329,-2297	17641,-5219
75_{US}	14513,-168	15018,-356	15568,-833	16347,-2265	17582,-5184
50_{US}	14508,-117	15023,-314	15700,-795	16496,-2252	17609,-5190
25_{US}	14447,-69	15051,-262	15678,-756	16536,-2220	17620,-5184
FT_{US}	14267,-12	15036,-208	15720,-716	16536,-2207	17693,-5167

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US}, SQ_{EC}).

Table 5.4.2 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1990 weights.

US Actions	GAME THREE: 1.00 ECU = 1.39 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	14234,-190	14757,280	15357,453	16065,-282	17394,-2450
75_{US}	14209,-140	14728,297	15301,480	16099,-262	17351,-2424
50_{US}	14214,-89	14749,324	15447,502	16164,-254	17393,-2429
25_{US}	14170,-41	14787,348	15440,524	16277,-231	17417,-2426
FT_{US}	14005,16	14785,385	15490,550*	16332,-220	17506,-2410

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(FT_{US}, 50_{EC})$.

Table 5.4.3 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1986 weights.

US Actions	GAME THREE: 1.00 ECU = 1.39 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	-3821,152	-3474,-384	-3114,-1417	-2653,-3379	-2058,-6508
75_{US}	-3556,295*	-2771,-202	-2954,-1244	-2594,-3240	-2093,-6404
50_{US}	-3582,455	-3063,-12	-3057,-1059	-2606,-3088	-2230,-6231
25_{US}	-3792,644	-3405,244	-3294,-838	-2908,-2887	-2528,-6078
FT_{US}	-4597,852	-4034,522	-3784,-581	-3379,-2632	-3014,-5849

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(75_{US},SQ_{EC})$.

Table 5.4.4 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1990 weights.

US Actions	GAME THREE: 1.00 ECU = 1.39 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	-3832,156	-3474,231	-3109,-186	-2630,-1459	-2022,-3890
75_{US}	-3521,297	-2731,369*	-2901,-46	-2524,-1355	-2013,-3795
50_{US}	-3507,456	-2905,514	-2969,94	-2600,-1220	-2113,-3649
25_{US}	-3686,644	-3295,706	-3174,272	-2775,-1051	-2382,-3523
FT_{US}	-4454,851	-3900,910	-3638,479	-3208,-842	-2831,-3329

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(75_{US},75_{EC})$.

Table 5.4.5 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1986 weights.

US Actions	GAME THREE: 1.00 ECU = 0.76 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	1512,261*	1500,-172	1511,-1205	1516,-2995	1517,-5887
75_{US}	500,419	500,38	572,-990	392,-2810	560,-5744
50_{US}	-756,602	-851,315	-837,-755	-864,-2615	-713,-5613
25_{US}	-2241,813	-2258,653	-2260,-445	-2221,-2348	-2209,-5389
FT_{US}	-4053,1077	-3978,1073	-4070,-53	-4018,-2061	-3945,-5118

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

Table 5.4.6 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1986 data and 1990 weights.

US Actions	GAME THREE: 1.00 ECU = 0.76 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	1462,260	1451,351*	1460,-141	1466,-1352	1465,-3631
75_{US}	526,417	526,502	600,23	422,-1212	593,-3525
50_{US}	-665,600	-761,703	-736,197	-761,-1064	-607,-3428
25_{US}	-2090,811	-2101,948	-2096,430	-2049,-854	-2021,-3243
FT_{US}	-3847,1074	-3775,1261	-3850,736	-3780,-634	-3695,-3021

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(SQ_{US},75_{EC})$.

Table 5.4.7 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1986 weights.

US Actions	GAME THREE: 1.00 ECU = 0.76 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	8663,92*	8615,-474	8621,-1715	8666,-3635	8734,-6520
75_{US}	5323,300	5254,-216	5256,-1503	5216,-3456	5255,-6383
50_{US}	1618,441	1471,168	1498,-1141	1319,-3150	1260,-6145
25_{US}	-2552,648	-2605,677	-2713,-705	-2934,-2720	-3120,-5837
FT_{US}	-7417,858	-7278,1434	-7474,23	-7729,-2114	-8040,-5308

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

Table 5.4.8 Political Payoff Function Values for Alternative US and EC Trade Liberalizations with 1990 data and 1990 weights.

US Actions	GAME THREE: 1.00 ECU = 0.76 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	8412,93*	8365,33	8372,-671	8418,-2045	8484,-4330
75_{US}	5276,302	5208,201	5204,-536	5166,-1923	5214,-4247
50_{US}	1745,443	1591,468	1615,-273	1445,-1705	1393,-4081
25_{US}	-2301,651	-2363,837	-2458,46	-2673,-1376	-2854,-3856
FT_{US}	-7105,862	-6975,1407	-7159,604	-7401,-902	-7700,-3452

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at (SQ_{US},SQ_{EC}).

consumer utility and budget savings for these simulations are listed in Appendix 5.1.5 - 5.1.8 and Appendix 5.2.5 - 5.2.8. In addition, the percentage changes in domestic quantities and prices resulting from an exchange rate change evaluated at the status quo are shown in Appendix 5.3.1 - 5.3.4.

In examining the game solutions in the scenarios involving a devaluation of the dollar, tables 5.4.1 - 5.4.4, there appears to be more variation in the Nash Equilibria as compared to Game One. The Nash Equilibrium for 1986 data using 1986 weights is at the status quo action for both countries. The scenario for 1986 data using 1990 weights shows a solution where the U.S. chooses free trade while the EC reduces protection levels by 50%. In both game variations using 1990 data the United States chooses protection at 75% of the status quo level. However, using 1986 weights the EC retains its status quo protection level while it reduces protection by 25% when using 1990 weights.

Although the variability of the Nash Equilibrium seems to have increased in these four scenarios, there is some similarity when compared with the corresponding Game One variations. Three scenarios remain relatively close to the status quo. One scenario, 1986 data using 1990 weights, shows both countries reducing protection to relatively low levels.

Tables 5.4.5 - 5.4.8, which present the bimatrices for the scenarios where the dollar is revalued to 1 ECU = 0.76 US$, show relatively uniform Nash Equilibria as compared with those representing a devaluation. In all four cases the United States' status quo action is strictly dominant. Similarly, the European Community chooses the status

quo in all scenarios except the case of 1986 data using 1990 weights variation, in which it chooses to reduce protection levels by 25%.

5.5 Game Four

Game Four is the same as Game Three with respect to the players, actions, and eight variations which are simulated. The political payoff function in Game Four is modified, allowing each government to provide compensation from budget savings to those sectors made worse off as a result of the policy change. The rules for budget compensation and an example are given in section 4.3.

Simulation results for Game Four are presented in bimatrix form in tables 5.5.1 - 5.5.8. The percentage changes in world prices, changes in producer quasi-rents, consumer utility and budget savings prior to compensation, and changes in domestic prices and quantities for these scenarios are identical to those for Game Three.

The four simulations using a dollar devaluation show the United States with a strictly dominant action of Free Trade in each case. The European Community chooses to reduce its protection levels by 50% in each case except the scenario using 1986 data with 1990 weights, where it reduces protection levels by 75%. Thus when governments are allowed to compensate losers from budget savings the result is freer trade on the part of the EC and free trade on the part of the U.S.

In the case of the scenarios where the dollar is revalued to 1 ECU = 0.76 US$, the United States has strictly dominant strategies of reducing protection by 25% for the variations with 1986 data and choosing the status quo for the variations with 1990 data. All four

Table 5.5.1 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1986 data and 1986 weights.

US Actions	GAME FOUR: 1.00 ECU = 1.39 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	14551,-218	15059,1844	15638,3406	16329,3143	17641,331
75_{US}	14833,-168	15280,1788	15766,3408	16512,3178	17675,340
50_{US}	15151,-117	15576,1775	16161,3400	16701,3155	17773,331
25_{US}	15410,-69	15895,1715	16350,3392	16984,3170	17864,336
FT_{US}	15539,-12	16191,1708	16624,3412*	17178,3178	18014,353

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(FT_{US},50_{EC})$.

Table 5.5.2 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1986 data and 1990 weights.

US Actions	GAME FOUR: 1.00 ECU = 1.39 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	14234,-190	14757,2438	15357,4543	16065,4813	17394,2520
75_{US}	14505,-140	14965,2375	15476,4540	16241,4842	17424,2525
50_{US}	14813,-89	15254,2356	16866,4526	16430,4818	17518,2515
25_{US}	15065,-41	15566,2289	16044,4512	16704,4829	17606,2519
FT_{US}	15190,16	15854,2277	16308,4526	16890,4838*	17750,2536

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(FT_{US},25_{EC})$.

Table 5.5.3 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1990 data and 1986 weights.

US Actions	GAME FOUR: 1.00 ECU = 1.39 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	-2986,190	-2530,1941	-2082,2701	-1514,1736	-800,-1225
75_{US}	-1521,361	-590,1973	-765,2761	-387,1878	106,-1145
50_{US}	-418,540	166,2012	153,2859	621,1945	905,-1037
25_{US}	413,753	868,2076	882,2960	1254,2072	1551,-870
FT_{US}	476,983	1088,2162	1262,3059*	1628,2251	1903,-629

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(FT_{US},50_{EC})$.

Table 5.5.4 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1990 data and 1990 weights.

US Actions	GAME FOUR: 1.00 ECU = 1.39 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	-2986,197	-2538,2464	-2107,3712	-1531,3255	-813,769
75_{US}	-1528,370	-593,2479	-761,3764	-373,3386	125,852
50_{US}	-455,550	132,2506	124,3845	605,3456	896,950
25_{US}	341,764	798,2528	823,3934	1205,3571	1514,1107
FT_{US}	374,997	984,2556	1169,4020*	1556,3732	1844,1334

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(FT_{US},50_{EC})$.

Table 5.5.5 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1986 data and 1986 weights.

US Actions	GAME FOUR: 1.00 ECU = 0.76 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	1512,294	1500,2101	1511,2834	1516,2149	1517,-369
75_{US}	1661,445	1678,2147	1754,2901*	1527,2254	1673,-234
50_{US}	1378,619	1260,2146	1242,2992	1169,2360	1301,-165
25_{US}	677,819	704,2200	634,3046	667,2550	595,14
FT_{US}	-469,1079	-382,2304	-529,3207	-2628,2731	-475,187

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(75_{US}, 50_{EC})$.

Table 5.5.6 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1986 data and 1990 weights.

US Actions	GAME FOUR: 1.00 ECU = 0.76 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	1462,290	1451,2540	1460,3705	1466,3448	1465,1344
75_{US}	1630,441	1644,2536	1718,3750*	1492,3532	1638,1460
50_{US}	1372,615	1254,2476	1242,3814	1173,3617	1310,1515
25_{US}	657,816	688,2454	625,3832	664,3783	605,1680
FT_{US}	-504,1075	-418,2468	-552,3919	-520,3933	-471,1834

The pair (P_{US}, P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(75_{US}, 50_{EC})$.

Table 5.5.7 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1990 data and 1986 weights.

US Actions	GAME FOUR: 1.00 ECU = 0.76 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	10232,92	10184,1654	10190,2062*	10235,1224	10302,-1319
75_{US}	8699,327	8653,1719	8650,2108	8590,1271	8624,-1250
50_{US}	6061,495	5942,1825	5942,2276	5729,1475	5648,-1039
25_{US}	2639,740	2586,1963	2454,2472	2506,1793	1951,-799
FT_{US}	-2142,949	-1992,1652	-2202,2823	-2471,2190	-2835,-264

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(SQ_{US},50_{EC})$.

Table 5.5.8 Political Payoff Function Values for Alternative U.S. and EC Protection Reductions with Budget Compensation using 1990 data and 1990 weights.

US Actions	GAME FOUR: 1.00 ECU = 0.76 US$ EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	9791,93	9744,2058	9751,2880*	9796,2436	9863,296
75_{US}	8374,325	8330,2092	8325,2876	8264,2444	8298,326
50_{US}	6067,491	5944,2080	5945,2980	5740,2590	5669,491
25_{US}	2564,733	2505,2098	2386,3106	2446,2850	1900,683
FT_{US}	-2324,944	-2179,1650	-2376,3368	-2632,3178	-2982,1145

The pair (P_{US},P_{EC}) are the PPF for the US and EC respectively.
* The Unique Nash Equilibrium occurs at $(SQ_{US},50_{EC})$.

scenarios show the European Community reducing protection levels by 50%.

Each of the eight scenarios shows the EC reducing its protection levels by 50-75%. Thus, when allowed to provide budget compensation to those made worse off by trade liberalization the European Community will choose freer trade, but not free trade. As in Game Two, the actions of the United States suggest that when the U.S. uses budget compensation, the incentive to reduce protection levels from the status quo increases as the dollar is devalued and decreases as the dollar is revalued.

CHAPTER SIX: SUMMARY AND CONCLUSIONS

6.1 Summary

The Uruguay round of the GATT negotiations has displayed an increased emphasis on agricultural trade liberalization. Contrasting European Community and United States negotiating positions show the need to seek out compromises in which both countries can be made at least as well off as prior to the agreement. This analysis identifies such compromises.

The method employed involves a Political Payoff Function (PPF) which is a weighted, additive function of producer quasi-rents, consumer utility, and government budget expenditures. In order to represent the political pressure which interest groups exert within the policy process, weights are estimated for six agricultural production sectors, a consumption sector, and the budget sector. The PPF is then used within a game-theoretic framework to model the decision process of the EC and U.S. in regards to agricultural negotiations within the GATT.

Modele Internationale Simplifie de Simulation (MISS), a simplified world trade model which simulates in a comparative static framework the effects of various policy actions, is used to model policy changes. MISS is also used to estimate the sector weights for the PPF. These sector weights are derived using the assumption that the actual policies chosen for a given year maximize the Political Payoff Function. The PPF is differentiated with respect to the policy actions employed and set equal to zero in order to obtain the sector weights.

6.1.1 Games Using Base Period Exchange Rates

Game simulations are conducted in which budget compensation is not allowed and in which governments are allowed to compensate those sectors made worse off by the policy change. Game One approximates the outcome of trade liberalization, similar to proposals made in the Uruguay round, through the use of the MISS model. Game Two is identical to Game One with the exception that in Game Two budget compensation is allowed. The actions of the U.S. and EC in Games One and Two are status quo (SQ), elimination of export related subsidies (EX), partial free trade (PF), and free trade (FT).

The results of these scenarios are displayed in Table 6.1.1. In Game One the Nash equilibrium solution for all four simulations occurs where both the U.S. and EC retain their status quo policies (SQ). No agricultural trade liberalization occurs. The results from the Game Two simulations show both countries eliminating export related subsidies (EX). Although complete free trade is not achieved, freer trade results when budget compensation is allowed.

Game Three approximates the outcome of trade liberalization using across-the-board reductions in agricultural protection. Game Four is identical to Game Three, with the exception that in Game Four budget compensation is allowed. The actions of the U.S. and EC in Games Three and Four are status quo (SQ), protection at seventy-five percent of status quo (75), protection at fifty percent of status quo (50), protection at twenty-five percent of status quo (25), and free trade (FT).

These solutions are presented in Table 6.1.2. In Game Three the

Table 6.1.1 Nash Equilibrium Solutions to Simulations Conducted in Games One and Two using Actual Exchange Rates.

US Actions	EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	$1^{86}_{86}, 1^{86}_{90}, 1^{90}_{86}, 1^{90}_{90}$			
EX_{US}		$2^{86}_{86}, 2^{86}_{90}, 2^{90}_{86}, 2^{90}_{90}$		
PF_{US}				
FT_{US}				

Game One and Game Two solutions are represented by 1^{D}_{W} and 2^{D}_{W} respectively, where D represents the base year and W represents the weights.

Table 6.1.2 Nash Equilibrium Solutions to Simulations Conducted in Games Three and Four using Actual Exchange Rates.

US Actions	EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}					
75_{US}	$3^{86}_{86}, 3^{90}_{86}$	$3^{86}_{90}, 3^{90}_{90}$			
50_{US}					
25_{US}			$4^{86}_{86}, 4^{86}_{90}, 4^{90}_{86}, 4^{90}_{90}$		
FT_{US}					

Game Three and Game Four solutions are represented by 3^{D}_{W} and 4^{D}_{W} respectively, where D represents the base year and W represents the weights.

U.S. reduces protection to seventy-five percent of its status quo level (75_{US}) in each of the four simulations. However, the EC chooses to retain its status quo protection level (SQ_{EC}) in scenarios using 1986 weights while reducing protection to seventy-five percent of its original level (75_{EC}) in scenarios using 1990 weights. This can be compared to the Game Four results in which the Nash equilibrium for each of the four scenarios occurs where the U.S. reduces protection levels to twenty-five percent of its original level (25_{US}) while the EC reduces protection to fifty percent of its original level (50_{EC}). Although complete trade liberalization is not achieved, freer trade once again occurs when the governments are allowed to use budget compensation. The simulations in Game Three also indicate that EC policy-makers may be more favorable towards trade liberalization in 1990 than in 1986.

6.1.2 Games Using Exchange Rate Variations

Tables 6.1.3 through 6.1.6 display the solutions to simulations in which shocks are introduced to the model by means of exchange rate fluctuations. The simulations conducted in Games One through Four are the same as those described previously with the exception that the exchange rate is devalued or revalued from the actual exchange rate observed during the base period.

Game One and Game Two solutions resulting from a dollar revaluation are presented in Table 6.1.3. The simulations conducted in Game One using a revaluation of the dollar show each of the four solutions occurring where both countries retain status quo policies (SQ). Game Two solutions indicate that a revaluation of the dollar when

Table 6.1.3 Nash Equilibrium Solutions to Simulations Conducted in Games One and Two with a Revaluation of the Dollar.

US Actions	EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	$1^{86}_{86}, 1^{86}_{90}, 1^{90}_{86}, 1^{90}_{90}$	$2^{86}_{86}, 2^{86}_{90}, 2^{90}_{86}, 2^{90}_{90}$		
EX_{US}				
PF_{US}				
FT_{US}				

Game One and Game Two solutions are represented by 1^{D}_{W} and 2^{D}_{W} respectively, where D represents the base year and W represents the weights.

Table 6.1.4 Nash Equilibrium Solutions to Simulations Conducted in Games One and Two with a Devaluation of the Dollar.

US Actions	EC Actions			
	SQ_{EC}	EX_{EC}	PF_{EC}	FT_{EC}
SQ_{US}	$1^{86}_{86}, 1^{90}_{86}, 1^{90}_{90}$			
EX_{US}		$2^{86}_{86}, 2^{86}_{90}$		
PF_{US}			1^{86}_{90}	
FT_{US}		$2^{90}_{86}, 2^{90}_{90}$		

Game One and Game Two solutions are represented by 1^{D}_{W} and 2^{D}_{W} respectively, where D represents the base year and W represents the weights.

budget compensation is allowed will result in an EC elimination of export related subsidies (EX_{EC}) while the U.S. retains its status quo policies (SQ_{US}).

These results can be compared to those in Games One and Two where the dollar is devalued. Table 6.1.4 shows that, in all but one situation, both countries choose to retain status quo protection levels (SQ) in Game One. The simulation using 1986 data and 1990 weights shows both countries favoring partial free trade (PF). Game Two solutions present the EC eliminating export related subsidies (EX_{EC}) in each case while the U.S. adopts the elimination of export related subsidies (EX_{US}) in simulations using 1986 data and free trade (FT_{EC}) in simulations using 1990 data.

As a result of the exchange rate shocks in Game One, seven of the eight solutions find both countries choosing the status quo. By allowing budget compensation in Game Two, the EC eliminates export related subsidies in all eight cases. U.S. solutions resulting from a revaluation show a tendency to retain the status quo while outcomes of simulations using a devalued dollar result either in freer trade or free trade.

Due to these shifts in currency values the European Community and the United States typically choose the retention of their status quo policies when budget compensation is not allowed. If budget compensation is allowed, the EC eliminates export related subsidies (EX_{EC}) regardless of the exchange rate. Game Two solutions indicate that the United States loses incentive to reduce protection given a revaluation of the dollar, while incentive increases as the dollar is

devalued.

The solutions for Game Three and Four simulations conducted using a revaluation of the dollar are shown in Table 6.1.5. Game Three results show the U.S. preferring the status quo (SQ_{US}) in each of the four situations while the European Community chooses the status quo (SQ_{EC}) in three of the four cases. The exception occurs in the simulation using 1986 data with 1990 weights where the EC chooses protection at seventy-five percent of its original level (75_{EC}). When budget compensation is allowed the EC chooses to reduce protection by fifty percent (50_{EC}) while the U.S. will reduce protection by only twenty-five percent (75_{US}) in simulations using 1986 data and not at all (SQ_{US}) in years using 1990 data.

Game Three and Four results from a devaluation of the dollar are presented in Table 6.1.6. The solutions in which no budget compensation is allowed are not clustered to the extent of those in previous simulations. Three of the four solutions show neither country reducing protection by more than twenty-five percent (75). The exception, 1986 data using 1990 weights, finds the U.S. choosing free trade (FT_{US}) while the EC reduces protection by fifty percent (50_{EC}). When budget compensation is allowed the U.S. favors free trade (FT_{US}) in each of the four simulation while the EC prefers a fifty percent reduction in protection (50_{EC}) in three cases and protection at twenty-five percent of the original level (25_{EC}) in the other.

Game solutions in scenarios where budget compensation is not allowed indicate once more that both countries prefer policies in which the status quo is retained or protection is decreased by only twenty-

Table 6.1.5 Nash Equilibrium Solutions to Simulations Conducted in Games Three and Four with a Revaluation of the Dollar.

US Actions	EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	$3^{86}_{86}, 3^{90}_{86}, 3^{90}_{90}$	3^{86}_{90}	$4^{90}_{86}, 4^{90}_{90}$		
75_{US}			$4^{86}_{86}, 4^{86}_{90}$		
50_{US}					
25_{US}					
FT_{US}					

Game Three and Game Four solutions are represented by 3^{D}_{W} and 4^{D}_{W} respectively, where D represents the base year and W represents the weights.

Table 6.1.6 Nash Equilibrium Solutions to Simulations Conducted in Games Three and Four with a Devaluation of the Dollar.

US Actions	EC Actions				
	SQ_{EC}	75_{EC}	50_{EC}	25_{EC}	FT_{EC}
SQ_{US}	3^{86}_{86}				
75_{US}	3^{90}_{86}	3^{90}_{90}			
50_{US}					
25_{US}					
FT_{US}			$3^{86}_{90}, 4^{86}_{86}, 4^{90}_{86}, 4^{90}_{90}$	4^{86}_{90}	

Game Three and Game Four solutions are represented by 3^{D}_{W} and 4^{D}_{W} respectively, where D represents the base year and W represents the weights.

five percent. Game Four simulations show the optimal EC solution entailing freer trade while the tendency of the United States to reduce protection levels is negatively correlated with the value of the dollar.

6.2 Conclusions

The analysis of these two basic scenarios, trade liberalization without budget compensation and trade liberalization with budget compensation, provide insight into the validation and consistency of both the model and the search for treaty spaces. Regardless of any proposals made by the United States or the European Community the policies chosen for a given time period reflect the policy preferences of the decision makers. The solutions in the analyses where budget compensation is not allowed are at or near the status quo and are consistent with the actual agricultural policies of both countries. This compatibility with the observed data not only supports the accuracy of the estimated PPF weights but validates the model as an accurate representation of the policy choice and negotiation process.

Scenarios in which the government can use budget savings to compensate sectors made worse off due to policy liberalization indicate that freer trade can be achieved through the use of budget compensation. In addition, the degree of liberalization chosen by the United States is dependent upon the value of the dollar. These results are consistent with recent agreements within the GATT as well as the agricultural policies of the individual countries[6].

The Dunkel compromise and later the Geneva Accord outline steps to

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[6] See Commission of the European Communities (1991) and (1992).

be taken in order to achieve agricultural trade liberalization[7]. Major points of the agreement call for substantial progressive reductions in support and protection levels, and the bringing of trade distorting policies under GATT jurisdiction. The compromise includes a thirty-six percent decrease in budget expenditures for export commodities together with a twenty-four percent decrease in subsidized exports; a twenty percent reduction in the Aggregate Measure of Support (AMS); the tariffication of current border protection combined with a thirty-six percent reduction from present levels; and a five percent guaranteed minimum import access. This bilateral agreement was made possible, in part, by the Common Agricultural Policy reforms undertaken by the European Community.

European Community policy reform has been initiated for cereals, oilseeds, beef, and dairy products. Cereal policy changes include the reduction of target and intervention prices, elimination of co-responsibility levies, and the introduction of compensatory payments contingent upon the withdrawal of land from cultivation. Oilseed producers will also receive compensatory payments based upon land withdrawn from cultivation along with aid on a per hectare basis which replaces guaranteed prices. Changes to beef policies include a reduction in the intervention price, ceilings for intervention buying which will gradually be lowered, the introduction of maximum densities which will gradually be decreased, and premiums based on various production standards. EC policies for dairy products will be modified by reducing quotas and lowering the price of butter. Current policies

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[7] See Guyomard et al. (1993).

for Cereal Substitutes, Pork, Poultry, and Sugar will remain the same.

The reform of the Common Agricultural Policy which decreases price support and protection levels while increasing the use of decoupled income support lends validity to the solutions found in Games Two and Four where freer trade was achieved through the use of budget compensation or decoupled payments. While the Geneva Accord sets forth a framework in which trade liberalization is achieved it does not result in free trade and the complete elimination of trade distorting policies. In addition, the United States plan to phase out all forms of trade distorting support was proposed while the value of the dollar was relatively low. These observations are consistent with and add credence to the results derived within the model.

The degree of trade liberalization achieved within the Uruguay round of the GATT negotiations has been made possible, in part, by the adoption of decoupled income support as opposed to direct price support policies. Although trade distorting agricultural policies have not been completely eliminated, significant progress toward the reduction of those measures has been made. The success of future negotiations, just as in the case of the Uruguay round, will depend on the identification of compromises such that each country involved is made at least as well off as prior to the agreement.

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APPENDIX

Modele Internationale Simplifie de Simulation simulates in a comparative static framework the effects of various policy actions. In the case of this analysis seven commodity groups in three areas or zones are examined.

The identities in the MISS model are used to derive the effects of policy changes in the three zones examined. Because the model operates on the principle of Walrasian equilibrium, policy actions affect supply, derived demand, and final demand such that there is a rebalancing of world trade, caused by adjustments in the world price levels.

Although the main focus of this thesis is the derivation of the political payoff function values for the United States and the European Community, the resulting effects of changes in world price levels are useful in examining the impacts of policy liberalization on specific interest groups in each of the three zones. Appendix 4.1.1 - 4.1.4 and 5.1.1 - 5.1.8 present percentage changes in world prices for the seven commodities as a result of policy changes for the various simulations.

The changes producer quasi-rents, consumer utility and budget savings are useful in examining the actual net benefit of the policy changes for each of the eight sectors analyzed. The sectoral changes in producer quasi-rents, consumer utility and budget savings are presented in Appendix 4.2.1 - 4.2.4 and 5.2.1 - 5.2.8. Additionally, the percentage changes in US and EC domestic quantities and prices as a result of either a revaluation or devaluation of the dollar are displayed in Appendix 5.3.1 - 5.3.4.

Appendix 4.1.1 Percent Change in World Prices for 1986 Simulations. Games One and Two.

	SQ/SQ	SQ/EX	SQ/PF	SQ/FT
Cereals	0.0	2.7	3.8	4.4
Oilmeals	0.0	-7.7	-2.8	-9.0
FGS	0.0	-16.6	-16.1	-27.6
Beef	0.0	4.1	7.9	12.6
Pork & Poultry	0.0	0.7	0.3	-3.1
Dairy	0.0	8.9	-0.5	18.3
Sugar	0.0	5.2	-0.1	18.4
	EX/SQ	EX/EX	EX/PF	EX/FT
Cereals	5.2	7.8	8.2	8.8
Oilmeals	-2.2	-7.3	-3.5	-7.6
FGS	-2.0	-18.1	-17.1	-28.4
Beef	-1.4	2.8	7.0	11.5
Pork & Poultry	-0.5	0.0	0.3	-3.0
Dairy	1.7	10.8	1.1	20.1
Sugar	-0.5	4.7	-0.5	18.4
	PF/SQ	PF/EX	PF/PF	PF/FT
Cereals	5.2	7.9	8.5	9.1
Oilmeals	-2.1	-6.8	-3.2	-7.5
FGS	-1.8	-17.8	-16.6	-28.3
Beef	0.8	3.5	6.6	10.1
Pork & Poultry	-0.6	0.1	0.4	-2.8
Dairy	-1.1	7.9	-1.4	17.9
Sugar	-0.5	4.8	-0.4	18.3
	FT/SQ	FT/EX	FT/PF	FT/FT
Cereals	3.8	6.8	7.1	8.3
Oilmeals	-4.5	-9.0	-5.6	-8.8
FGS	-3.9	-19.6	-19.0	-28.8
Beef	-0.2	3.0	5.9	9.5
Pork & Poultry	-1.2	-0.5	-0.3	-3.2
Dairy	13.6	21.3	13.2	27.1
Sugar	7.2	12.2	7.2	24.0

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 4.1.2 Percent Change in World Prices for 1990 Simulations. Games One and Two.

	SQ/SQ	SQ/EX	SQ/PF	SQ/FT
Cereals	0.0	2.3	4.5	5.4
Oilmeals	0.0	-5.8	-0.2	-6.1
FGS	0.0	-12.8	-17.9	-29.5
Beef	0.0	1.4	6.2	10.4
Pork & Poultry	0.0	0.5	1.9	-1.4
Dairy	0.0	7.9	-0.3	18.0
Sugar	0.0	6.4	-0.1	17.1
	EX/SQ	**EX/EX**	**EX/PF**	**EX/FT**
Cereals	5.3	7.6	8.9	9.8
Oilmeals	-4.9	-8.6	-4.5	-8.5
FGS	-1.8	-14.3	-18.7	-30.1
Beef	-1.2	0.2	5.4	9.5
Pork & Poultry	-0.6	-0.2	1.8	-1.4
Dairy	1.3	9.4	0.8	19.2
Sugar	-0.3	6.0	-0.3	17.0
	PF/SQ	**PF/EX**	**PF/PF**	**PF/FT**
Cereals	5.3	7.7	9.2	9.0
Oilmeals	-4.8	-8.6	-4.3	-9.5
FGS	-1.6	-14.1	-18.4	-30.3
Beef	0.5	1.8	5.4	7.9
Pork & Poultry	-0.7	-0.3	1.9	-1.6
Dairy	-1.2	6.7	-1.3	26.7
Sugar	-0.3	6.0	-0.3	21.9
	FT/SQ	**FT/EX**	**FT/PF**	**FT/FT**
Cereals	3.7	6.3	7.7	9.1
Oilmeals	-7.3	-10.8	-7.1	-9.7
FGS	-3.9	-16.0	-20.8	-30.5
Beef	-0.1	0.8	4.8	8.1
Pork & Poultry	-1.3	-1.0	1.1	-1.8
Dairy	14.4	21.5	14.2	27.4
Sugar	5.9	12.1	5.9	21.9

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 4.1.3 Percent Change in World Prices for 1986 Simulations. Games Three and Four.

	SQ/SQ	SQ/75	SQ/50	SQ/25	SQ/FT
Cereals	0.0	0.9	1.9	3.1	4.4
Oilmeals	0.0	-1.9	-4.0	-6.3	-9.0
FGS	0.0	-6.6	-13.1	-20.2	-27.6
Beef	0.0	2.5	5.1	8.4	12.6
Pork & Poultry	0.0	-0.3	-1.0	-1.8	-3.1
Dairy	0.0	3.6	7.8	12.5	18.3
Sugar	0.0	3.1	6.9	11.7	18.4
	75/SQ	75/75	75/50	75/25	75/FT
Cereals	0.9	1.7	2.8	4.0	5.4
Oilmeals	-1.1	-1.8	-3.2	-4.4	-5.9
FGS	-0.8	-6.8	-13.3	-20.3	-27.6
Beef	0.0	1.9	3.9	6.4	9.5
Pork & Poultry	-0.2	-0.3	-1.0	-1.6	-2.8
Dairy	2.7	5.0	8.8	12.6	17.3
Sugar	1.4	4.0	7.7	12.1	18.2
	50/SQ	50/75	50/50	50/25	50/FT
Cereals	1.8	2.6	3.7	4.9	6.3
Oilmeals	-1.9	-2.5	-3.8	-4.9	-6.5
FGS	-1.7	-7.2	-13.7	-20.6	-27.9
Beef	-0.1	1.7	3.9	6.2	9.4
Pork & Poultry	-0.5	-0.5	-1.2	-1.7	-2.9
Dairy	5.8	7.4	11.2	15.2	20.0
Sugar	3.0	5.4	9.0	13.6	19.9
	25/SQ	25/75	25/50	25/25	25/FT
Cereals	2.8	3.5	4.6	5.8	7.2
Oilmeals	-3.1	-3.8	-4.7	-6.1	-7.7
FGS	-2.8	-7.5	-13.9	-21.0	-28.4
Beef	0.0	2.0	3.8	6.5	9.6
Pork & Poultry	-0.8	-0.7	-1.3	-1.9	-3.0
Dairy	9.4	10.0	13.9	18.1	23.3
Sugar	4.9	6.9	10.7	15.4	21.8
	FT/SQ	FT/75	FT/50	FT/25	FT/FT
Cereals	3.8	4.4	5.6	6.9	8.3
Oilmeals	-4.5	-4.7	-6.0	-7.3	-8.8
FGS	-3.9	-7.9	-14.4	-21.4	-28.8
Beef	-0.2	1.8	3.9	6.2	9.5
Pork & Poultry	-1.2	-0.9	-1.5	-2.1	-3.2
Dairy	13.6	13.0	17.0	21.6	27.1
Sugar	7.2	8.9	12.7	17.4	24.0

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT).

Appendix 4.1.4 Percent Change in World Prices for 1990 Simulations. Games Three and Game Four.

	SQ/SQ	SQ/75	SQ/50	SQ/25	SQ/FT
Cereals	0.0	1.0	2.4	3.7	5.4
Oilmeals	0.0	-1.3	-2.7	-4.4	-6.1
FGS	0.0	-7.0	-14.1	-21.7	-29.5
Beef	0.0	2.1	4.4	7.2	10.4
Pork & Poultry	0.0	0.0	-0.4	-0.7	-1.4
Dairy	0.0	3.6	7.6	12.2	18.0
Sugar	0.0	2.9	6.5	10.9	17.1

	75/SQ	75/75	75/50	75/25	75/FT
Cereals	0.9	1.9	3.2	4.6	6.3
Oilmeals	-1.4	-2.0	-2.9	-3.8	-4.6
FGS	-0.8	-7.2	-14.2	-21.9	-29.6
Beef	0.0	1.6	3.4	5.7	8.4
Pork & Poultry	-0.3	-0.1	-0.4	-0.6	-1.2
Dairy	2.9	5.1	8.6	12.6	17.3
Sugar	1.1	3.7	7.1	11.3	17.1

	50/SQ	50/75	50/50	50/25	50/FT
Cereals	1.8	2.7	4.1	5.5	7.2
Oilmeals	-3.1	-3.4	-4.3	-5.2	-6.0
FGS	-1.7	-7.4	-14.5	-22.1	-29.8
Beef	-0.1	1.6	3.3	5.7	8.2
Pork & Poultry	-0.5	-0.3	-0.6	-0.7	-1.3
Dairy	6.1	7.5	11.2	15.3	20.2
Sugar	2.4	4.8	8.2	12.5	18.3

	25/SQ	25/75	25/50	25/25	25/FT
Cereals	2.7	3.6	4.9	6.3	8.1
Oilmeals	-4.9	-5.2	-6.0	-7.0	-7.9
FGS	-2.7	-7.7	-14.8	-22.4	-30.1
Beef	0.0	1.5	3.5	5.7	8.2
Pork & Poultry	-0.9	-0.5	-0.8	-0.9	-1.5
Dairy	9.9	10.3	14.1	18.3	23.5
Sugar	4.0	6.2	9.6	13.9	19.8

	FT/SQ	FT/75	FT/50	FT/25	FT/FT
Cereals	3.7	4.5	5.9	7.3	9.1
Oilmeals	-7.3	-7.1	-7.9	-8.8	-9.7
FGS	-3.9	-8.1	-15.2	-22.8	-30.5
Beef	-0.1	1.3	3.2	5.6	8.1
Pork & Poultry	-1.3	-0.8	-1.0	-1.2	-1.8
Dairy	14.5	13.4	17.6	22.0	27.4
Sugar	5.9	7.8	11.3	15.7	21.9

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT).

Appendix 4.2.1 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings measured in Million ECU's. Game One, No Budget Compensation.

	SQ/SQ		SQ/EX		SQ/PF	
	US	EC	US	EC	US	EC
Cereals	0	0	0	-5908	0	-6653
Oilmeals	0	0	0	-213	0	-934
Beef	0	0	-43	-3595	-117	-6087
P & P	0	0	120	-787	-81	-887
Dairy	0	0	-7	-4242	-120	1141
Sugar	0	0	6	-1418	6	0
Consumers	0	0	-295	14402	-294	12520
Budget	0	0	288	8267	863	5689

	SQ/FT		EX/SQ		EX/EX	
	US	EC	US	EC	US	EC
Cereals	0	-9021	-13766	0	-13164	-5929
Oilmeals	0	-1194	-877	-60	-1198	-202
Beef	-88	-7777	208	32	164	-3613
P & P	-615	-659	224	-47	312	-796
Dairy	-50	-7480	-1020	63	-1039	-4251
Sugar	5	-2837	0	0	0	-1423
Consumers	314	26780	1611	117	1341	14490
Budget	623	11714	15939	168	15943	8267

	EX/PF		EX/FT		PF/SQ	
	US	EC	US	EC	US	EC
Cereals	-12965	-6068	-12781	-8590	-13768	0
Oilmeals	-977	-937	-1232	-1178	-876	-56
Beef	125	-6206	147	-7836	-758	30
P & P	269	-1039	-260	-773	204	-70
Dairy	-1054	1079	-1072	-7356	262	59
Sugar	0	0	0	-2831	0	0
Consumers	1234	12412	1872	26490	1414	134
Budget	15868	5649	15733	11664	15182	145

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 4.2.1 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings measured in Million ECU's. Game One, No Budget Compensation, continued.

	PF/EX		PF/PF		PF/FT	
	US	EC	US	EC	US	EC
Cereals	-13003	-5929	-12952	-6068	-12761	-8508
Oilmeals	-1196	-191	-939	-934	-1193	-1180
Beef	-80	-3618	479	-6259	1214	-8014
P & P	306	-811	309	-1052	-249	-752
Dairy	227	-4238	183	1055	213	-7562
Sugar	0	-1423	0	0	0	-2821
Consumers	329	14475	-333	12395	-512	26976
Budget	15229	8235	15160	5685	15295	11598

	FT/SQ		FT/EX		FT/PF	
	US	EC	US	EC	US	EC
Cereals	-14172	0	-13404	-5970	-13207	-6270
Oilmeals	-1037	-121	-1340	-249	-1143	-961
Beef	-760	65	-228	-3638	435	-6423
P & P	222	-113	323	-805	285	-1040
Dairy	-5257	128	-4730	-4248	-5345	1155
Sugar	-974	0	-939	-1424	-971	0
Consumers	8857	256	7027	14680	7255	12875
Budget	16603	532	16508	8318	16397	6199

	FT/FT	
	US	EC
Cereals	-13077	-8554
Oilmeals	-1312	-1185
Beef	1159	-8171
P & P	-230	-771
Dairy	-4382	-6671
Sugar	-856	-2765
Consumers	5291	26094
Budget	16513	11617

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 4.2.2 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings measured in Million ECU's. Game One, No Budget Compensation.

	SQ/SQ		SQ/EX		SQ/PF	
	US	EC	US	EC	US	EC
Cereals	0	0	0	-4890	0	-7218
Oilmeals	0	0	0	-279	0	-1833
Beef	0	0	-28	-1578	-136	-5392
P & P	0	0	111	-923	226	-2176
Dairy	0	0	3	-3117	-157	1207
Sugar	0	0	6	-2248	11	0
Consumers	0	0	-248	11957	-682	14899
Budget	0	0	254	6448	1216	5634

	SQ/FT		EX/SQ		EX/EX	
	US	EC	US	EC	US	EC
Cereals	0	-9836	-12977	0	-12644	-4938
Oilmeals	0	-2187	-323	-225	-632	-405
Beef	-114	-7196	199	61	165	-1565
P & P	-400	-2071	200	-26	271	-906
Dairy	-92	-5899	-783	121	-799	-3102
Sugar	11	-4251	0	0	0	-2249
Consumers	-45	30760	1400	166	1184	12144
Budget	1042	10595	14404	296	14616	6577

	EX/PF		EX/FT		PF/SQ	
	US	EC	US	EC	US	EC
Cereals	-12289	-6573	-12124	-9359	-12979	0
Oilmeals	-335	-1885	-597	-2200	-322	-221
Beef	102	-5487	117	-7249	-715	59
P & P	583	-2282	-52	-2122	181	-51
Dairy	-814	1212	-817	-5776	267	117
Sugar	0	0	0	-4231	0	0
Consumers	623	14752	1293	30469	1355	186
Budget	14571	5561	14511	10571	13759	262

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 4.2.2 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings measured in Million ECU's. Game One, No Budget Compensation, continued.

	PF/EX		PF/PF		PF/FT	
	US	EC	US	EC	US	EC
Cereals	-12643	-4938	-12281	-6572	-12332	-9238
Oilmeals	-598	-408	-321	-1881	-707	-2201
Beef	-636	-1593	207	-5491	851	-7422
P & P	247	-905	585	-2275	-42	-2127
Dairy	251	-3083	144	1202	-4377	-5071
Sugar	0	-2249	0	0	-1178	-4150
Consumers	1025	12150	-455	14732	5188	29663
Budget	13980	6584	14046	5513	16014	10561

	FT/SQ		FT/EX		FT/PF	
	US	EC	US	EC	US	EC
Cereals	-13391	0	-12874	-4987	-12694	-6795
Oilmeals	-508	-332	-746	-503	-505	-1921
Beef	-872	102	-575	-1557	50	-5564
P & P	166	-136	210	-896	549	-2299
Dairy	-5201	201	-4844	-3074	-5301	1310
Sugar	-1314	0	-1264	-2258	-1309	0
Consumers	9026	367	7685	12319	7334	15128
Budget	15764	685	15797	6672	15870	6078

	FT/FT	
	US	EC
Cereals	-12335	-9338
Oilmeals	-708	-2205
Beef	851	-7518
P & P	-74	-2127
Dairy	-4548	-5050
Sugar	-1179	-4155
Consumers	5524	29926
Budget	15830	10514

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 4.2.3 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings measured in Million ECU's. Game Three, No Budget Compensation.

	SQ/SQ		SQ/75		SQ/50		SQ/25		SQ/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	0	0	0	-2393	0	-4761	0	-6875	0	-9021
Oilmeals	0	0	0	-3667	0	-674	0	-958	0	-1194
Beef	0	0	-16	-2115	-37	-4003	-60	-5897	-88	-7777
P & P	0	0	-65	-86	-211	-110	-368	-326	-615	-659
Dairy	0	0	-7	-1956	-19	-3938	-33	-5723	-50	-7480
Sugar	0	0	2	-790	3	-1548	4	-2227	5	-2837
Consumers	0	0	3	6029	76	12039	154	19032	314	26780
Budget	0	0	124	5344	275	9582	438	11626	623	11714

	75/SQ		75/75		75/50		75/25		75/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-3744	0	-3389	-2161	-2942	-4548	-2494	-6781	-1954	-8942
Oilmeals	-196	-29	-296	-364	-363	-660	-460	-937	-570	-1172
Beef	-164	15	184	-2205	705	-4250	1261	-6242	1817	-8063
P & P	57	-23	26	-164	-135	-148	-272	-375	-524	-683
Dairy	-1387	29	-1066	-1666	-584	-3861	6	-5764	736	-7610
Sugar	-274	0	-221	-743	-156	-1526	-68	-2226	46	-2835
Consumers	1931	55	1081	5706	8	12131	-1268	19323	-2421	27280
Budget	5456	111	5204	5149	4773	9502	4371	11786	3719	11689

	50/SQ		50/75		50/50		50/25		50/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-7302	0	-6960	-2043	-6659	-4436	-6227	-6678	-5577	-8764
Oilmeals	-472	-51	-547	-377	-621	-669	-731	-941	-802	-1174
Beef	-329	28	111	-2258	455	-4255	1108	-6251	1790	-8130
P & P	112	-49	96	-220	-54	-200	-182	-417	-421	-707
Dairy	-2752	55	-2613	-1131	-2164	-3428	-1702	-5404	-1061	-7335
Sugar	-527	0	-498	-674	-446	-1469	-378	-2195	-278	-2817
Consumers	4004	110	3173	5316	2358	11684	1039	18934	-328	27017
Budget	9938	229	9837	4764	9550	9290	9321	11659	8706	11550

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 4.2.3 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings measured in Million ECU's. Game Three, No Budget Compensation, continued.

	25/SQ		25/75		25/50		25/25		25/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-10829	0	-10623	-1807	-10213	-4324	-9801	-6475	-9385	-8756
Oilmeals	-752	-82	-751	-403	-868	-682	-932	-952	-1017	-1181
Beef	-608	45	-284	-2262	287	-4267	706	-6255	1356	-8140
P & P	160	-81	168	-305	23	-273	-117	-453	-389	-728
Dairy	-4065	88	-4011	-451	-3683	-2873	-3265	-5003	-2795	-7051
Sugar	-746	0	-746	-584	-703	-1422	-657	-2149	-584	-2799
Consumers	6391	178	5915	4831	4733	11200	3743	18420	2422	26553
Budget	13774	374	13616	4135	13556	9018	13298	11497	13224	11695

	FT/SQ		FT/75		FT/50		FT/25		FT/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-14172	0	-13980	-1571	-13783	-4102	-13393	-6367	-13077	-8554
Oilmeals	-1037	-121	-1058	-422	-1138	-701	-1215	-963	-1312	-1185
Beef	-760	65	-435	-2293	-3	-4339	554	-6263	1159	-8171
P & P	222	-113	256	-400	98	-331	-36	-494	-230	-771
Dairy	-5257	128	-5297	241	-5073	-2229	-4776	-4503	-4382	-6671
Sugar	-974	0	-959	-495	-935	-1337	-901	-2091	-856	-2765
Consumers	8857	256	8395	4194	7451	10738	6364	17555	5291	26094
Budget	16603	532	16597	3663	16747	8550	16628	11286	16513	11617

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 4.2.4 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings measured in Million ECU's. Game Three, No Budget Compensation.

	SQ/SQ		SQ/75		SQ/50		SQ/25		SQ/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	0	0	0	-2507	0	-5124	0	-7462	0	-9836
Oilmeals	0	0	0	-677	0	-1278	0	-1774	0	-2187
Beef	0	0	-18	-1933	-47	-3745	-75	-5545	-114	-7196
P & P	0	0	-22	-407	-134	-762	-211	-1382	-400	-2071
Dairy	0	0	-12	-1551	-35	-3084	-57	-4487	-92	-5899
Sugar	0	0	3	-1176	5	-2326	8	-3352	11	-4251
Consumers	0	0	-56	6826	-56	14011	-90	22044	-45	30760
Budget	0	0	192	5169	451	9108	708	10932	1042	10595

	75/SQ		75/75		75/50		75/25		75/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-3483	0	-3079	-2378	-2674	-5005	-2267	-7356	-1653	-9749
Oilmeals	-104	-66	-138	-700	-172	-1280	-239	-1765	-305	-2175
Beef	-172	20	147	-1934	576	-3877	1007	-5774	1549	-7505
P & P	38	-25	43	-453	-41	-809	-125	-1400	-302	-2079
Dairy	-1432	40	-1137	-1280	-704	-2964	-247	-4501	439	-6000
Sugar	-370	0	-304	-1133	-231	-2288	-125	-3332	30	-4250
Consumers	1951	70	1099	6505	95	13861	-1042	22243	-2315	31240
Budget	5375	138	5019	5035	4604	9180	4292	10950	3540	10568

	50/SQ		50/75		50/50		50/25		50/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-6826	0	-6632	-2121	-6243	-4882	-5851	-7243	-5263	-9645
Oilmeals	-211	-142	-245	-747	-278	-1313	-346	-1785	-411	-2183
Beef	-327	43	-6	-2013	399	-3875	973	-5891	1398	-7509
P & P	94	-58	129	-540	35	-857	-24	-1449	-213	-2093
Dairy	-2734	85	-2589	-752	-2228	-2575	-1825	-4185	-1278	-5750
Sugar	-722	0	-677	-1045	-613	-2226	-538	-3286	-423	-4214
Consumers	4095	155	3384	6112	2416	13449	1155	21894	81	30865
Budget	9467	295	9426	4626	9136	9018	8911	11018	8371	10566

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 4.2.4 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings measured in Million ECU's. Game Three, No Budget Compensation, continued.

	25/SQ		25/75		25/50		25/25		25/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-10202	0	-10017	-1964	-9647	-4641	-9273	-7128	-8898	-9539
Oilmeals	-356	-227	-342	-808	-403	-1352	-456	-1809	-523	-2194
Beef	-630	69	-267	-2008	24	-3871	551	-5826	1092	-7515
P & P	97	-86	183	-617	85	-911	6	-1477	-178	-2102
Dairy	-4032	136	-4026	-173	-3746	-2086	-3416	-3790	-3067	-5407
Sugar	-1036	0	-1003	-958	-957	-2169	-900	-3245	-817	-4187
Consumers	6388	242	5817	5613	4967	12976	3739	21385	2540	30427
Budget	13270	471	13170	4295	13050	8707	12975	10909	12948	10556

	FT/SQ		FT/75		FT/50		FT/25		FT/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-13391	0	-13216	-1729	-13039	-4516	-12689	-6901	-12335	-9338
Oilmeals	-508	-332	-500	-870	-575	-1395	-642	-1833	-708	-2205
Beef	-872	102	-470	-2002	-130	-3921	293	-5828	851	-7518
P & P	166	-136	271	-704	159	-989	83	-1521	-74	-2127
Dairy	-5201	201	-5223	522	-5042	-1530	-4861	-3280	-4548	-5050
Sugar	-1314	0	-1295	-825	-1267	-2068	-1229	-3176	-1179	-4155
Consumers	9026	367	8541	5047	7650	12458	6627	20876	5524	29926
Budget	15764	685	15650	3746	15863	8547	15903	10636	15830	10514

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.2

Appendix 5.1.1 Percent Change in World Prices for 1986 Simulations with a Devaluation of the Dollar. Games One and Two.

	SQ/SQ	SQ/EX	SQ/PF	SQ/FT
Cereals	-3.4	-0.2	0.6	1.3
Oilmeals	-14.1	-17.7	-16.4	-19.9
FGS	-9.6	-20.0	-25.0	-35.4
Beef	-15.3	-12.7	-7.8	-4.9
Pork & Poultry	-10.9	-13.9	-11.0	-13.6
Dairy	-5.9	2.6	-6.4	13.1
Sugar	-2.9	2.1	-2.9	15.6
	EX/SQ	EX/EX	EX/PF	EX/FT
Cereals	-3.4	-0.3	0.1	1.2
Oilmeals	-15.1	-18.3	-17.1	-20.0
FGS	-10.7	-20.8	-26.0	-35.5
Beef	-15.7	-13.0	-8.2	-5.0
Pork & Poultry	-11.2	-14.0	-11.3	-13.6
Dairy	-1.1	5.7	-1.5	13.6
Sugar	-3.0	2.1	-3.0	15.6
	PF/SQ	PF/EX	PF/PF	PF/FT
Cereals	-2.8	0.0	0.6	1.2
Oilmeals	-14.7	-18.0	-16.3	-19.8
FGS	-9.8	-20.3	-25.0	-35.3
Beef	-15.4	-13.0	-7.8	-4.9
Pork & Poultry	-10.9	-13.8	-11.0	-13.5
Dairy	-6.0	2.8	-6.4	13.0
Sugar	-3.0	2.2	-2.9	15.6
	FT/SQ	FT/EX	FT/PF	FT/FT
Cereals	-3.4	-0.3	0.1	1.2
Oilmeals	-15.5	-18.7	-17.4	-20.2
FGS	-10.6	-20.7	-25.9	-35.4
Beef	-15.7	-13.1	-8.2	-5.0
Pork & Poultry	-11.2	-14.0	-11.2	-13.6
Dairy	-1.1	5.6	-1.5	13.6
Sugar	0.9	5.7	0.9	17.6

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 5.1.2 Percent Change in World Prices for 1990 Simulations with a Devaluation of the Dollar. Games One and Two.

	SQ/SQ	SQ/EX	SQ/PF	SQ/FT
Cereals	-0.3	2.1	3.8	5.4
Oilmeals	-3.2	-7.1	-1.4	-7.4
FGS	-2.3	-13.4	-18.4	-31.2
Beef	-2.1	-1.0	4.4	6.1
Pork & Poultry	-2.6	-3.0	0.8	-3.7
Dairy	-1.6	6.1	-2.3	16.8
Sugar	-0.5	5.9	-0.6	16.6
	EX/SQ	EX/EX	EX/PF	EX/FT
Cereals	3.4	5.8	7.1	8.3
Oilmeals	-7.4	-10.8	-7.4	-10.9
FGS	-3.8	-14.8	-20.6	-31.6
Beef	-2.7	-1.7	4.4	5.8
Pork & Poultry	-2.8	-3.3	-0.8	-3.6
Dairy	1.3	9.3	0.8	19.1
Sugar	-0.8	5.5	-0.8	16.6
	PF/SQ	PF/EX	PF/PF	PF/FT
Cereals	3.8	6.2	7.6	8.5
Oilmeals	-6.9	-10.5	-6.8	-10.8
FGS	-3.3	-14.4	-20.0	-31.4
Beef	-2.5	-1.5	2.7	5.9
Pork & Poultry	-2.7	-3.2	-0.4	-3.4
Dairy	-2.1	5.6	-2.4	16.5
Sugar	-0.7	5.6	-0.7	16.6
	FT/SQ	FT/EX	FT/PF	FT/FT
Cereals	2.4	4.9	6.3	7.7
Oilmeals	-9.1	-12.4	-9.2	-11.8
FGS	-5.4	-16.1	-22.2	-31.9
Beef	-3.2	-1.9	2.0	5.3
Pork & Poultry	-3.3	-3.7	-1.2	-3.9
Dairy	11.5	18.1	11.2	24.9
Sugar	4.9	11.0	4.9	20.7

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 5.1.3 Percent Change in World Prices for 1986 Simulations with a Revaluation of the Dollar. Games One and Two.

	SQ/SQ	SQ/EX	SQ/PF	SQ/FT
Cereals	1.4	4.1	5.1	5.8
Oilmeals	2.5	-5.4	0.1	-6.0
FGS	0.8	-16.8	-15.0	-26.5
Beef	4.9	9.2	11.9	16.8
Pork & Poultry	1.8	3.3	2.6	-0.9
Dairy	3.9	13.0	3.3	21.7
Sugar	0.0	5.2	-0.1	18.7
	EX/SQ	EX/EX	EX/PF	EX/FT
Cereals	8.7	11.3	11.5	12.2
Oilmeals	3.4	-2.5	2.1	-2.4
FGS	2.1	-16.7	-13.2	-25.5
Beef	0.9	5.1	9.0	13.8
Pork & Poultry	4.2	6.7	5.6	2.0
Dairy	2.0	10.9	1.2	20.5
Sugar	0.1	5.2	-0.1	18.9
	PF/SQ	PF/EX	PF/PF	PF/FT
Cereals	8.1	10.8	11.3	12.0
Oilmeals	2.5	-2.8	1.9	-2.7
FGS	1.4	-17.0	-13.4	-25.7
Beef	8.1	10.8	12.8	16.6
Pork & Poultry	3.6	6.1	5.2	1.7
Dairy	1.0	10.0	0.6	19.9
Sugar	0.0	5.2	-0.1	19.0
	FT/SQ	FT/EX	FT/PF	FT/FT
Cereals	6.5	9.3	9.6	10.9
Oilmeals	-0.2	-5.3	-1.3	-4.2
FGS	-1.0	-19.1	-16.2	-25.9
Beef	6.7	9.9	12.0	15.5
Pork & Poultry	3.0	5.3	4.3	1.3
Dairy	19.6	27.9	19.4	32.3
Sugar	9.8	14.8	9.8	26.5

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 5.1.4 Percent Change in World Prices for 1990 Simulations with a Revaluation of the Dollar. Games One and Two.

	SQ/SQ	SQ/EX	SQ/PF	SQ/FT
Cereals	4.3	6.3	8.6	9.7
Oilmeals	6.1	-0.6	7.4	1.8
FGS	2.9	-13.2	-14.3	-25.5
Beef	12.6	14.0	16.5	21.0
Pork & Poultry	5.3	8.4	8.3	4.7
Dairy	11.1	19.7	10.9	27.3
Sugar	0.0	6.4	-0.1	17.4
	EX/SQ	EX/EX	EX/PF	EX/FT
Cereals	16.1	17.7	18.8	19.7
Oilmeals	9.6	3.7	11.4	6.2
FGS	10.6	-10.2	-6.6	-20.8
Beef	4.6	5.8	10.4	15.0
Pork & Poultry	13.4	20.7	17.7	13.5
Dairy	1.5	9.4	1.1	20.1
Sugar	0.0	6.4	0.0	17.9
	PF/SQ	PF/EX	PF/PF	PF/FT
Cereals	14.3	15.9	17.4	18.4
Oilmeals	7.6	2.1	10.0	5.1
FGS	8.0	-11.7	-7.9	-21.2
Beef	20.8	22.1	22.7	26.5
Pork & Poultry	11.5	17.8	16.0	12.2
Dairy	4.6	12.7	4.6	22.8
Sugar	0.0	6.4	0.0	17.9
	FT/SQ	FT/EX	FT/PF	FT/FT
Cereals	11.8	13.6	15.2	17.0
Oilmeals	3.8	-1.5	5.5	2.8
FGS	4.8	-14.7	-11.5	-21.2
Beef	19.2	20.6	21.3	24.9
Pork & Poultry	10.7	16.8	14.9	11.5
Dairy	33.0	40.9	32.8	43.1
Sugar	11.9	18.3	11.9	27.8

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade.

Appendix 5.1.5 Percent Change in World Prices for 1986 Simulations with a Devaluation of the Dollar. Games Three and Four.

	SQ/SQ	SQ/75	SQ/50	SQ/25	SQ/FT
Cereals	-3.4	-2.4	-1.4	-0.2	1.3
Oilmeals	-14.1	-15.3	-16.6	-18.1	-19.9
FGS	-9.6	-15.5	-21.8	-28.2	-35.4
Beef	-15.3	-13.5	-11.2	-8.5	-4.9
Pork & Poultry	-10.9	-11.1	-11.6	-12.4	-13.6
Dairy	-5.9	-2.5	2.0	7.0	13.1
Sugar	-2.9	0.0	3.9	8.7	15.6
	75/SQ	75/75	75/50	75/25	75/FT
Cereals	-3.4	-2.5	-1.4	-0.2	1.2
Oilmeals	-14.5	-15.5	-16.8	-18.3	-19.9
FGS	-9.8	-15.5	-21.8	-28.3	-35.3
Beef	-15.4	-13.6	-11.3	-8.5	-4.9
Pork & Poultry	-11.0	-11.1	-11.7	-12.5	-13.7
Dairy	-4.8	-2.0	2.4	7.3	13.2
Sugar	-2.1	0.6	4.5	9.2	16.0
	50/SQ	50/75	50/50	50/25	50/FT
Cereals	-3.5	-2.5	-1.4	-0.2	1.2
Oilmeals	-14.9	-15.7	-17.0	-18.3	-20.0
FGS	-10.1	-15.5	-21.8	-28.3	-35.3
Beef	-15.5	-13.7	-11.4	-8.6	-4.9
Pork & Poultry	-11.0	-11.2	-11.7	-12.5	-13.7
Dairy	-3.6	-1.2	3.0	7.6	13.3
Sugar	-1.2	1.4	5.1	9.7	16.6
	25/SQ	25/75	25/50	25/25	25/FT
Cereals	-3.5	-2.5	-1.4	-0.2	1.2
Oilmeals	-15.2	-15.9	-17.2	-18.5	-20.1
FGS	-10.3	-15.6	-21.8	-28.3	-35.3
Beef	-15.6	-13.7	-11.4	-8.6	-4.9
Pork & Poultry	-11.1	-11.2	-11.7	-12.5	-13.7
Dairy	-2.4	-0.5	3.4	8.0	13.5
Sugar	-0.2	2.0	5.8	10.4	17.0
	FT/SQ	FT/75	FT/50	FT/25	FT/FT
Cereals	-3.4	-2.5	-1.5	-0.2	1.2
Oilmeals	-15.5	-16.2	-17.5	-18.7	-20.2
FGS	-10.6	-15.7	-21.9	-28.4	-35.4
Beef	-15.7	-13.8	-11.5	-8.6	-5.0
Pork & Poultry	-11.2	-11.3	-11.8	-12.5	-13.6
Dairy	-1.1	0.3	4.1	8.4	13.6
Sugar	0.9	2.8	6.5	11.1	17.6

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT).

Appendix 5.1.6 Percent Change in World Prices for 1990 Simulations with a Devaluation of the Dollar. Games Three and Four.

	SQ/SQ	SQ/75	SQ/50	SQ/25	SQ/FT
Cereals	-0.3	0.9	2.1	3.6	5.4
Oilmeals	-3.2	-4.1	-5.2	-6.4	-7.4
FGS	-2.3	-9.1	-16.0	-23.6	-31.2
Beef	-2.1	-0.6	1.3	3.7	6.1
Pork & Poultry	-2.6	-2.5	-2.7	-3.1	-3.7
Dairy	-1.6	2.0	6.2	11.1	16.8
Sugar	-0.5	2.5	6.0	10.5	16.6
	75/SQ	75/75	75/50	75/25	75/FT
Cereals	0.3	1.4	2.7	4.2	5.8
Oilmeals	-4.5	-5.2	-6.2	-7.3	-8.4
FGS	-2.9	-9.3	-16.2	-23.8	-31.3
Beef	-2.4	-0.7	1.1	3.5	6.1
Pork & Poultry	-2.7	-2.6	-2.8	-3.1	-3.7
Dairy	1.0	3.7	8.1	13.0	18.6
Sugar	0.6	3.4	6.8	11.3	17.5
	50/SQ	50/75	50/50	50/25	50/FT
Cereals	0.9	1.9	3.2	4.7	6.4
Oilmeals	-5.8	-6.2	-7.3	-8.4	-9.3
FGS	-3.6	-9.4	-16.3	-23.9	-31.4
Beef	-2.5	-1.0	0.8	3.4	5.8
Pork & Poultry	-2.9	-2.7	-2.8	-3.2	-3.8
Dairy	4.1	5.9	10.1	15.0	20.4
Sugar	1.8	4.4	7.8	12.4	18.4
	25/SQ	25/75	25/50	25/25	25/FT
Cereals	1.6	2.6	3.8	5.3	7.0
Oilmeals	-7.4	-7.7	-8.5	-9.8	-10.7
FGS	-4.4	-9.6	-16.5	-24.2	-31.7
Beef	-2.9	-1.2	0.7	3.0	5.7
Pork & Poultry	-3.0	-2.8	-2.9	-3.3	-3.8
Dairy	7.5	8.2	12.3	17.2	22.6
Sugar	3.2	5.6	8.9	13.4	19.5
	FT/SQ	FT/75	FT/50	FT/25	FT/FT
Cereals	2.4	3.2	4.4	5.9	7.7
Oilmeals	-9.1	-9.2	-10.1	-10.9	-11.8
FGS	-5.4	-9.8	-16.7	-24.4	-31.9
Beef	-3.2	-1.4	0.5	2.8	5.3
Pork & Poultry	-3.3	-2.9	-3.0	-3.3	-3.9
Dairy	11.5	10.9	14.8	19.5	24.9
Sugar	4.9	6.8	10.3	14.8	20.7

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT).

Appendix 5.1.7 Percent Change in World Prices for 1986 Simulations with a Revaluation of the Dollar. Games Three and Four.

	SQ/SQ	SQ/75	SQ/50	SQ/25	SQ/FT
Cereals	1.4	2.3	3.3	4.5	5.8
Oilmeals	2.5	0.8	-1.3	-3.4	-6.0
FGS	0.8	-5.7	-12.3	-19.1	-26.5
Beef	4.9	7.3	9.9	13.0	16.8
Pork & Poultry	1.8	1.6	1.0	0.2	-0.9
Dairy	3.9	7.5	11.5	16.2	21.7
Sugar	0.0	3.1	7.1	11.9	18.7
	75/SQ	75/75	75/50	75/25	75/FT
Cereals	2.5	3.3	4.4	5.6	6.9
Oilmeals	2.2	0.9	-1.0	-3.0	-5.4
FGS	0.4	-5.5	-12.1	-18.8	-26.3
Beef	5.5	7.6	10.0	12.8	16.5
Pork & Poultry	2.0	2.1	1.5	0.8	-0.3
Dairy	6.9	9.7	13.8	18.3	23.8
Sugar	1.7	4.5	8.4	13.3	20.1
	50/SQ	50/75	50/50	50/25	50/FT
Cereals	3.7	4.4	5.5	6.7	8.1
Oilmeals	1.6	0.7	-0.8	-2.8	-5.1
FGS	0.1	-5.1	-11.7	-18.6	-26.2
Beef	5.9	8.0	10.0	12.9	16.2
Pork & Poultry	2.4	2.6	2.1	1.3	0.2
Dairy	10.2	12.2	16.2	20.8	26.2
Sugar	3.7	6.2	10.1	14.9	21.8
	25/SQ	25/75	25/50	25/25	25/FT
Cereals	5.0	5.7	6.8	8.1	9.4
Oilmeals	0.9	0.5	-1.0	-2.8	-4.4
FGS	-0.5	-4.9	-11.7	-18.6	-26.1
Beef	6.3	8.1	10.4	12.6	15.9
Pork & Poultry	2.6	3.0	2.3	1.7	0.7
Dairy	14.6	15.1	18.9	23.9	29.1
Sugar	6.2	8.2	12.2	17.0	23.8
	FT/SQ	FT/75	FT/50	FT/25	FT/FT
Cereals	6.5	7.0	8.2	9.5	10.9
Oilmeals	-0.2	-0.2	-1.3	-2.6	-4.2
FGS	-1.0	-4.7	-11.4	-18.4	-25.9
Beef	6.7	8.3	10.5	12.7	15.5
Pork & Poultry	3.0	3.5	2.9	2.2	1.3
Dairy	19.6	18.6	22.5	27.1	32.3
Sugar	9.8	11.1	15.0	19.7	26.5

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT).

Appendix 5.1.8 Percent Change in World Prices for 1990 Simulations with a Revaluation of the Dollar. Games Three and Four.

	SQ/SQ	SQ/75	SQ/50	SQ/25	SQ/FT
Cereals	4.3	5.3	6.6	8.1	9.7
Oilmeals	6.1	5.0	4.0	2.9	1.8
FGS	2.9	-4.1	-11.0	-18.2	-25.5
Beef	12.6	14.5	16.5	18.5	21.0
Pork & Poultry	5.3	5.4	5.4	5.2	4.7
Dairy	11.1	14.6	18.3	22.4	27.3
Sugar	0.0	3.0	6.7	11.1	17.4
	75/SQ	75/75	75/50	75/25	75/FT
Cereals	5.7	6.7	7.9	9.4	11.1
Oilmeals	6.0	5.4	4.4	3.3	2.4
FGS	3.2	-2.9	-9.7	-17.3	-24.7
Beef	14.0	15.7	17.6	19.8	22.0
Pork & Poultry	6.5	6.8	6.6	6.5	6.0
Dairy	14.8	17.2	20.9	25.2	30.1
Sugar	1.7	4.4	8.2	12.6	19.0
	50/SQ	50/75	50/50	50/25	50/FT
Cereals	7.4	8.3	9.4	11.0	12.7
Oilmeals	5.9	5.7	4.7	3.7	2.9
FGS	3.6	-1.4	-8.3	-16.2	-23.8
Beef	15.7	16.8	18.8	20.7	23.0
Pork & Poultry	7.6	8.2	8.1	7.9	7.5
Dairy	19.2	20.4	24.1	28.5	33.4
Sugar	3.8	6.2	10.0	14.6	20.9
	25/SQ	25/75	25/50	25/25	25/FT
Cereals	9.4	10.0	11.3	12.8	14.6
Oilmeals	5.1	5.6	5.1	3.9	3.0
FGS	4.1	0.3	-6.9	-14.8	-22.6
Beef	17.4	18.3	20.0	21.8	24.3
Pork & Poultry	9.0	10.0	9.8	9.8	9.3
Dairy	25.0	24.5	28.2	32.5	37.5
Sugar	6.8	8.8	12.5	17.2	23.5
	FT/SQ	FT/75	FT/50	FT/25	FT/FT
Cereals	11.8	12.2	13.6	15.1	17.0
Oilmeals	3.8	5.0	4.3	3.4	2.8
FGS	4.8	2.3	-5.0	-13.2	-21.2
Beef	19.2	19.6	21.3	23.0	24.9
Pork & Poultry	10.7	12.0	11.8	11.8	11.5
Dairy	33.0	30.1	33.7	38.1	43.1
Sugar	11.9	12.9	16.8	21.5	27.8

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT).

endix 5.2.1 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Devaluation of the Dollar. Game One, No Budget Compensation.

	SQ/SQ		SQ/EX		SQ/PF	
	US	EC	US	EC	US	EC
ereals	0	0	0	-6015	0	-7125
ilmeals	1648	-361	1184	-470	1390	-1078
eef	5582	185	6507	-3665	8361	-8233
& P	7559	-1847	6478	-700	7450	-2025
Dairy	0	366	0	-4198	0	1550
Sugar	0	0	0	-1426	0	0
Consumers	-11973	2478	-12181	14952	-14252	18088
Budget	11380	-822	13056	8507	13298	5653

	SQ/FT		EX/SQ		EX/EX	
	US	EC	US	EC	US	EC
Cereals	0	-9403	-1852	0	-667	-6097
Oilmeals	976	-1275	1502	-384	1122	-484
Beef	9552	-9442	5604	201	6594	-3676
P & P	6545	-1829	7528	-1866	6452	-702
Dairy	0	-7629	-2384	397	-1470	-4309
Sugar	0	-2903	0	0	0	-1448
Consumers	-14529	32883	-9707	2541	-10915	15263
Budget	14730	11668	14772	-710	14943	8548

	EX/PF		EX/FT		PF/SQ	
	US	EC	US	EC	US	EC
Cereals	-224	-7163	0	-9402	-1757	0
Oilmeals	1312	-1085	976	-1275	1616	-375
Beef	8381	-8226	9556	-9444	5591	191
P & P	7423	-2035	6539	-1830	7551	-1844
Dairy	-2446	1574	-386	-7593	0	378
Sugar	0	0	0	-2903	0	0
Consumers	-11915	18136	-14194	32827	-11956	2489
Budget	14864	5864	15102	11684	13295	-805

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade. The PPF changes for the U.S. and EC are measured in Million Dollars and Million ECUs respectively.

Appendix 5.2.1 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Devaluation of the Dollar. Game One, No Budget Compensation, continued.

	PF/EX		PF/PF		PF/FT	
	US	EC	US	EC	US	EC
Cereals	-445	-6097	-224	-7087	0	-9352
Oilmeals	1185	-476	1350	-1077	976	-1273
Beef	6712	-3682	8361	-8235	9552	-9447
P & P	6488	-710	7460	-2033	6574	-1837
Dairy	0	-4251	0	1542	0	-7590
Sugar	0	-1448	0	0	0	-2899
Consumers	-12353	15199	-14260	18065	-14541	32753
Budget	13503	8516	13612	5648	14645	11736

	FT/SQ		FT/EX		FT/PF	
	US	EC	US	EC	US	EC
Cereals	-1761	0	-446	-6097	-446	-7182
Oilmeals	1498	-393	1150	-493	1277	-1088
Beef	5604	203	6670	-3699	8385	-8226
P & P	7528	-1862	6469	-719	7429	-2038
Dairy	-2384	402	-1469	-4258	-2446	1572
Sugar	-566	0	-513	-1448	-564	0
Consumers	-8917	2544	-10276	15276	-11136	18115
Budget	14611	-691	14558	8544	15126	5942

	FT/FT	
	US	EC
Cereals	0	-9348
Oilmeals	978	-1275
Beef	9556	-9441
P & P	6543	-1825
Dairy	-419	-7571
Sugar	-355	-2879
Consumers	-13698	32767
Budget	15149	11615

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade. The PPF changes for the U.S. and EC are measured in Million Dollars and Million ECUs respectively.

Appendix 5.2.2 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Devaluation of the Dollar. Game One, No Budget Compensation.

	SQ/SQ		SQ/EX		SQ/PF	
	US	EC	US	EC	US	EC
Cereals	-4516	0	-4518	-4866	-4523	-7329
Oilmeals	-904	-147	-1243	-336	-1369	-1853
Beef	1618	49	1923	-1594	1011	-5606
P & P	-19	-612	-143	-920	-1461	-2304
Dairy	-2650	97	-2648	-3055	-2655	1255
Sugar	232	0	232	-2240	233	0
Consumers	1298	728	934	11900	2982	15513
Budget	2939	117	3930	6543	4936	5628

	SQ/FT		EX/SQ		EX/EX	
	US	EC	US	EC	US	EC
Cereals	-4513	-9852	-18790	0	-18122	-4986
Oilmeals	-1283	-2202	-1311	-335	-1651	-504
Beef	4267	-7675	1481	101	1787	-1543
P & P	-341	-2428	-95	-567	-235	-862
Dairy	-2642	-5912	-4463	199	-4457	-3058
Sugar	231	-4257	236	0	236	-2243
Consumers	-1289	32265	3188	805	2837	12127
Budget	5243	10573	19956	382	20162	6717

	EX/PF		EX/FT		PF/SQ	
	US	EC	US	EC	US	EC
Cereals	-17663	-6906	-17418	-9551	-18772	0
Oilmeals	-1304	-1926	-1643	-2225	-1308	-315
Beef	1018	-5562	4147	-7759	1479	93
P & P	490	-2586	-318	-2406	-61	-553
Dairy	-4358	1327	-4264	-5726	-2674	183
Sugar	235	0	235	-4257	236	0
Consumers	2748	15635	331	31957	1262	771
Budget	20218	5675	20162	10619	19364	306

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade. The PPF changes for the U.S. and EC are measured in Million Dollars and Million ECUs respectively.

Appendix 5.2.2 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Devaluation of the Dollar. Game One, No Budget Compensation, continued.

	PF/EX		PF/PF		PF/FT	
	US	EC	US	EC	US	EC
Cereals	-18104	-4985	-17624	-6800	-17400	-9476
Oilmeals	-1605	-493	-1256	-1918	-1598	-2224
Beef	1785	-1549	3186	-5915	4302	-7751
P & P	-203	-848	589	-2573	-266	-2404
Dairy	-2670	-3069	-2660	1291	-2662	-5897
Sugar	235	-2243	234	0	234	-4246
Consumers	919	12098	-1231	15949	-1550	32206
Budget	19557	6713	19506	5653	19804	10507

	FT/SQ		FT/EX		FT/PF	
	US	EC	US	EC	US	EC
Cereals	-19311	0	-18408	-4987	-17941	-7019
Oilmeals	-1556	-411	-1803	-574	-1500	-1951
Beef	1334	130	1640	-1650	2888	-5875
P & P	-229	-625	-353	-906	379	-2572
Dairy	-8741	257	-8215	-3010	-8703	1402
Sugar	-1232	0	-1164	-2244	-1226	0
Consumers	11752	934	10298	12368	9464	16245
Budget	21465	666	21424	6826	21321	6058

	FT/FT	
	US	EC
Cereals	-17692	-9547
Oilmeals	-1791	-2228
Beef	4162	-7782
P & P	-388	-2419
Dairy	-7714	-5227
Sugar	-1054	-4178
Consumers	6768	31282
Budget	21743	10682

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade. The PPF changes for the U.S. and EC are measured in Million Dollars and Million ECUs respectively.

Appendix 5.2.3 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Revaluation of the Dollar. Game One, No Budget Compensation.

	SQ/SQ		SQ/EX		SQ/PF	
	US	EC	US	EC	US	EC
Cereals	0	0	0	-5887	0	-6450
Oilmeals	0	70	0	-153	0	-899
Beef	0	-27	0	-3612	0	-5483
P & P	295	361	539	-817	416	-712
Dairy	0	-54	0	-4253	0	1048
Sugar	256	0	264	-1417	264	0
Consumers	-735	-400	-1148	14357	-1079	11307
Budget	1501	272	1522	8215	2094	5704

	SQ/FT		EX/SQ		EX/EX	
	US	EC	US	EC	US	EC
Cereals	0	-8833	-14786	0	-14481	-5866
Oilmeals	0	-1166	-1419	94	-1656	-71
Beef	0	-7360	0	-43	0	-3612
P & P	-137	-480	-1956	901	-1580	-846
Dairy	0	-7299	-192	-85	-208	-4255
Sugar	263	-2827	119	0	123	-1411
Consumers	-522	25319	3230	-915	2642	14243
Budget	1677	11740	14206	321	14408	8132

	EX/PF		EX/FT		PF/SQ	
	US	EC	US	EC	US	EC
Cereals	-14317	-5656	-14327	-8222	-14978	0
Oilmeals	-1444	-872	-1654	-1135	-1424	70
Beef	0	-5945	0	-7683	-2668	-31
P & P	-1721	-571	-2164	-260	-2045	780
Dairy	-160	862	-240	-7500	0	-62
Sugar	129	0	122	-2808	92	0
Consumers	2762	10891	3386	25064	6301	-785
Budget	14233	5763	14253	11776	13722	439

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade. The PPF changes for the U.S. and EC are measured in Million Dollars and Million ECUs respectively.

Appendix 5.2.3 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Revaluation of the Dollar. Game One, No Budget Compensation, continued.

	PF/EX		PF/PF		PF/FT	
	US	EC	US	EC	US	EC
Cereals	-14508	-5906	-14496	-5652	-14343	-8219
Oilmeals	-1688	-79	-1479	-873	-1656	-1137
Beef	-2091	-3606	-1800	-5414	-1311	-7374
P & P	-1667	-859	-1773	-590	-2206	-273
Dairy	0	-4242	0	882	0	-7584
Sugar	103	-1412	110	0	111	-2807
Consumers	4983	14300	4735	10360	4671	24799
Budget	13874	8127	13974	5524	13887	11654

	FT/SQ		FT/EX		FT/PF	
	US	EC	US	EC	US	EC
Cereals	-15370	0	-14896	-5907	-14735	-5858
Oilmeals	-1612	-5	-1841	-149	-1634	-911
Beef	-2782	9	-2297	-3575	-2008	-5552
P & P	-2168	720	-1809	-818	-1927	-581
Dairy	-5747	17	-5332	-4250	-5729	1003
Sugar	-947	0	-923	-1412	-944	0
Consumers	15886	-647	13899	14392	14535	10827
Budget	15078	900	15029	8191	14896	6170

	FT/FT	
	US	EC
Cereals	-14564	-8270
Oilmeals	-1774	-1143
Beef	-1418	-7531
P & P	-2301	-287
Dairy	-5140	-6224
Sugar	-867	-2716
Consumers	12882	23457
Budget	15022	11568

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade. The PPF changes for the U.S. and EC are measured in Million Dollars and Million ECUs respectively.

Appendix 5.2.4 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Revaluation of the Dollar. Game One, No Budget Compensation.

	SQ/SQ		SQ/EX		SQ/PF	
	US	EC	US	EC	US	EC
Cereals	-4080	0	-4079	-4817	-4079	-6651
Oilmeals	-1242	295	-1241	-29	-1241	-1716
Beef	913	-82	912	-1524	912	-3652
P & P	-298	1418	388	-1003	364	-1353
Dairy	-2316	-161	-2313	-3175	-2308	917
Sugar	1722	0	1739	-2238	1742	0
Consumers	159	-1474	-846	11705	-1001	10802
Budget	14459	-78	14198	6174	15480	5731

	SQ/FT		EX/SQ		EX/EX	
	US	EC	US	EC	US	EC
Cereals	-4080	-9303	-27339	0	-27187	-4814
Oilmeals	-1242	-2097	-3864	469	-4057	184
Beef	912	-5951	969	-176	967	-1586
P & P	-432	-1196	-7842	3915	-7202	-992
Dairy	-2312	-5368	-108	-349	37	-3192
Sugar	1744	-4204	1235	0	1249	-2237
Consumers	-140	26005	13982	-3623	12087	11454
Budget	14865	10559	19446	-896	19505	5977

	EX/PF		EX/FT		PF/SQ	
	US	EC	US	EC	US	EC
Cereals	-27010	-5068	-26930	-8212	-27834	0
Oilmeals	-3794	-1640	-3965	-2045	-3969	369
Beef	967	-4811	967	-6851	-7185	-136
P & P	-7434	-26	-7822	241	-8174	3347
Dairy	37	523	-46	-6165	-2548	-270
Sugar	1265	0	1253	-4165	1065	0
Consumers	12673	9173	13656	25365	27712	-3129
Budget	19563	5609	19265	10531	19660	-561

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade. The PPF changes for the U.S. and EC are measured in Million Dollars and Million ECUs respectively.

Appendix 5.2.4 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Revaluation of the Dollar. Game One, No Budget Compensation, continued.

	PF/EX		PF/PF		PF/FT	
	US	EC	US	EC	US	EC
Cereals	-27590	-4815	-27341	-5287	-27283	-8291
Oilmeals	-4156	102	-3892	-1659	-4032	-2052
Beef	-7055	-1560	-6929	-2557	-6459	-5220
P & P	-7630	-946	-7732	-262	-8080	3
Dairy	-2542	-3142	-2536	600	-2540	-6015
Sugar	1080	-2237	1102	0	1103	-4159
Consumers	26122	11465	26165	7062	26108	23095
Budget	19597	6042	19751	5226	19491	10606

	FT/SQ		FT/EX		FT/PF	
	US	EC	US	EC	US	EC
Cereals	-28252	0	-28092	-4817	-27860	-5635
Oilmeals	-4227	183	-4395	-74	-4158	-1729
Beef	-7485	-74	-7354	-1505	-7231	-2737
P & P	-8512	3214	-7970	-966	-8095	-288
Dairy	-10601	-147	-10408	-3137	-10571	772
Sugar	-1539	0	-1512	-2238	-1535	0
Consumers	47876	-2907	45419	11710	46451	7710
Budget	18817	288	18963	6202	18851	6155

	FT/FT	
	US	EC
Cereals	-27622	-8443
Oilmeals	-4234	-2062
Beef	-6704	-5496
P & P	-8367	-40
Dairy	-10309	-4121
Sugar	-1476	-3980
Consumers	44861	21203
Budget	18785	10687

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,EX,PF,FT) where SQ represents Status Quo, EX represents elimination of Export Subsidies, PF represents Partial Free Trade, and FT represents Free Trade. The PPF changes for the U.S. and EC are measured in Million Dollars and Million ECUs respectively.

Appendix 5.2.5 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Devaluation of the Dollar. Game Three, No Budget Compensation, continued.

	25/SQ		25/75		25/50		25/25		25/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-1368	0	-887	-2561	-666	-4951	-399	-7205	0	-9349
Oilmeals	1562	-387	1446	-647	1316	-880	1146	-1092	977	-1276
Beef	5597	199	6340	-2598	7096	-5034	8119	-7361	9504	-9442
P & P	7537	-1852	7465	-1774	7258	-1662	6967	-1659	6519	-1810
Dairy	-1780	393	-1655	-1303	-1231	-3623	-846	-5652	-337	-7573
Sugar	-432	0	-413	-708	-383	-1523	-627	-2247	-262	-2884
Consumers	-9777	2520	-10517	8748	-11472	15727	-12546	23630	-13853	32754
Budget	14019	-727	14043	4892	14294	9891	14670	12336	15029	11610

	FT/SQ		FT/75		FT/50		FT/25		FT/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-1761	0	-1455	-2560	-887	-4950	-533	-7204	0	-9348
Oilmeals	1498	-393	1409	-652	1302	-884	1148	-1095	978	-1275
Beef	5604	203	6348	-2597	7099	-5033	8122	-7359	9556	-9441
P & P	7528	-1862	7459	-1775	7252	-1663	6965	-1657	6543	-1825
Dairy	-2384	402	-2188	-1163	-1700	-3547	-1088	-5648	-419	-7571
Sugar	-566	0	-540	-678	-495	-1497	-440	-2238	-355	-2879
Consumers	-8917	2544	-9805	8640	-10861	15612	-12159	23622	-13698	32767
Budget	14611	-691	14991	4789	14858	9878	15013	12333	15149	11615

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 5.2.6 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Devaluation of the Dollar. Game Three, No Budget Compensation.

	SQ/SQ		SQ/75		SQ/50		SQ/25		SQ/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-4516	0	-4515	-2637	-4514	-5082	-4514	-7474	-4513	-9852
Oilmeals	-904	-147	-990	-776	-1033	-1344	-1159	-1809	-1283	-2202
Beef	1618	49	2232	-2022	2695	-3959	3320	-5913	4267	-7675
P & P	-19	-612	-14	-954	-63	-1311	-166	-1804	-341	-2428
Dairy	-2650	97	-2648	-1535	-2646	-3091	-2644	-4563	-2642	-5912
Sugar	232	0	232	-1212	232	-2328	231	-3368	231	-4257
Consumers	1298	728	613	7724	129	14892	-466	23299	-1289	32265
Budget	2939	117	3415	5482	3861	9446	4506	11155	5243	10573
	75/SQ		75/75		75/50		75/25		75/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-8289	0	-8186	-2508	-8438	-4961	-8182	-7469	-7919	-9756
Oilmeals	-1005	-207	-1090	-811	-1176	-1365	-1301	-1822	-1383	-2207
Beef	1623	66	2083	-2020	2703	-4033	3329	-5963	4279	-7776
P & P	-53	-606	-30	-984	-74	-1334	-172	-1818	-334	-2431
Dairy	-4253	131	-4375	-1167	-4247	-2778	-4153	-4341	-3903	-5782
Sugar	-194	0	-177	-1160	-164	-2274	-144	-3338	-121	-4245
Consumers	3475	762	3017	7390	2248	14655	1526	22998	416	32176
Budget	8530	233	9388	5222	9551	9259	9753	11262	9937	10556
	50/SQ		50/75		50/50		50/25		50/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-11927	0	-11727	-2379	-11722	-4887	-11474	-7359	-10971	-9654
Oilmeals	-1152	-266	-1219	-847	-1279	-1390	-1404	-1837	-1485	-2212
Beef	1475	84	2090	-2096	2712	-4033	3339	-6075	4290	-7778
P & P	-101	-608	-48	-1013	-95	-1341	-185	-1830	-359	-2420
Dairy	-5844	167	-5887	-769	-5719	-2452	-5549	-4091	-5207	-5575
Sugar	-568	0	-553	-1091	-537	-2228	-504	-3310	-461	-4218
Consumers	6016	808	5318	7073	4471	14277	3604	22896	2329	31921
Budget	13471	358	13871	4988	13908	9150	14210	11121	13982	10458

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 5.2.6 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Devaluation of the Dollar. Game Three, No Budget Compensation, continued.

	25/SQ		25/75		25/50		25/25		25/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-15612	0	-15608	-2198	-15130	-4765	-14887	-7247	-14403	-9649
Oilmeals	-1305	-338	-1349	-896	-1430	-1416	-1513	-1857	-1593	-2222
Beef	1481	107	1943	-2094	2565	-4081	3350	-6068	4143	-7781
P & P	-154	-607	-72	-1054	-119	-1370	-223	-1821	-373	-2419
Dairy	-7368	211	-7363	-292	-7138	-2081	-6878	-3856	-6519	-5401
Sugar	-923	0	-912	-1003	-863	-2173	-825	-3270	-775	-4205
Consumers	8668	859	8042	6580	7015	13961	5832	22610	4573	31657
Budget	17939	505	18402	4677	18057	8967	18266	11012	18140	10566

	FT/SQ		FT/75		FT/50		FT/25		FT/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-19311	0	-19082	-2067	-18621	-4642	-18160	-7132	-17692	-9547
Oilmeals	-1556	-411	-1553	-941	-1591	-1451	-1714	-1871	-1791	-2228
Beef	1334	130	1797	-2142	2419	-4151	3204	-6073	4162	-7782
P & P	-229	-625	-112	-1092	-157	-1395	-242	-1836	-388	-2419
Dairy	-8741	257	-8790	321	-8467	-1629	-8131	-3522	-7714	-5227
Sugar	-1232	0	-1209	-889	-1169	-2095	-1122	-3223	-1054	-4178
Consumers	11752	934	11124	6057	9824	13606	8388	22195	6768	31282
Budget	21465	666	21810	4299	21694	8734	21813	10936	21743	10682

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 5.2.7 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Revaluation of the Dollar. Game Three, No Budget Compensation.

	SQ/SQ		SQ/75		SQ/50		SQ/25		SQ/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	0	0	0	-2322	0	-4650	0	-6808	0	-8833
Oilmeals	0	70	0	-311	0	-629	0	-924	0	-1166
Beef	0	-27	0	-1971	0	-3793	0	-5606	0	-7360
P & P	295	361	264	200	169	98	38	-98	-137	-480
Dairy	0	-54	0	-1981	0	-3839	0	-5604	0	-7299
Sugar	256	0	259	-778	261	-1550	262	-2227	263	-2827
Consumers	-735	-400	-754	5288	-713	11245	-639	17920	-522	25319
Budget	1501	272	1528	5486	1580	9475	1631	11645	1677	11740

	75/SQ		75/75		75/50		75/25		75/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-3931	0	-3931	-2158	-3931	-4474	-3930	-6665	-3854	-8740
Oilmeals	-374	61	-394	-307	-408	-623	-407	-918	-440	-1160
Beef	-698	-22	-599	-1985	-499	-3810	-400	-5623	-300	-7377
P & P	-245	426	-320	237	-336	113	-522	-57	-684	-428
Dairy	-1526	-43	-1569	-1557	-1568	-3456	-1426	-5306	-1397	-7097
Sugar	-89	0	-83	-714	-79	-1493	-69	-2191	-52	-2814
Consumers	2946	-448	2909	4707	2747	10753	2623	17421	2547	24853
Budget	5875	397	5951	5217	6095	9214	5889	11537	6058	11795

	50/SQ		50/75		50/50		50/25		50/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-8048	0	-7867	-1923	-7685	-4297	-7609	-6521	-7427	-8645
Oilmeals	-750	42	-769	-311	-813	-619	-813	-914	-844	-1156
Beef	-1354	-14	-1295	-1923	-1000	-3826	-901	-5638	-702	-7392
P & P	-898	529	-908	255	-978	167	-1088	-13	-1241	-375
Dairy	-2998	-27	-3088	-967	-2956	-3042	-2799	-4999	-2705	-6868
Sugar	-405	0	-400	-643	-396	-1430	-375	-2146	-351	-2790
Consumers	6908	-523	6926	4029	6433	10124	6151	16911	5873	24466
Budget	9920	536	9687	4676	9586	8995	9484	11416	9494	11712

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 5.2.7 1986 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Revaluation of the Dollar. Game Three, No Budget Compensation, continued.

	25/SQ		25/75		25/50		25/25		25/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-11588	0	-11757	-1640	-11414	-4096	-11408	-6355	-11064	-8459
Oilmeals	-1160	26	-1193	-314	-1221	-620	-1251	-911	-1310	-1148
Beef	-2029	-5	-1892	-1835	-1698	-3770	-1306	-5653	-1008	-7472
P & P	-1478	598	-1427	252	-1438	153	-1591	16	-1718	-345
Dairy	-4469	-9	-4466	-368	-4349	-2437	-4171	-4639	-3906	-6606
Sugar	-699	0	-696	-524	-676	-1365	-657	-2100	-629	-2753
Consumers	11194	-567	10907	3188	10439	9484	9768	16312	9086	24000
Budget	12752	701	13041	4162	12735	8522	12898	11348	12629	11699

	FT/SQ		FT/75		FT/50		FT/25		FT/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-15370	0	-15305	-1330	-15052	-3828	-14826	-6147	-14564	-8270
Oilmeals	-1612	-5	-1611	-328	-1666	-623	-1721	-906	-1774	-1143
Beef	-2782	9	-2533	-1851	-2301	-3788	-1911	-5673	-1418	-7531
P & P	-2168	720	-2029	256	-2089	196	-2169	43	-2301	-287
Dairy	-5747	17	-5791	506	-5591	-1822	-5353	-4187	-5140	-6224
Sugar	-947	0	-938	-391	-923	-1258	-898	-2061	-867	-2716
Consumers	15886	-647	15460	2296	14779	8648	13848	15599	12882	23457
Budget	15078	900	15143	3458	14976	8170	15009	11221	15022	11568

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 5.2.8 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Revaluation of the Dollar. Game Three, No Budget Compensation.

	SQ/SQ		SQ/75		SQ/50		SQ/25		SQ/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-4080	0	-4080	-2425	-4080	-4803	-4080	-7107	-4080	-9303
Oilmeals	-1242	295	-1242	-444	-1242	-1096	-1242	-1649	-1242	-2097
Beef	913	-82	913	-1633	913	-3112	912	-4511	912	-5951
P & P	-298	1418	-274	839	-274	233	-331	-413	-432	-1196
Dairy	-2316	-161	-2315	-1511	-2314	-2852	-2313	-4138	-2312	-5368
Sugar	1722	0	1727	-1173	1731	-2315	1736	-3312	1744	-4204
Consumers	159	-1474	38	4623	-66	11224	-122	18147	-140	26005
Budget	14459	-78	14487	4931	14576	8537	14710	10591	14865	10559

	75/SQ		75/75		75/50		75/25		75/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-10647	0	-10648	-2192	-10647	-4582	-10559	-6880	-10558	-9097
Oilmeals	-1947	290	-1947	-428	-1932	-1083	-1946	-1639	-1982	-2087
Beef	-1104	-83	-1183	-1396	-1103	-2990	-1103	-4411	-969	-5859
P & P	-2434	1777	-2375	1112	-2405	589	-2428	-165	-2501	-968
Dairy	-4591	-165	-4668	-1177	-4665	-2504	-4632	-3883	-4583	-5180
Sugar	729	0	719	-1060	736	-2236	753	-3256	763	-4172
Consumers	10403	-1781	10480	3478	10285	10113	10152	17299	9856	25159
Budget	18781	58	18784	4568	18857	8226	18799	10329	18999	10446

	50/SQ		50/75		50/50		50/25		50/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-16812	0	-17020	-1855	-16809	-4262	-16726	-6649	-16641	-8886
Oilmeals	-2684	286	-2653	-417	-2636	-1071	-2682	-1626	-2714	-2076
Beef	-3221	-86	-3271	-1084	-3090	-2796	-3037	-4201	-2828	-5773
P & P	-4456	2158	-4365	1396	-4376	858	-4398	93	-4452	-728
Dairy	-6815	-170	-6907	-661	-6874	-2050	-6806	-3545	-6693	-4930
Sugar	-180	0	-186	-937	-170	-2140	-149	-3204	-125	-4126
Consumers	21538	-2100	21594	2054	21175	8838	20911	16126	20377	24101
Budget	21338	118	21440	4040	21343	7877	21205	10184	21222	10486

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 5.2.8 1990 Changes in Producer Quasi-Rents, Consumer Utility and Budget Savings with a Revaluation of the Dollar. Game Three, No Budget Compensation, continued.

	25/SQ		25/75		25/50		25/25		25/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-22863	0	-22867	-1462	-22674	-3938	-22591	-6302	-22401	-8669
Oilmeals	-3399	244	-3381	-418	-3426	-1057	-3422	-1617	-3447	-2068
Beef	-5303	-81	-5424	-797	-5127	-2577	-4923	-4114	-4796	-5689
P & P	-6475	2635	-6365	1740	-6364	1191	-6362	406	-6406	-426
Dairy	-8831	-161	-8971	56	-8855	-1519	-8727	-3105	-8620	-4563
Sugar	-965	0	-968	-759	-941	-1997	-924	-3100	-892	-4070
Consumers	33661	-2473	33959	437	33119	7388	32406	14728	31911	22920
Budget	21916	217	21789	3334	21780	7458	21698	10080	21487	10452

	FT/SQ		FT/75		FT/50		FT/25		FT/FT	
	US	EC	US	EC	US	EC	US	EC	US	EC
Cereals	-28252	0	-28188	-934	-28024	-3511	-27855	-5947	-27622	-8443
Oilmeals	-4227	183	-4185	-438	-4203	-1071	-4220	-1617	-4234	-2062
Beef	-7485	-74	-7481	-565	-7242	-2355	-6950	-3978	-6704	-5496
P & P	-8512	3214	-8360	2145	-8351	1589	-8332	788	-8367	-40
Dairy	-10601	-147	-10655	1088	-10570	-621	-10458	-2435	-10309	-4121
Sugar	-1539	0	-1531	-417	-1519	-1757	-1503	-2942	-1476	-3980
Consumers	47876	-2907	47740	-1574	46897	5444	45830	13079	44861	21203
Budget	18817	288	18874	2344	18889	6887	18934	9810	18785	10687

Action pair A_{US}/A_{EC} represent the policy choices of the United States and the European Community respectively for A = (SQ,75,50,25,FT) where SQ is Status Quo, 75 is protection at seventy-five percent of the status quo, 50 is protection at fifty percent of the status quo, 25 is protection at twenty-five percent of the status quo, and FT is Free Trade.

Appendix 5.3.1

Percentage Change in Domestic Quantities Resulting from a Revaluation of the Dollar. 1986 Data with Status Quo Policies.

	European Community			United States		
	Prod.	Derived Demand	Final Demand	Prod.	Derived Demand	Final Demand
Cereals	-0.1	2.0	0.0	-5.9	-5.6	5.3
Oilmeal	2.2	-0.7	0.4	-5.5	-5.4	-4.6
FGS	0.1	0.7	0.4	-2.5	-5.4	-6.2
Beef	-0.2	0.0	0.4	-6.0	0.0	6.7
Pork&Poul	3.1	0.0	-1.1	-5.7	0.0	5.7
Milk	-0.3	0.0	0.1	-7.9	8.9	5.3
Sugar	-0.1	0.0	0.0	1.5	0.0	1.2

Percentage Change in Domestic Prices Resulting from a Revaluation of the Dollar. 1986 Data with Status Quo Policies.

	European Community			United States		
	Prod.	Derived Demand	Final Demand	Prod.	Derived Demand	Final Demand
Cereals	0.0	0.0	0.0	0.0	1.4	1.4
Oilmeal	2.5	2.5	2.5	0.0	2.5	2.5
FGS	0.8	0.8	0.8	0.8	0.8	0.8
Beef	0.0	0.0	0.0	0.0	0.0	0.0
Pork&Poul	1.8	1.8	1.8	1.8	1.8	1.8
Milk	0.0	0.0	0.0	0.0	0.0	0.0
Sugar	0.0	0.0	0.0	12.4	12.4	12.4

Appendix 5.3.2

Percentage Change in Domestic Quantities Resulting from a Devaluation of the Dollar. 1986 Data with Status Quo Policies.

	European Community			United States		
	Prod.	Derived Demand	Final Demand	Prod.	Derived Demand	Final Demand
Cereals	0.8	-12.2	-0.2	14.9	21.2	-22.6
Oilmeal	-12.1	3.5	-2.3	29.6	26.4	21.4
FGS	-0.8	-0.9	-2.3	17.8	17.8	29.6
Beef	1.4	0.0	-2.3	25.8	0.0	-18.4
Pork&Poul	-17.0	0.0	7.2	42.5	0.0	27.0
Milk	0.0	0.0	-0.6	11.1	-19.5	-10.0
Sugar	0.0	0.0	0.0	11.7	0.0	-9.6

Percentage Change in Domestic Prices Resulting from a Devaluation of the Dollar. 1986 Data with Status Quo Policies.

	European Community			United States		
	Prod.	Derived Demand	Final Demand	Prod.	Derived Demand	Final Demand
Cereals	0.0	0.0	0.0	0.0	36.1	36.1
Oilmeal	-14.1	-14.1	-14.1	20.5	32.6	32.6
FGS	-9.6	-9.6	-9.6	39.5	39.5	39.5
Beef	0.0	0.0	0.0	24.0	24.0	24.0
Pork&Poul	-10.9	-10.9	-10.9	37.6	37.6	37.6
Milk	-2.0	0.0	0.0	0.0	0.0	0.0
Sugar	-0.8	0.0	0.0	0.0	0.0	0.0

Appendix 5.3.3

Percentage Change in Domestic Quantities Resulting from a Revaluation of the Dollar. 1990 Data with Status Quo Policies.

	European Community			United States		
	Prod.	Derived Demand	Final Demand	Prod.	Derived Demand	Final Demand
Cereals	-0.3	5.9	0.1	-16.9	-16.2	17.0
Oilmeal	5.1	-0.9	1.0	-15.8	-15.1	-13.4
FGS	0.2	1.9	1.0	-7.3	-15.7	-17.7
Beef	-0.5	0.0	1.0	-17.1	0.0	21.6
Pork&Poul	9.2	0.0	-3.1	-16.3	0.0	18.5
Milk	0.0	0.0	0.2	-22.0	29.3	17.0
Sugar	0.0	0.0	0.0	4.5	0.0	3.6

Percentage Change in Domestic Prices Resulting from a Revaluation of the Dollar. 1990 Data with Status Quo Policies.

	European Community			United States		
	Prod.	Derived Demand	Final Demand	Prod.	Derived Demand	Final Demand
Cereals	0.0	0.0	0.0	0.0	4.3	4.3
Oilmeal	6.1	6.1	6.1	0.0	6.1	6.1
FGS	2.9	2.9	2.9	2.9	2.9	2.9
Beef	0.0	0.0	0.0	0.0	0.0	0.0
Pork&Poul	5.3	5.3	5.3	5.3	5.3	5.3
Milk	0.8	0.0	0.0	0.0	0.0	0.0
Sugar	0.3	0.0	0.0	42.4	42.4	42.4

Appendix 5.3.4

Percentage Change in Domestic Quantities Resulting from a Devaluation of the Dollar. 1990 Data with Status Quo Policies.

	European Community			United States		
	Prod.	Derived Demand	Final Demand	Prod.	Derived Demand	Final Demand
Cereals	0.2	-2.9	-0.1	3.0	7.0	-2.7
Oilmeal	-2.7	0.7	-0.5	6.8	4.4	4.1
FGS	-0.2	-0.2	-0.5	3.4	2.8	5.2
Beef	0.3	0.0	-0.5	4.0	0.0	-2.6
Pork&Poul	-4.1	0.0	1.6	10.2	0.0	-6.7
Milk	0.0	0.0	-0.1	3.4	-4.4	-2.3
Sugar	0.0	0.0	0.0	2.4	0.0	-2.1

Percentage Change in Domestic Prices Resulting from a Devaluation of the Dollar. 1990 Data with Status Quo Policies.

	European Community			United States		
	Prod.	Derived Demand	Final Demand	Prod.	Derived Demand	Final Demand
Cereals	0.0	0.0	0.0	0.0	-0.3	-0.3
Oilmeal	-3.2	-3.2	-3.2	5.5	5.9	5.9
FGS	-2.3	-2.3	-2.3	6.8	6.8	6.8
Beef	0.0	0.0	0.0	2.0	2.0	2.0
Pork&Poul	-2.6	-2.6	-2.6	6.6	6.6	6.6
Milk	-0.4	0.0	0.0	0.0	0.0	0.0
Sugar	-0.2	0.0	0.0	0.0	0.0	0.0