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Abstract

This paper deals with an issue of increasing importance in a world where preferential trading arrangements are the call of the day: the effects on world welfare of sequential customs union formation. A computational model of customs union formation is developed and simulated under a variety of assumptions. These assumptions concern various characteristics of the world, the pattern of customs union formation, and GATT restrictions on the common external tariff imposed by the customs union. The results show that unrestricted customs union formation is likely to result in successive deterioration of world welfare, despite gains for the member countries collectively. An examination of the current GATT guidelines, however, reveals that if they were more vigorously enforced, the deleterious effects of customs union formation could be eliminated.

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1. Introduction

The existence of the General Agreement on Tariffs and Trade (GATT) has been largely responsible for the historical reductions in the incidence of tariffs worldwide. The current Uruguay Round of negotiations is, however, calling into question the ability of the GATT to continue as the primary forum for trade negotiations. There are in fact those in the economics profession who suggest that the GATT as an institution is either dead, should be shot, or both. Concurrent with the declining success of the multilateral negotiations is an increased willingness of countries to enter into preferential trading arrangements (PTAs). Examples of such arrangements are the European Economic Community (EEC), the North American Free Trade Area (NAFTA), and the Association of Southeast Asian Nations (ASEAN). While it is not clear that the GATT is being appropriately eulogized, it is increasingly clear that a greater understanding of the effects on world welfare of PTAs is needed. Accordingly, this paper proceeds to analyze the welfare effects of a particular type of PTA: the formation of a customs union.

Of particular interest is the path of global welfare in a world in which trade liberalization is accomplished solely through customs union formation. While conventional wisdom has it that sequential rounds of multilateral negotiations will inch us ever closer to the optimal pattern of world trade, the same cannot be said, with any confidence, of sequential customs union formation. Inherent in the formation of any given customs union are competing forces on welfare; there is a welfare-improving tendency for trade between member countries to increase and a welfare-reducing tendency to discourage trade between the member countries and the rest of the world. While it is unlikely that completely general results
regarding the path of world welfare will ever exist, it is important that we develop some intuition into the likely path of world welfare. It is this intuition that will guide policy and attitudes regarding the restriction or regulation of preferential trading arrangements. Such restrictions might come from within the confines of the GATT which has as its primary goal the promotion of the optimal pattern of world trade. The extent, then, to which unfettered customs union formation is consistent with this goal should be reflected in GATT policy.

The existing theoretical literature on customs union formation, of which there is a great deal, has devoted substantial effort towards decomposing and quantifying the impact on welfare of a given customs union. The work largely begins with the pioneering effort of Jacob Viner (1950), which introduced the distinction between the trade creating and trade diverting effects of a given customs union mentioned above. A recent review and extension of the literature is to be found in de Melo, Panagariya and Rodrik (1992).

What is noteworthy, however, is that the literature referred to above deals only with the formation of a single customs union. What we actually observe is a dynamic process of more and larger unions being formed. Therefore, the question that appears especially relevant is: Will successive customs union formation lead to increased world welfare? Ultimately, the answer must be yes, if the process leads to its logical culmination in a world consisting of one customs union - a situation of global free trade. Whether or not world welfare increases in the intermediate stages is unclear, but important given the likely event that the process will stop short of free trade.

Krugman (1991) and Deardorff and Stern (1991) represent two recent attempts to identify the effects of dynamic customs union formation. Each provides insight into the path of world welfare under a regime of bilateral trade negotiations by employing very different methodologies. Deardorff and Stern, using a model in which trade conforms to the patterns dictated by comparative advantage, theoretically derive the path of world welfare as the world, through symmetric customs union formation, moves from autarky to free trade. Tariffs are set at a level that prohibits inter-bloc trade while intra-bloc trade is undistorted.
Individual countries differ in terms of technology and endowments. They proceed to derive the expected level of world welfare at each stage. The resulting path of world welfare is a concave function that increases monotonically as the world moves from autarky to free trade. The basic conclusion is that the majority of the gains from trade could be captured by a small group of large trading blocs. "The blocs would only need to be large enough and to include countries with a sufficiently divergent variety of comparative advantages." (Deardorff and Stern, 1991, p. 26) As we will see, the inclusion of non-prohibitive tariffs, and hence the possibility of trade diversion, in the analysis alters this result.

Alternatively, Krugman uses a highly stylized model of differentiated products in which each country produces a single good that is distinguishable from all other goods. Each stage of customs union formation assumes that every country enters into a trading agreement with exactly one country, or pre-existing bloc of countries, at each stage, resulting in symmetrically sized trading blocs; which is similar to the format used by Deardorff and Stern. He finds, in simulations, that world welfare declines with customs union formation until the number of blocs reaches three. Beyond this point CU formation is found to be welfare improving.

Krugman assumes optimal tariff formation, but as Deardorff and Stern point out, his extreme form of product differentiation imposes something very like the Armington assumption; i.e., that goods are differentiated completely on the basis of country of origin. The Armington assumption in this context exaggerates the role of trade diversion (the negative aspect of CU formation) relative to trade creation (the positive aspect). Since trade diversion is most often thought to be welfare reducing, this assumption will produce results for the path of world welfare that are excessively pessimistic.

The present paper sheds new light on the issue of successive customs unions formation. In particular, a computational model of dynamic customs union formation is developed

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1 Conceptually, Krugman's model is identical to one in which each country is endowed with a unique commodity and trading patterns conform to comparative advantage.

2 Tests performed with the model presented here reveal that it is the product differentiation assumption that is directly responsible for the minimal level of welfare at 3 blocs rather than 2.
and used to generate the expected path of world welfare. The model presented here is conceptually similar to that of Deardorff and Stern, with the exception that non-prohibitive tariffs are assumed. As will become clear, this difference permits the discussion of a much broader array of issues.

In brief, the model is based on a world of pure exchange with trading patterns determined by comparative advantage; goods flow from countries in which they are relatively abundant into countries in which they are relatively scarce. In the benchmark case, countries are assumed to set tariffs optimally at all stages. That is, each bloc sets tariff rates to maximize welfare taking the tariffs of the other blocs as given.\(^3\) The path of world welfare is calculated as countries sequentially enter into customs union agreements; asymmetrically sized customs unions are possible.

More precisely, in each period of a sequential game, two countries, or blocs of countries, are selected randomly to eliminate the barriers to trade between them and to impose common external barriers on goods originating in other countries.\(^4\) This process continues until there is a single customs union counting all of the countries in the world as members. The focus of the analysis will be on the expected change in world welfare corresponding to changes in the number of trading blocs. It should be noted that the structure imposed on the model results in an increase in welfare for the customs union collectively, but that one or more members may experience a decline in welfare. That is, with intra-union transfers, all member countries can be made better off by entering into the customs union.

As will be seen, customs union formation is likely to have deleterious effects on world welfare prior to reaching global free trade. The robustness of this result is tested in two ways; first, by altering the distribution of goods across countries, i.e., making the distribution more

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\(^3\) This approach is not a realistic representation of the politics of trade policy. As a single, clearly defined model of the political economy of tariff formation does not exist, this form of external tariff formulation provides a useful starting point. The structure of the model also limits the types of regimes that can be examined. For example, the pure exchange nature eliminates the potential for a pro-producer or pro-consumer bias in determining trade policy.

\(^4\) As there is no single explanation, economic or political, for which countries will likely enter into a preferential trading arrangements, the assumption of random selection will serve as a useful benchmark. Simulations based on particular selection rules will also be presented; e.g., rules based on the relative endowment structure of the countries.
or less equal; and second, by selectively choosing countries to form trading blocs, either the two countries with the most similar pattern of endowments, or the countries with the most different pattern of endowments. The results of these tests reveal that the magnitude of the welfare effect is altered by altering the distribution of goods, but that the direction is not. A more concentrated distribution of goods results in a more extreme decline in world welfare with customs union formation. The results again hold when it is the most similar countries forming a customs union, but when the most different countries are selected we find that world welfare increases at every stage.

Subsequent attention is given to different forms of GATT involvement, or influence on external tariffs, that might affect the path of world welfare with customs union formation. As noted above, the benchmark simulations assume optimal tariffs. To emulate GATT involvement, simulations are performed that assume countries entering into a customs union are somewhat less aggressive. Three simulations are performed assuming that countries set the tariff on each good not higher than the maximum, a trade weighted average, or the minimum of the pre-existing tariffs, respectively. The general result is that in each of these cases world welfare is an increasing function of customs union formation.

Each of the scenarios outlined above provide additional evidence and insight into the likely path of world welfare in a world where preferential trading arrangements are a common form of trade liberalization. It is in this way that this paper builds on and extends the meager literature concerning the dynamic “time-path” of world welfare. The paper proceeds as follows. Section 2 presents a model of customs union formation in a comparative advantage framework, including a discussion of the assumptions and characteristics of the model that particularly influence the results. Section 3 provides simulation results intended to facilitate a discussion of the role played by various characteristics of the world in determining the path of world welfare under a system of PTAs. These characteristics include the degree of specialization of each country; the extent to which it is similar or different countries that enter into trading arrangements; and ways in which the GATT might influence the resulting
common external tariff levels so as to minimize welfare losses. Section 4 concludes and provides a discussion of possible extensions.

2. The Theoretical Model

The model employed is one of \( n \) countries and \( m \) commodities. Each country enters the system as a representative consumer, assumed to maximize a utility function of the following Cobb–Douglas form:

\[
U^i = A \prod_{j=1}^{m} C_{ij}^\sigma,
\]

where \( i \) indexes country and \( j \) indexes goods, subject to the budget constraint

\[
\sum_{j=1}^{m} P_j (1 + \tau_j^i) C_{ij} = \sum_{j=1}^{m} P_j (1 + \tau_j^i) \epsilon_{ij} + \sum_{j=1}^{m} P_j \tau_j^i M_{ij},
\]

where: \( C_{ij} \) is the consumption of good \( j \) in country \( i \); \( \epsilon_{ij} \) is country \( i \)'s endowment of good \( j \); \( M_{ij} \) is the net imports of good \( j \) by country \( i \), \( (C_{ij} - \epsilon_{ij}) \); \( P_j \) is the world price of good \( j \); and \( \tau_j^i \) is the tariff imposed on good \( j \) in country \( i \). The left hand side of the budget constraint is the value of consumption and the right hand side is the value of the endowments including tariff revenue, i.e., national income. It is assumed that each country retains and redistributes the tariff revenue collected at its borders.

It is assumed that there are equal amounts of each good in world supply. Each good is distributed across the \( n \) countries via random draws from a normal distribution with a common pre-specified variance. Each country is, therefore, endowed with some of each good. The endowments are normalized within each country so that the sum of endowments is the same in each country. Given the distribution of goods across countries, this ensures that the countries are approximately the same size, both in terms of quantities and values, calculated at the free trade prices. These assumptions are made to facilitate a greater understanding.

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5 The distribution is given a mean such that the lowest random draw is positive. This rules out negative endowments. While the normal distribution has infinite tails, a sample of random draws from a normal distribution will, in general, have finite tails.

6 Units are chosen such that the free trade prices are the same for each good. Equalizing quantities is therefore equivalent to equalizing the wealth of each country.
of the results by abstracting from changes in welfare due to transfers from large to small countries and from the effects of relatively scarce goods.\footnote{These are important issues that are beyond the scope of this paper; future work will address these issues.}

Utility maximization leads to an expenditure system that allocates a fixed portion of income to the consumption of each good. The derived demand for each good is

\[
C_{ij} = \frac{\sum_{j=1}^{m} P_j \cdot \epsilon_{ij}}{P_j \theta_{ij}},
\]

where

\[
\theta_{ij} = \sum_{k=1}^{m} \left( \frac{1 + \tau_j^i}{1 + \tau_k^i} \right).
\]

Note that the demand for each good is a function of the landed price of that good, \( P_j(1 + \tau_j^i) \). World prices are determined by the requirement that global demand for each good be equal to its fixed supply, i.e.,

\[
\sum_{i=1}^{n} C_{ij} = \sum_{i=1}^{n} \epsilon_{ij}, \quad j = 1, \ldots, m. \tag{4}
\]

Given the assumption that preferences in each country are identical, an appropriate index of world welfare is obtained as the sum of each country's utility,

\[
WU = \sum_{i=1}^{n} U^i.
\]

The results that follow focus on changes in WU corresponding to changes in the global trading environment.

\textbf{Nash Tariff Equilibrium}

At each stage, it is assumed that each country or bloc of countries is pursuing a policy of optimal tariffs, i.e., that the system is at the Nash tariff equilibrium. The Nash tariff equilibrium is characterized by a matrix of tariffs such that each country, or bloc of countries, is maximizing its welfare given the tariffs of the other countries. An algorithm for obtaining the Nash equilibrium tariffs follows.
Equation (3) defines consumption to be a function of prices and own tariffs, $C_{ij} = C(P, \tau^i)$; where $P$ is the vector of world prices and $\tau^i$ is the vector of tariffs levied by country $i$. Equation (4) then defines world prices implicitly as a function of global tariffs, $P = P(\tau)$, where $\tau = [\tau^1, \ldots, \tau^n]$. Solving (4) for $P(\tau)$ and substituting back into (3) results in goods demand equations, $C(\tau)$, depending only on tariff levels. Further substitution into the utility function, equation (1), results in an equation $U(\tau)$ that directly relates each country's utility to $\tau$, the matrix of tariffs for each good in each country.

From $U(\tau)$ the optimal or Nash equilibrium tariffs are derived as the $\tau$ such that, given every other countries tariffs, no country can improve its welfare by altering its tariffs, $\tau^i$. In principle, this equilibrium could be solved for as the $\tau^i$ that solve the first order conditions $\frac{\partial U_i}{\partial \tau_{ij}} = 0$ for each country. In an effort to maintain the general nature of the model, and for computational reasons, the solution is generated by the use of iterative numerical techniques.

The procedure begins with good 1 in country 1. A search is conducted for the tariff on good 1 that maximizes welfare in country 1 subject to all other tariffs in the world being zero. The procedure continues through the remaining tariffs in country 1 and proceeds to do the same for the tariffs in the other countries. At the end of this round we have found the optimal tariffs for each country in the absence of retaliation. Subsequent rounds determine the level of retaliation that is necessary to arrive at the Nash tariff equilibrium.

The second round proceeds along the same lines as the first, searching for the optimal tariffs. This time, however, the tariffs are conditional on the first round tariffs for all of the other countries. This procedure is repeated until no country wishes to alter its tariffs. At this point, the Nash tariff equilibrium has been established and welfare calculations can proceed as outlined above. It should be noted that it was necessary to impose the constraint that taxes/subsidies on exports be zero for the system to have a unique solution.

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8 Endowments are constant and hence not included in the argument string.
9 The first round search is conducted in a range from zero to ten; that is, ad valorem tariff rates in the range of zero to 1,000 percent. Subsequent round searches are conducted within an interval of two surrounding the previous round solution.
10 In only one out of some ten thousand simulations did this procedure fail to converge to the equilibrium.
11 This framework further excludes the analysis of such important elements in CU formation as increasing returns to scale and changes in market structure that accompany the formation of trading blocs.
Customs Union Formation

The next stage of the model involves successive customs union (CU) formation. First, two of the $n$ countries are selected randomly to form a single trading bloc.\(^{12}\) Once these countries have been chosen, the world is characterized as a group of $n - 1$ trading units that are no longer of equal size. Optimal tariffs are calculated for these $n - 1$ trading blocs, as described above, and the resulting level of world welfare is obtained. Welfare is still calculated separately for each country within a bloc, maintaining the assumption that countries are the same size.

The optimal tariffs for the customs union are arrived at by treating the two countries as a single country with an endowment vector equal to the sum of the member country endowments. The vector of common external tariffs is that which maximizes joint welfare. The corresponding consumption levels of each of the goods are calculated for the entire bloc and distributed across the member countries according to the relative wealth of each country valued at the tariff distorted world prices.\(^{13}\) It is possible that one of the countries will be made worse off in the CU than it was standing alone. It can be shown, however, that the country that gains can compensate the country that loses and still be made better off by the agreement. Kemp and Wan (1976) point out that a CU can always be Pareto improving if the CU sets the appropriate external tariffs. It follows then that a CU that does not consider the welfare of extra-union countries can enhance the welfare of each of its member countries and hence that the "winners" can compensate the "losers" when imposing optimal tariffs.

The process of reducing the number of trading blocs then continues. That is, of the $n - 1$ trading blocs, one of which is a bloc of two countries, two are randomly combined. The result will be $n - 2$ trading units, and either there will be two trading units with two member countries and $n - 4$ single countries, or one trading unit with three member countries and $n - 3$ single countries. This process continues until there are no additional trading blocs to be formed, i.e., all countries are included in a single trading bloc. This situation, free trade,

\(^{12}\) As will be seen, selection rules other than random customs union formation can be used.

\(^{13}\) The relative wealth of countries will differ in the tariff distorted equilibrium.
given countries of approximately the same size, will result in the maximum level of world welfare.

A single iteration of the above procedure yields a path of world welfare that is dependent on both the pattern of endowments and the order in which countries are chosen to form customs unions. In order to eliminate this dependency, the procedure is carried out a large number of times. For each iteration, a different distribution of the goods is generated, and the pattern of CU formation is different. The results presented will thus be the expected path of world welfare, conditional only on the number of countries and the number of goods.

3. Results: Welfare Effects of Customs Union Formation

Having developed the model theoretically and computationally, it is a straightforward matter to modify it to address a number of issues. The questions discussed in this section are: (1) what, on average, are the costs or benefits in terms of world welfare of a system that reduces trade barriers through CU formation; (2) how much does it matter what type of world we live in, e.g., how does the distribution of each good across countries matter; (3) does it matter what types of countries form a CU; and (4) how might GATT-imposed restrictions on the common external tariff alter the path of world welfare in a system of CU formation?

The results presented in the following subsections are expectations in the statistical sense. The process described in Section 2, performed only once, will yield a particular path of world welfare dependent on the order in which the countries were randomly selected to form customs unions. For instance, the path of world welfare could be very different if the random process happened to pick the most similar countries than if it happened to pick the most different countries. The following results are thus averages over a large number of simulations. The results presented here are based on 200 iterations of the procedure outlined above.

The first subsection will analyze the base case of the effects of customs union formation. The subsequent subsections will seek to decompose this result and to shed some light
on what might cause the actual experience to deviate from this benchmark case.

General Impact: A Benchmark Case

This section proceeds to calculate the expected path of world welfare with random CU formation. It is difficult to predict what this may look like a priori. While the standard gains from trade arguments suggest that the elimination of the barriers to trade between countries is likely to be welfare enhancing, the imposition of an optimal common external tariff accompanied by retaliation from non-member countries, and the general "beggar-thy-neighbor" qualities of trading blocs cloud the issue. As discussed above, the results can in essence be thought of as the extent to which trade creating forces overshadow the trade diversionary tendencies of trading blocs.

Figure 1 presents the path of world welfare for the benchmark case of bilateralism. The vertical axis measures the deviation from free trade welfare of a given configuration of trading blocs,\(^{14}\),\(^{15}\) and the horizontal axis denotes the number of trading blocs. It is presented in a high-low graph of the expected level of welfare at each configuration along with the maximum and minimum levels of world welfare at the given configuration. The dashed lines are, therefore, the outer envelope of welfare under dynamic customs union formation.\(^{16}\) The solid line in Figure 1 is the expected path of world welfare for a world starting with ten countries and three goods that sequentially combine to form CUs until all countries are members of a single CU, a situation of free trade.

From Figure 1, it is evident that a system of liberalization via CU formation is not likely to be beneficial should the process stop short of free trade. World welfare is found to

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\(^{14}\) Welfare is measured relative to free trade, which is the situation that maximizes world welfare.

\(^{15}\) I have refrained from expressing the results as a fraction of free trade world welfare as the appropriate choice of parameters can yield any fractional deviation that is desired. This is a drawback to most models of this type. Krugman (1991), for example, was able to achieve dramatically different results by varying the elasticity of substitution in consumption.

\(^{16}\) It should be noted that what is depicted is not the same as the optimal path of welfare given a configuration of endowments. The resulting low at a given stage may not lie along the same path as the low in the previous stage. The minimum and maximum reported are specific to the number of trading blocks rather than to a particular path of customs union development.
Figure 1
Benchmark Path of World Welfare

10 Countries, 3 Goods, and 200 Iterations
(With high and low for each # of trading blocs.)

\[ \text{Deviation From Free Trade Welfare} \]

\[ \begin{align*}
\text{Free Trade} \\
10 & 9 & 8 & 7 & 6 & 5 & 4 & 3 & 2 \\
\text{Number of Trading Blocs}
\end{align*} \]

...decline at an increasing rate as the number of trading blocs declines.\(^{17}\) The minimal level of welfare is reached when there are only two large trading blocs, the stage just prior to free trade. This is not to say that all CUs are detrimental since what is reported is an average across many random simulations. Instead, the decline in welfare is a result of the asymmetric changes in welfare caused by the most beneficial and the most detrimental CUs. While the welfare increasing arrangements lead to a very small increase in welfare, significant losses are incurred by the formation of other unions. The result is that on average welfare declines with CU formation.

Interestingly, the lower envelope for world welfare reaches a minimum when there are three trading blocs. The computational structure of the model permits a detailed analysis.
of this phenomenon. The results of such an analysis show that the minimum level of welfare arises when the three blocs are configured as one large trade union, composed of eight of the original countries, and two of the original countries are excluded from the union. Welfare then increases when one of the countries is absorbed into the union. This is quite consistent with fears expressed elsewhere that a tremendous drawback to regionalism is its capacity, perhaps even tendency, to exclude small, perhaps less developed, countries.

It is important to note that an increase in world welfare does not necessarily represent a pareto improvement. The customs unions that form are always beneficial (with transfers) to the member countries, but possibly detrimental to the excluded countries. If world welfare increases, it is likely to be because the gains accruing to the CU exceed the losses experienced by the excluded blocs, rather than that everybody gains.

Figure 2 presents the average tariff rates corresponding to the path of world welfare in Figure 1. What is depicted is the average tariff paid on any good in any transaction involving a positive tariff; thereby including interbloc trade in the calculation. As in Figure 4, the solid line represents the expected average tariff while the dashed lines represent the outer envelope of the average tariffs observed in the 200 iterations.

Not surprisingly, there is an inverse relationship between average tariff levels and world welfare. If the average tariff increases (decreases) with CU formation, world welfare decreases (increases). The path of the average tariff rate is quite interesting. The change in the number of blocs from ten to two results in roughly a tripling of average tariffs, from 25% to 75%. These simulated tariff levels are significantly greater than those actually observed. There are many possible, not mutually exclusive, explanations for this observation. Some examples are: first, there may be greater cooperation between countries, or blocs of countries, than this model assumes; second, the relatively small number of countries taken as the starting point may be a poor representation of the world; and third, goods may be closer substitutes than is assumed in this model, so that each country's market power and

\[18\] Indeed, simulations with a larger number of countries do result in lower optimal tariffs in the initial stages; stages with many trading blocs.
hence optimal tariffs are lower. It is not unlikely that even in this model the average non-cooperative tariff would be much lower if the number of countries more accurately reflected the world configuration.

Two conclusions can be drawn from Figures 4 and 5. First, a system of CU formation is likely to reduce world welfare until there exist two competing blocs of countries. Second, CU formation could lead to significantly higher tariffs than are currently observed. As discussed below, controlling this change in tariffs may prove to be the solution to the problem posed by the increased tendency towards regionalism.

The Effects of Specialization

This section examines the extent to which the degree of specialization affects the dynamic time-path of world welfare under CU formation. Specialization in this framework
is reflected by the variance of the distribution of goods across countries. A greater variance in the distribution of goods implies a greater concentration of each good in a small number of countries and is conceptually the same as increased specialization in production. Figure 3 presents the path of world welfare for three different assumptions regarding the degree of specialization. The three lines each represent CU formation for different worlds, each with goods distributed with a different variance across countries.

The benchmark case of the previous section is included in Figure 3 as the time-path of world welfare for a world in which there is an intermediate degree of specialization. The results for this case hold consistently across different assumptions regarding the degree of specialization. Also from Figure 3, it is apparent that the loss associated with customs union formation is an increasing function of the variance of the distribution of each good across countries. This results from the greater disparity in the endowments between the existing trading blocs at each stage. For example, suppose that there are only two blocs and the first imports goods 1 through \( m_1 \), while the second imports goods \( m_1 + 1 \) through \( m \). Then, as the
variance of the distribution of goods increases, so does the fraction of each bloc’s endowment of its export goods as a fraction of the world endowment. As this percent increases, so does each bloc’s ability to affect its terms of trade. This implies that each country will impose larger tariffs. The larger the tariffs, the larger the deviation from the free trade outcome and hence the larger the decline in world welfare associated with the formation of any given trading bloc.

The general conclusion to be drawn from Figure 3 is that the efforts to refocus trade negotiations away from bilateral methods to multilateral negotiations should increase with beliefs regarding the distribution of resources world-wide; as the variance of the distribution increases, so do the detrimental effects of customs union formation.

Types of CU Formation

This section concerns itself with the extent to which the relative endowments of countries forming CUs matters for world welfare. Riezman (1985) presents a discussion of optimal customs union formation where enhancing economic welfare is the objective of each individual country. A look at the pattern of existing preferential trading arrangements suggests that elements related to the physical proximity of countries perhaps play a greater role than does the enhancement of economic welfare alone. Given this casual observation, this section will analyze CU formation along economic lines that will provide insights into the effects of bilateralism as it is observed.

The starting point for this section will be the assertion that proximity is a significant indicator of differences in countries. That is, the relative endowments of primary factors and the stage of development are highly correlated with proximity. Once this assertion is made, it is reasonable to represent proximity, in this model, with the extent to which individual countries differ in their pattern of endowments.

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19 One way of thinking about this is to make an analogy to the 4-firm concentration ratio. As the concentration of sales within a small number of firms increases, the anticompetitive effects of a merger increase. Similarly, as the good becomes concentrated within a small number of countries, the likelihood that a “merger” of “firms” is more detrimental to world welfare increases.
The results presented correspond to the path of world welfare under three different rules of customs union formation. The first two rules for CU formation are based on a comparison of the endowments of the countries; first, countries with the most similar endowments are selected to form a CU at each stage and second, countries with the least similar endowments are chosen to form a CU. The third selection mechanism is the benchmark case, random CU formation.

Countries are judged to be similar or different based on the following index of relative endowments (RE):

\[ RE_{ik} = \sum_{j} |\delta_{ij} - \delta_{kj}|, \]

where

\[ \delta_{xy} = \frac{P_x \cdot \epsilon_{xy}}{\sum_{j=1}^{m} P_j \cdot \epsilon_{xj}}, \]

is the fraction of the total wealth of country \( x \) derived from its endowment of good \( y \). At each stage, the two countries that yield the lowest (highest) RE are determined to be the most (least) similar. A country that is endowed with relatively more of a given good is said to possess a comparative advantage with respect to that good. This formula will thus select the two countries with the least and most divergent patterns of comparative advantage.

Figure 4 presents the results for the three different scenarios. The graph is to be read in the same way as was Figure 1, with the number of independent trading blocs decreasing from left to right. The top line in Figure 4 is the path of world welfare assuming that the least similar countries form a CU.\(^{20}\) The center line represents random customs union formation. The bottom line assumes customs union formation between the most similar countries. Each of these scenarios is generated holding the distribution of goods across countries constant.

The story told in Figure 4 is that if it is the most different countries that form customs unions, customs union formation should be encouraged. In contrast to all other simulations thus far, welfare increases in every stage. This result is fairly easily explained in terms of

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\(^{20}\) Note that this differs from the preceding section in that this is for a given distribution of goods across countries while the previous section allowed the distribution of goods across countries to vary while forming random CUs.
trade creation and diversion. When the most different countries eliminate their barriers to trade, the potential for trade diversion is greatly reduced. Trade between the "most efficient producer," the largest exporter, and the "least efficient producer," the largest importer, is promoted. While it is possible for trade diversion to occur, any deleterious effects that result are generally overwhelmed by the positive trade creation effects.

At the opposite extreme, if the countries with the most similar endowments erect common barriers to trade, the effects on world welfare are far worse than random customs union formation. This results from the dramatically increased ability of the customs union to affect its terms of trade, leading to higher tariffs and increasingly distorted trade flows. As blocs with very different endowments appear, these symmetrically higher tariffs divert consumption towards that good in which the bloc is well endowed, greatly reducing the volume of trade. The reduced volume of trade implies a lower level of world welfare.

The results of this section imply a possible role for the GATT in a system of bi-
lateral trade arrangements. That is, if the GATT can devise a method of encouraging arrangements between countries with diverse patterns of comparative advantage, bilateral agreements would be more likely to promote rather than to reduce world welfare. In addition, it permits a superficial analysis of the observed trading arrangements. Given that countries seem to enter into such arrangements based on geographical considerations, it seems likely that it is similar countries that are entering into these arrangements, with the exception of Mexico. The European Economic Community has also had significant difficulties integrating the Mediterranean countries, which are less developed, that is, which differ significantly from the original members. The results of this section suggest, therefore, that the observed arrangements are likely to be welfare reducing.

Common External Tariff Formulation

The final issue addressed is the formulation of the common external tariff (CET) for a given customs union. Article XXIV of the GATT states that “barriers should not on the whole be higher or more restrictive than in the constituent territories prior to formation of such a union.” While there are many interpretations of this requirement, some involving the average of tariffs across goods and some that apply a common standard to each good, we will focus here on the effects of a standard applied to each good separately.

Suppose that the above guidelines were taken to mean that the CET for any particular good must not exceed a trade weighted average of the tariff levels in each of the member countries prior to the agreement. Two issues regarding the imposition of such a requirement are examined below. First, what are the expected benefits of such a restriction, and second, are there other guidelines that might further negate the deleterious effects found in the previous sections. As will be discussed below, from a pragmatic point of view, the non-compliance of a CU with any particular restriction must be considered.

21 It has been pointed out that this recommendation could be interpreted as suggesting that the most beneficial customs unions could be between natural resource poor and natural resource rich countries. The fear was subsequently expressed that if this union were between a developed and developing country, this could lead to a faster depletion of the developing countries natural resources than is desirable. I would like to point out that this recommendation is only suggestive and, as with most rules, there are exceptions to it.
production in $B$ and $C$, country $A$ will now import from $C$. Thus the customs union has diverted imports to $A$ away from the most efficient producer and world welfare is reduced. Restrictions placed on the external tariff help to reduce the probability that such diversion occurs by reducing the likelihood that the common external tariff is greater than the cost difference between production in $B$ and $C$.

In addition to the reduction in trade diversion associated with higher external tariffs, the non-member countries will not be induced to increase their barriers in retaliation. As a result, the trade creation resulting from the elimination of the internal barriers to trade will likely outweigh the inevitable trade diverting effects and world welfare improves with customs union formation.

The above suggests that GATT restrictions would eliminate the detrimental effects of CU formation. Inherent in the GATT, however, is a problem of enforcement. There do exist certain "member of the global community" incentives that lead countries to abide by the GATT guidelines. But in the event that the GATT guidelines impose large costs on a particular country, or group of countries, the GATT guidelines could be ignored. As has already been discussed, the cost of wholesale non-compliance with the GATT guidelines is potentially severe. Given this, there is interest in examining the potential loss associated with relaxing the above restriction. Relaxed the guidelines will, at the margin, induce greater compliance with the regulations. Of interest then is the cost, assuming full compliance, of relaxing the rules regarding common external tariff formulation.

Suppose the GATT were to impose the somewhat looser restriction that the common external tariff on imports of a particular good were not to exceed the maximum tariff existing in the constituent territories prior to the arrangement. What would be the cost in terms of world welfare, assuming both scenarios mean full compliance? From Figure 6, it is evident that this would imply a very small reduction in world welfare, and would at the margin result in a greater degree of compliance. Figure 6 further reports the path of world welfare

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23 The common external tariffs of the EEC were never evaluated because it was not certain what to do if they were found to be unacceptable.
Figure 5 presents the pattern of world welfare under two regimes. The top line is the path of world welfare when blocs are restricted to imposing a CET no larger than the trade weighted average of the member country tariffs prior to the formation of a CU. The bottom line is the path of world welfare under random customs union formation and unrestricted common external tariff imposition; that is, the benchmark case.

The benefits of restricting the common external tariff are obvious. Under restricted CET formulation, world welfare is not significantly affected by customs union formation, while under optimal tariffs, welfare declines significantly. This differential arises through the elimination of the trade diverting effects of the increase in monopsony power associated with larger countries. Trade diversion may still occur due to the removal of barriers on intra-union trade, but is largely eliminated. For example, suppose countries A and C form a customs union. If a good was imported into country A from country B prior to the formation of the customs union, it must be that B is the more efficient producer of the good. If the common external tariff of the $[A, C]$ customs union exceeds the cost differential between

22 While the sequence of CU formation is random, the sequence is the same in both scenarios.
under the stricter guideline that the CET not exceed the minimum of the pre-existing tariffs. This is included primarily to illustrate that there is only a marginal payoff to imposing a rather severe upper bound on the common external tariff. If one is sufficiently pessimistic about the degree of compliance likely to accompany any GATT restriction, the small cost of relaxing the restriction and the small benefits associated with a tighter restriction suggest that perhaps the former is more prudent than the latter.

Figure 6 can also be used to loosely discuss the dynamic time-path of world welfare under the assumption that regionalism takes the form of free trade areas (FTAs) rather than customs unions. FTAs are similar to customs unions with the difference being that each country maintains its own set of external tariffs. The scenarios restricting the common external tariffs to their minimum and maximum preexisting values can be thought of as
upper and lower bounds on the time path of world welfare with FTAs. If the countries involved agree not to raise their respective trade barriers, we know that the aggregate rate of protection will lie within these bounds. This is quite a striking result. It says that the sequential formation of FTAs is, in fact, likely to raise world welfare, or at least not likely to lower it. This suggests that free trade areas can indeed serve to complement the multilateral process. If, in fact, FTAs do not reduce world welfare even in the absence of progress in the multilateral arena, FTAs can be looked upon favorably as they have the potential effect of reducing the number of players in any subsequent multilateral negotiations, or at least reducing the number of margins on which multilateral negotiations are pushing.

5. Conclusions

This paper deals with an issue of increasing importance in a world where preferential trading arrangements are the call of the day. The purpose is to provide some insight into the potential costs or benefits associated with sequential customs union formation and to provide some guidelines against which proposed customs unions might be judged. The principle finding of the analysis is that the dynamic time-path of world welfare is likely to decline monotonically with sequential customs union formation. This decline stops, of course, when the final two trading blocs form a trade union and we have global free trade, in which case world welfare is maximized.

The assertion that free trade is the eventual outcome of bilateralism is, however, not certain. More likely is the existence of a small number of large trading blocs. As we have seen, this proposition suggests that sequential customs union formation, left unfettered, is not likely to be beneficial from a global perspective, and will be particularly detrimental should the unions be exclusionary, leaving some countries in the lurch.

The results presented here are generally consistent with the results presented by Krugman. Absent from my results is the somewhat intriguing "pessimal" value of three blocs. As mentioned above, the model presented here suggests that welfare declines monotonically
with a discontinuity between two blocs and a single bloc. The results differ substantially from Deardorff and Stern, who suggest that successive customs union formation results in monotonically increasing world welfare. As discussed in the introduction, the inclusion of only prohibitive tariffs in their analysis is the source of this difference. Where the results presented here diverge from the other studies is in the scope of issues the model will address. More precisely, this model is capable of analyzing a wider variety of tariff setting rules than are either of the other models. In addition, the welfare effects of different patterns of customs union formation have been discussed.

It has been shown that the extent to which PTAs should be thought of as an undesirable phenomenon is related very closely to the extent to which countries differ. If one believes that resources and technology differ dramatically across countries and that the GATT lacks any influence regarding which customs unions are formed, then efforts should be made to shift the emphasis of trade negotiations back to the multilateral arena. It would be useful if further research on this issue were forthcoming.

The results further reveal that arrangements between individual countries that differ significantly, given a world distribution of goods, should be encouraged while those between similar countries should be discouraged. A customs union such as that between the United States and Canada, for instance, is more likely to reduce world welfare than is an agreement between the United States and Mexico. That is not to say that the U.S.–Canada agreement will not enhance the welfare of both countries; in fact, both countries benefit from the formation of a customs union if the appropriate tariffs are set. The reasoning underlying the reduction in world welfare is that a U.S.–Canada customs union possesses a greater ability to increase its terms of trade than does a U.S.–Mexico arrangement. This is a rather discouraging result. Given the close physical proximity of the countries currently participating in preferential trading arrangements the world is likely made worse off by the current set of agreements. This conclusion does, however, rest on the assumption that geographical proximity is a reasonable proxy for comparative advantage.
On a more pragmatic level, it has been shown that the guidelines imposed by GATT could be extremely effective in reducing the costs associated with customs union formation. It has even been shown that these restraints need not be extremely strict to prevent the significant losses in terms of world welfare. A restriction as seemingly innocuous as the maximum of the pre-existing tariffs will largely eliminate the deleterious effects of customs union formation. In addition to the reduction in trade diversion associated with higher external tariffs, the non-member countries will not be induced to increase their barriers in retaliation. As a result, the trade creation resulting from the elimination of the internal barriers to trade will likely outweigh the inevitable trade diverting effects and world welfare will improve with customs union formation.

While this paper has shed light on certain aspects of PTAs, there are a number of issues that have not been addressed. One is the apparent regional aspect of PTAs. This suggests that the endogenization of the customs union partner choice should be investigated further. In addition, it would be useful to explore different tariff setting rules; tariff setting policies that are not intended to reap monopsony benefits, but are instead more consistent with perhaps a conservative social welfare approach, or the protection of particular industries for non-economic objectives. Some mention was made in the text regarding the likely effects of free trade areas. The results presented were merely suggestive. Given the preponderance of free trade areas, the differential effects of customs unions and free trade areas should be examined in greater detail.

A final issue is the extent to which gains in the multilateral arena might offset the losses due to customs union formation. One way of looking at this issue, in the context of this model, is to assume that world tariffs are a declining fraction of the optimal tariffs. For instance, the move from ten blocs to nine involves imposing tariffs that are only 95% of the optimal level and the move from nine to eight blocs involves the imposition of tariffs that are 90% of the optimal level. The declining fraction would be a proxy for success in the multilateral arena concurrent with customs union formation.
Of further interest is the similarity between these results and that of the horizontal merger literature. When two countries that export the same product, i.e., the most similar countries, form a customs union, the "merger" increases their market power and reduces general welfare. A further investigation of this analogy and the incorporation of the insights provided by this literature could prove to be informative.
REFERENCES


