# Customs Unions and Potential World Welfare : a Proof of Viner's Conjecture

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**Abstract**

*Fifty years ago, Viner conjectured that customs unions may reduce the potential world welfare. The purpose of this note is to prove his conjecture rigorously using a simple and straightforward method. With respect to normative economics, this requires to show the possibility that, consecutively to a customs union (or a free trade area), the welfare of any arbitrarily country cannot increase while the welfare of all other countries is held unchanged through assumed international transfers. In order to show this, we construct a model of a world economy where inter-country compensations actually take place and we use it to provide numerical exemples. It is further shown that the deterioration of the potential world welfare may occur even if there is no trade diversion in the Vinerian sense, since substitution effects in consumption are the only cause of welfare changes in our model.*

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# 1. Introduction

Fifty years ago, the contribution of Viner on the customs unions issue has had a dominant impact on economists' thinking on international economic integration. Viner introduced the now familiar concepts of trade creation and trade diversion. To the Contrary of the common belief, Viner stated that customs unions may reduce the world economic efficiency.

Viner's analysis, which lacks precise specification, has been criticized for its implicit assumptions and has been the starting point for a huge literature on the effects of customs unions.[1] However, most of this literature adopts the point of view of one of the member countries alone rather than the point of view of the world as a whole. Such vinerian worldwide efficiency perspertive requires a complete general equilibrium approach of the world trading economy and a relevant criterion for determining world welfare changes. The most significant examples in this direction are due to Meade (1955), Vanek (1965) and Lipsey (1970). Although these authors provided an intuitive understanding of the possibility that a customs union reduce the world economic efficiency, they failed to give rigorous proofs of this result. With respect to standard normative economics, the issue has been better considered by Vanek. Through his concept of world's utility possibility set, Vanek has pointed out the need for a compensation approach. But Vanek's analysis is carried out diagrammatically and is not rigorously explicit.

An important contribution of Kemp and Wan (1976) rehabilitated, in some extent, the pre-vinerian view on customs unions. Kemp and Wan (1976) stated that a customs union can be always pareto-improving when an appropriate common external tariff (CET) and a redistribution inside the union are implemented. The CET required, is one that leaves unchanged trade flows between the customs union and each non-member countries thereby ruling out trade diversion.[2] It follows that customs union formation leads to a potential Pareto improvement within the union while the welfare of non-member countries is unaffected. Of course, the Kemp-Wan theorem, which is an existence result, is not a conclusive refutation of Viner's conjecture.

In more recent years, there has been a rise in the literature studying the effets of sequential customs unions formation on world welfare. The line of research is quite different from that

[1] See Corden (1984, pp. 112-130) for an useful survey of the customs unions theory.
[2] This is a generalisation of the compensating common tariff introduced by Vanek (1965).

of the traditional customs union theory which compares a given particular customs union with some arbitrarily initial situation. This resurgent literature began with a seminal paper by Krugman (1991). Krugman used a highly stylized model to examine the effects of the number of trading blocs on world welfare. In Krugman's analysis, each trading bloc contains the same number of countries and the size of the trading blocs increases symmetrically. Others authors examined different patterns of successive customs unions formation. For example, Bond and Syropoulos (1996) attempt to identify the effects of trading blocs expansion with changes in the relative size of trading blocs. The simulations results we encounter in this literature, show that the world welfare may decline with customs unions formation. However, the analysis is typically developped in terms of (Nash) non-cooperative tariffs setting. Each trading bloc is assumed to set its CET optimally taking the tariffs of the other countries as given. Haveman (1996) considered the case where the customs unions formation follows GATT restrictions on common external tariffs. He suggested that, in this less agressive tariffs setting, the world welfare would rise.[3]

This note is intended to provide a simple and straightforward illustration of the possibility that a customs unions be detrimental to the potential world welfare. In the present note, we will examine that question within the traditional framework. The analysis deals with static effects in a perfectly competitive economy. In that, scale effects and dynamic aspects of economic integration are excluded.

A test of whether a customs union or a free trade area may cause a deterioration of potential world welfare is that any arbitrarily country cannot be made better off while all other countries being held unchanged through appropriate lump-sum transfers. To show this, we construct a model of a world economy with three-countries and three-goods where inter-country compensations actually take place. Then, we use this framework to generate numerical examples.

## II. The Model

Consider a simple pure exchange economy model consisting of three countries (indexed by $k$), and three goods (indexed by $i$). Each country has a single consumer . The preferences over goods are identical accross countries and are represented by a Cobb-Douglas utility function:

$$U^k(x_1^k, x_2^k, x_3^k) = (x_1^k)^{1/3}(x_2^k)^{1/3}(x_3^k)^{1/3}, \qquad k = 1,2,3.$$

[3] It is worth noting that Haveman (1996), Bond and Syropoulos (1996) employ respectively an utilitarian and a

Each country *k* has an initial endowment of each good *i* denoted by $\omega_i^k$. We assume that total world endowment of each good equals 100. This endowment is divided among countries so that each country exports a particular good (country 1 exports good 1, country 2 exports good 2,...) and imports the other goods at equilibrium. Precisely, we allow to each country 3/4 of the world endowment of its exported good, the rest of the endowment being equally allocated between the other countries: $\omega_i^k = 75$ if $k = i$ and $\omega_i^k = 12{,}5$ if $k \neq i$.

Note that by using a pure exchange economy model, there will be no vinerian trade diversion effect since by definition no production effect will occur. The only cause of welfare changes in our model are then consumption effects.

We assume that each country imposes *ad valorem* tariff rates on their imports. It follows that in each country the consumer faces domestic prices: $p_i^k = (1 + t_i^k) p_i$ , $i = 1,2,3$ with $t_i^k = 0$ if $k = i$. Where $p_i$ is the world price of good *i* and $t_i^k$ is the tariff rate charged by country *k* on good *i*. We normalize world prices by setting $p_3 = 1$ so that $p_1$ and $p_2$ are relative prices of goods 1 and 2 in terms of good 3. For each country the revenue from tariffs equals:

$$r^k = \sum_{i=1}^{3} t_i^k \, p_i \, (x_i^k - \omega_i^k), \qquad k = 1,2,3.$$

We assume that this revenue is redistributed to the consumer in a lump-sum fashion.

To predict the effect of removing tariffs on potential world welfare, we fix the utility levels in two of the countries by assuming international transfers. Then, we observe the impact on the utility level of the third country. Clearly, when the later decreases, holding steady the utilities in the other countries, we can say that potential world welfare is lower. Without loss of generality, we choose to freeze the level of utility in the countries 2 and 3.

The minimum cost of achieving fixed utility levels in countries 2 and 3 ($\overline{U}^2$ and $\overline{U}^3$) are given by the expenditure functions: $E^2(p_1, p_2, \overline{U}^2)$ and $E^3(p_1, p_2, \overline{U}^3)$ . The corresponding compensated demand functions in countries 2 and 3: $x_i^{ck}(p_1, p_2, \overline{U}^k)$, $i = 1,2,3$, $k = 2,3$ are derived by solving the following problems:

$$\begin{aligned} &Min \;\; (1+t_1^2)p_1x_1^2 + p_2x_2^2 + (1+t_3^2)x_3^2 \\ &s.t: \;\; (x_1^2)^{1/3}(x_2^2)^{1/3}(x_3^2)^{1/3} = \overline{U}^2 \end{aligned} \qquad \begin{aligned} &Min \;\; (1+t_1^3)p_1x_1^3 + (1+t_2^3)p_2x_2^3 + x_3^2 \\ &s.t: \;\; (x_1^3)^{1/3}(x_2^3)^{1/3}(x_3^3)^{1/3} = \overline{U}^3 \end{aligned}$$

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weighted sum social welfare function of each country's utility as an index of world welfare.

Substitute the solution into the objective function give us the expenditure function in countries 2 and 3.

If there are no international transfers, in each country the income available for the consumer equals the value of initial endowment plus the tariff revenue. It follows that a way to keep utility levels in countries 2 and 3 constant is to give the difference (positive or negative) between that income and the minimum expenditure necessary to achieve these levels of utilities. Let $b^2$ and $b^3$ designate the net transfer payments made by country 1 to countries 2 and 3 to keep utilities $\overline{U}^2$ and $\overline{U}^3$ fixed.

$$b^2 = (1+t_1^2)p_1\omega_1^2 + p_2\omega_2^2 + (1+t_3^2)\omega_3^2 + r^2 - E^2(p_1, p_2, \overline{U}^2),$$
$$b^3 = (1+t_1^3)p_1\omega_1^3 + (1+t_2^3)p_2\omega_2^3 + \omega_3^3 + r^3 - E^3(p_1, p_2, \overline{U}^3).$$

We can now solve the problem for the price-taker consumer in country 1. It involves maximizing its utility function subject to the budget constraint. The latter implies that total expenditure must equal the value of initial endowment plus the tariff revenue and any net transfers to countries 2 and 3. That is:

$$Max \quad (x_1^1)^{1/3}(x_2^1)^{1/3}(x_3^1)^{1/3}$$
$$st: \quad p_1(x_1^1 - \omega_1^1) + (1+t_2^1)p_2(x_2^1 - \omega_2^1) + (1+t_3^2)(x_3^1 - \omega_3^1) = r^1 + b^2 + b^3$$

The world market equilibrium conditions of the model are:

$$x_1^1(p_1, p_2) + x_1^{c2}(p_1, p_2, \overline{U}^2) + x_1^{c3}(p_1, p_2, \overline{U}^3) = \omega_1^1 + \omega_1^2 + \omega_1^3$$
$$x_2^1(p_1, p_2) + x_2^{c2}(p_1, p_2, \overline{U}^2) + x_2^{c3}(p_1, p_2, \overline{U}^3) = \omega_2^1 + \omega_2^2 + \omega_2^3$$
$$x_3^1(p_1, p_2) + x_3^{c2}(p_1, p_2, \overline{U}^2) + x_3^{c3}(p_1, p_2, \overline{U}^3) = \omega_3^1 + \omega_3^2 + \omega_3^3$$

## III. Simulations

Holding numerical values for tariffs and utilities constant, the above system can be solved to determine the equilibrium values of the relative world prices.[4] From this, the corresponding utility level in country 1 can easily be found.

Starting from an initial arbitrary situation, it is then possible to observe changes in the utility in country 1 as a result of establishing a customs unions or a free trade area. Without loss of generality, we consider that the preferential trading arrangement occurs among countries 1 and 2. To compute a free trade area (FTA) between these two countries, we simply eliminate tariffs on their respective export goods while retaining tariffs on the third good. To compute a customs union, we need to choose a CET. The latter can be established in a variety of method. Reflecting a customs union as a trade liberalizing process, we consider two rules of common external tariff determination which are compatible with WTO's requirements.[5] The first rule ($CU_1$) is the arithmetic average of the pre-union tariffs of member countries. The second rule ($CU_2$) is the minimum of the pre-union tariffs of member countries.[6] Concerning the redistribution scheme for the common tariff revenue, we assume, as in the FTA case, that each member country retains the tariff revenues from its own imports from the rest of the world.[7] Experimentation with alternative values of tariffs produced the following examples:

Table 1

| | $t_2^1$ | $t_3^1$ | $t_1^2$ | $t_3^2$ | $t_1^3$ | $t_2^3$ | $U^1$ |
|---|---|---|---|---|---|---|---|
| Initial situation | 0.2 | 0.2 | 0.4 | 0.4 | 0.6 | 0.6 | 38.736 |
| FTA | 0 | 0.2 | 0 | 0.4 | 0.6 | 0.6 | 38.717 |
| $CU_1: t_3^u = (t_3^1 + t_3^2)/2$ | 0 | 0.3 | 0 | 0.3 | 0.6 | 0.6 | 38.713 |
| $CU_2: t_3^u = Min(t_3^1, t_3^2)$ | 0 | 0.2 | 0 | 0.2 | 0.6 | 0.6 | 38.982 |
| For $\overline{U}^2 = \overline{U}^3 = 30$ | | | | | | | |

[4] By Walras' law, one of the market equilibrium conditions is redundant.
[5] This is quite different from Nash noncooperative strategy of tariffs determination asssumed in recent literature on regional trading blocs.
[6] Another possible rule is that proposed by Kemp and Wan (1976). While interesting in itself, the Kemp-Wan tariff setting has no relance here since it ensures that the customs union is always potentially beneficial.
[7] This simply avoid to modify the specification of our model. The latter describing automatic international redistribtion of countries tariff revenues.

Table 2

| | $t_2^1$ | $t_3^1$ | $t_1^2$ | $t_3^2$ | $t_1^3$ | $t_2^3$ | $U^1$ |
|---|---|---|---|---|---|---|---|
| Initial situation | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 38.391 |
| FTA | 0 | 0.3 | 0 | 0.5 | 0.6 | 0.7 | 38.32 |
| $CU_1: t_3^u = (t_3^1 + t_3^2)/2$ | 0 | 0.4 | 0 | 0.4 | 0.6 | 0.7 | 38.31 |
| $CU_2: t_3^u = Min(t_3^1, t_3^2)$ | 0 | 0.3 | 0 | 0.3 | 0.6 | 0.7 | 38.598 |
| For $\overline{U}^2 = \overline{U}^3 = 30$ | | | | | | | |

Table 3

| | $t_2^1$ | $t_3^1$ | $t_1^2$ | $t_3^2$ | $t_1^3$ | $t_2^3$ | $U^1$ |
|---|---|---|---|---|---|---|---|
| Initial situation | 0.2 | 0.3 | 0.3 | 0.4 | 0.8 | 0.9 | 38.148 |
| FTA | 0 | 0.3 | 0 | 0.4 | 0.8 | 0.9 | 37.991 |
| $CU_1: t_3^u = (t_3^1 + t_3^2)/2$ | 0 | 0.35 | 0 | 0.35 | 0.8 | 0.9 | 37.978 |
| $CU_2: t_3^u = Min(t_3^1, t_3^2)$ | 0 | 0.3 | 0 | 0.3 | 0.8 | 0.9 | 38.142 |
| For $\overline{U}^2 = \overline{U}^3 = 30$ | | | | | | | |

The range of tariff rates which results in a lowering of $U^1$ in the tables proves that a free trade area or a customs union may well have negative effects on the potential world welfare. This, because the welfare of at least one country declines while the welfare levels of the others are kept constant by assumed international transfers.[8] Of course, our results cannot be considered as pathological since in our model all goods are substitutes and none of them are inferior.

Moreover, our third example shows that the potential world welfare can be deteriorated even when the customs union adopt the lowest member's pre-union tariff. This contradicts the presumption that the world welfare would rise with customs union formation if the setting of the common external tariffs follows GATT (now WTO) guidelines.[9]

It is worth noting that our results occur in absence of trade diversion in the Vinerian sense. Even if there is no shift in production in our model, a customs union causes changes in imports and consumption patterns. This underline the importance of substitution effects in

[8] Of course, whatever we say here concerning a world composed of countries of one representative consumer is valid for a world composed of countries with arbitrary numbers of different inhabitants.
[9] As suggested for example by Haveman (1996).

consumption pointed out by Lipsey (1957, 1960). The latter were usually introduced in the literature to show that a trade-diverting customs union may be welfare improving. Here, it is shown that these effects may well have a negative impact on the potential world welfare.

Of course these simulations, which do not refer to real-world data, are purely illustrative and have no relevance from an empirical point of view. They have mainly an analytical interest. While the conclusion is certainly not surprising, we believe that the methodology employed here is more rigorous and straightforward than in previous treatments.

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