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Are the Concepts of Creating and Diverting of Trade Flows Relevant to the Measurement of Net Welfare?

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ABSTRACT

This paper deals with the problem of assessing the net effect of economic integration on the welfare of the populations of the countries concerned. Viner's pioneering work in 195 concluded that any economic integration necessarily creates a trade creation effect and a trade diversion effect, but this assessment was ambiguous. In fact, the obligatory and concomitant existence of trade creation and trade diversion effects means that it is no longer possible to accurately determine the net effects of economic integration on the welfare of the populations of the countries concerned without first accurately assessing these effects, which can only be done ex-post. Resolving this problem of ambiguity therefore appears to be a major problem for theorists and practitioners of economic integration. We establish that the effect of creating and diverting trade flows does not play a role in assessing the net welfare effect of economic/trade integration. Our conclusion is that neither Jacob Viner's conclusion in 1950 nor Krugman's in 1991 is well-founded.

Key Words: Economic integration - Traffic creation - Traffic diversion - Net welfare effect - Trade policy.

JEL Classification: F02; F13; F15.

INTRODUCTION

The concepts of trade creation and trade diversion introduced by Viner in 1950 are still very much at the heart of the assessment of the net welfare effects of economic integration processes, despite the many reservations they have aroused and continue to arouse.

For Viner (1950), any economic integration necessarily creates two effects on trade flows (the creation of trade flows and the diversion of trade flows), the net effect of which on the social welfare of the countries concerned is ambiguous, since while the creation of trade flows improves social welfare, the diversion of trade flows worsens social welfare. Consequently, it is not possible to predict a priori the net effect of economic or trade integration on the welfare of the countries concerned. Therefore, economic or trade integration is only acceptable if the effect of creating trade flows is greater than the effect of diverting trade flows.

Viner's conclusion triggered a wave of controversy either to explain it or to go beyond it. For some, such as Meade (1955), Gehrels (1956 and 1957) and Lipsey (1957 and 1960), Viner's conclusion is mainly the result of his assumption that consumption structures are fixed, so that it is a partial equilibrium analysis. For others such as Cooper and Massell (1965), Corden (1972), Venables (1990) and Baldwin and Venables (1995) it is the postulate of pure and perfect competition on which his analysis is based that leads to this conclusion. For still others (Baldwin; 1992, Venables; 1989, Berehns et al; 2007) it is the static and economically focused nature of[1] that explains Viner's conclusion. Finally, for Kemp and Wan (1976), it is because Viner's analysis does not take into account the mechanisms for compensating for trade losses caused by economic integration that it

[1] An economic-centred analysis along the lines of Perroux's (1958) criticism of neo-classical analyses.

reaches this conclusion. All in all, it has to be said that the concepts of creation and diversion remain the benchmark for assessing the welfare effects of economic integration.

In this respect, acceptance of this conclusion from Viner's (1950) work was bolstered by Krugman's (1991) findings, according to which the analysis by Kemp and Wan (1976) demonstrates that it is possible to conceive of a process of economic integration following which the change in the welfare of each of the partner countries is positive. In this case, what matters is the political analysis of the economic integration process. The task then becomes to investigate whether or not the economic integration process will lead to the establishment of a protectionist system. This view is evident in numerous empirical studies, particularly the most recent ones: Jinji and Kamata (2020), Romo (2001), Chatri and Essadiqi (2026), Hayakawa and Keola (2025), Hu and*al.* (2025), Kumari (2025), Manocha (2025), Thangavelu and *al.* (2021), Madhur (2013), Bano and *al.* (2013), etc.

However, there have been some dissenting voices in the empirical literature: Moran (1967) found both types of effect to be very weak, whilst Ghosh and Yamarik (2004) found no evidence of either a creation effect or a trade diversion effect in commercial agreements.

Beyond the controversies raised by these two concepts, it is the conclusion that the net effect of any economic integration on the well-being of member countries remains ambiguous that poses a problem in itself. In fact, if economic agents are rational, we can assume that a group formed by them is also rational, regardless of the method used to aggregate them[2] . Under these conditions, Viner's conclusion that, a priori, it is impossible to know whether a given country's participation in a process of economic integration is favourable or unfavourable poses a problem. The intuition behind this thinking is that it seems impossible for rational economic agents (countries) to make a choice without taking into account whether or not it is to their advantage.

Although the transparency mechanism of the World Trade Organisation's (WTO) regional trade agreements[3] does not explicitly refer to the concepts of creating and diverting trade flows, the requirements relating to customs duties do suggest their usefulness in this area, particularly through the issue of tariff rearrangement.

As a matter of fact, the Brexit also raises the broader question of whether it is in a country's interest to join or be part of a process of economic and commercial integration. Indeed, political games aside, it was the conviction of a majority of British voters that the costs of the European Union outweigh the benefits for their country that led to the vote in favour of Britain's exit from it. Britain's withdrawal raises the question of how to assess the effects of economic and trade integration for a given country, given that the UK joined the European Economic Community (now the European Union) in 1973, some 16 years after its creation.

The question then arises as to whether it is really impossible to determine ex-ante the net effect of economic/trade integration without including the effects of creating and diverting trade flows. Put another way, is it relevant to consider that countries can embark on a process of economic integration without knowing whether this process is favourable to them or not?

Our aim in this paper is to demonstrate that it is not only possible to determine a priori the conditions for improving the welfare of the countries concerned by economic integration, but also that these conditions do not depend on the effects of creating and diverting trade flows.

To show this, we carry out an analysis in terms of commercial policy on an algebraic basis of a comparative static type. Our hypotheses are general ones.

This document is organised into ten sections. Section 2 presents the trade policy model by describing a world economy and its main characteristics. Section 3 presents the characteristics of the autarkic equilibrium for each country in the world. The characteristics of the free trade equilibrium are presented in Section 4. Section 5 presents the characteristics of country C when it introduces tariffs on its imports. Section 6 presents the characteristics of country C when countries C and B establish a customs union. Section 7 analyses the effects of a customs union between countries C and B on

[2] I'm thinking here of Arrow's impossibility theorem or Condorcet's Paradox.

[3] https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=r:/WT/L/671.pdf&Open=True

the characteristics of country C compared to its equilibrium characteristics in the presence of tariffs. Section 8 analyses the effects of establishing a customs union between countries C and B on the characteristics of country C compared to its characteristics in free trade equilibrium. Section 9 concludes our analysis.

The global economy

Consider a world with three countries A, B and C and a homogeneous good. Assume that each of these three countries supplies and demands this homogeneous good according to linear relationships. In particular, assume that the supply and demand functions of each country, for the homogeneous good, are linear. To be precise, let's consider each of the three countries.

Country A

The demand and supply functions for country A are as follows.

$$Q_d^A = a - kP \quad (1).$$

The demand function of country A where, Q_d^A is the quantity demanded of the homogeneous good in country A; P is the price of the homogeneous good on the market of country A and k et a are positive parameters; i.e. $a > 0$ et $k > 0$.

$$Q_s^A = -b + kP \quad (2).$$

The supply function of country A where Q_s^A is the quantity offered of the homogeneous good in country A; P is the price of the homogeneous good on the market of country A; k is a positive parameter and b is a positive non-zero parameter; i.e. $b > 0$ and $k > 0$.

Country B

Country B's demand and supply functions are as follows.

$$Q_d^B = ma - kP \quad (3)$$

The demand function of country B where, Q_d^B is the quantity demanded of the homogeneous good in country B; P is the price of the homogeneous good on the market of country A and k, a and m are positive parameters with a particular value for m; i.e. $a > 0,\ k > 0$

$$Q_s^B = -mb + kP \quad (4).$$

The supply function of country B where Q_s^B is the quantity offered of the homogeneous good in country B; P is the price of the homogeneous good on the market of country B; k is a positive parameter and b is a positive non-zero parameter; i.e. $b > 0$ et $k > 0$.

Country C

Country C's demand and supply functions are asfollows.

$$Q_d^C = na - kP \quad (5).$$

The demand function of country C where, Q_d^C is the quantity demanded of the homogeneous good in country C; P is the price of the homogeneous good on the market of country C and k et a are positive parameters; i.e. $a > 0$ et $k > 0$.

$$Q_s^C = -nb + kP \quad (6).$$

The supply function of country C where Q_s^C is the quantity offered of the homogeneous good in country C; P is the price of the homogeneous good on the market of country C; k and n are positive parameters and b is a positive parameter; i.e. $b > 0,\ k > 0$.

For each of the countries A, B and C, we assume that:

$$a > b \quad (7).$$

$$n > m > 1 \quad (8).$$

Assumptions (7) and (8) are simplifying assumptions which also make it possible to describe normal demand and supply of goods.

Characteristics of Autarkic Equilibrium

Let's determine the characteristics of trade equilibrium in a situation of autarky for each of the three countries that make up our world. In a situation of autarky, there will be equilibrium in each country if domestic demand is equal to domestic supply of the homogeneous good.

Country A

Equilibrium condition: $Q_d^A = Q_s^A \Rightarrow \begin{cases} a - kP = -b + kP \\ a + b = 2kP \end{cases}$ Thus, we have the following relationship:

$$P_a^A = \frac{a+b}{2k} \quad (9).$$

The quantity produced and consumed of the homogeneous good in a situation of autarky in country A will be as follows:

$Q_d^A = Q_s^A = \frac{a-b}{2}$, this value is positive by assumption (equation 7).

Country B

Equilibrium condition: $Q_S^B = Q_d^B \Rightarrow \begin{cases} ma - kP = -mb + kP \\ m(a+b) = 2kP \end{cases}$ Thus, we have the following relationship:

$$P_a^B = \frac{m(a+b)}{2k} \quad (10).$$

The quantity produced and consumed of the homogeneous good in a situation of autarky in country B will be as follows :

$Q_d^B = Q_s^B = \frac{m(a-b)}{2}$, this value is positive by assumption $a > b$ (equation 7).

Country C

$$Q_d^C = Q_s^C \Rightarrow \begin{cases} na - kP = -nb + kP \\ n(a+b) = 2kP \end{cases}$$

Equilibrium condition: , thus, we have the following relationship:

$$P_a^C = \frac{n(a+b)}{2k} \quad (11).$$

The quantity produced and consumed of the homogeneous good in a situation of autarky in country C will be as follows:

$Q_s^C = Q_d^C = \frac{n(a-b)}{2}$, this value is positive by assumption $a > b$ (equation 7).

We find that the most competitive country is country A and the least competitive country is country C. We will therefore focus our analysis on the characteristics of country C and the effects of establishing a customs union between countries B and C on these characteristics. The logic of the trade diversion effect implies that in a customs union, country C is the most likely to generate the highest trade diversion effects.

Free Trade Equilibrium

Let's determine the characteristics of the trade equilibrium under free trade for each of the three countries that make up our world.

Determining the world price in a free trade equilibrium

In a free trade situation, equilibrium exists when the sum of demand equals the sum of supply, i.e. the sum of net demand is zero. So, let's start by calculating the net demand of each country, i.e.:

$\sum_i E_i = 0$ with $E_i = Q_d^i - Q_s^i$ and . $i = \{A, B, C\}$

Country A

Net demand : $E_A = a - kP - (-b + kP) = (a+b) - 2kP$

Country B

$E_B = ma - kP - (-mb + kP) = m(a+b) - 2kP$

Country C

$E_C = na - kP - (-nb + kP) = n(a+b) - 2knP$

$\sum_i E_i = (a+b) - 2kP + m(a+b) - 2kP + n(a+b) - 2knP$

$\sum_i = (a+b)(1+m+n) - 6kP$

$$\Rightarrow \sum_i E_i = 0 \Leftrightarrow (a+b)(1+m+n) - 6kP = 0$$

International balance

Let $P_{le} = \dfrac{(a+b)(1+m+n)}{6k}$ (12).

Where P_{le} is the free-trade equilibrium price.

Equilibrium characteristics in country A

Quantity required: $Q^A_{dle} = a - kP_{le}$

$$Q^A_{dle} = a - k\left(\frac{(1+m+n)(a+b)}{6k}\right)$$

$$Q^A_{le} = \frac{6a - (1+m+n)(a+b)}{6}$$

Quantity produced: $Q^A_{sle} = -b + kP_{le}$

$$Q^A_{sle} = -b + k\frac{(1+m+n)(a+b)}{6k}$$

$$Q^A_{sle} = \frac{-6b + (1+m+n)(a+b)}{6}$$

Let's demonstrate by absurdity that $Q^A_{dle} > 0$ and $Q^A_{sle} > 0$. Let us assume that:

$Q^A_{dle} > 0 \Rightarrow 6a > (a+b)(1+m+n).....(a)$

et

$Q^A_{sle} > 0 \Rightarrow (a+b)(1+m+n) > 6b.....(b)$

$(a)+(b) \Rightarrow 6a + (a+b)(1+m+n) > 6b + (a+b)(1+m+n) \Rightarrow a > b$ which is true by definition (equation 7).

Equilibrium characteristics in country B

Quantity required: $Q^B_{dle} = ma - kP_{le}$

$$Q^B_{dle} = ma - k\left(\frac{(a+b)(1+m+n)}{6k}\right)$$

$$Q^B_{dle} = \frac{6mb - (a+b)(1+m+n)}{6}$$

Quantity produced: $Q^C_{sle} = -nb + kP_{le}$

$$Q_{sle}^{B}=\frac{-6mb+\left(a+b\right)\left(1+m+n\right)}{6}$$

We can also demonstrate by absurdity that $Q_{dle}^{B}>0$ and $Q_{sle}^{B}>0$

Equilibrium characteristics in country C

Quantity required: $Q_{dle}^{C}=na-kP_{le}$

$$Q_{dle}^{C}=\frac{6na-\left(a+b\right)\left(1+m+n\right)}{6}$$

Quantity produced: . $Q_{sle}^{C}=-nb+kP_{le}$

$$Q_{sle}^{C}=\frac{-6nb+\left(a+b\right)\left(1+m+n\right)}{6}$$

We can also demonstrate by absurdity that $Q_{dle}^{C}>0$ and $Q_{sle}^{C}>0$.

Imports from country C

$$\left.\begin{aligned}&M_{le}^{C}=Q_{dle}^{C}-Q_{sle}^{C}\\&Q_{dle}^{C}=\frac{6na-\left(a+b\right)\left(1+m+n\right)}{6}\\&Q_{sle}^{C}=\frac{-6nb+\left(a+b\right)\left(1+m+n\right)}{6}\end{aligned}\right\}\Rightarrow M_{le}^{C}=\frac{6na-\left(a+b\right)\left(1+m+n\right)}{6}-\frac{-6nb+\left(a+b\right)\left(1+m+n\right)}{6}$$

$$\Rightarrow M_{le}^{C}=\frac{\left(a+b\right)\left(2n-m-1\right)}{3}$$

Note that $M_{le}^{C}>0$ if and only if $2n>m+1$.

Consumer surplus in country C

$$\left.\begin{aligned}&Sc_{le}^{C}=\frac{1}{2}\left(P_{\max}^{C}-P_{le}\right)\times Q_{dle}^{C}\\&Q_{dle}^{C}=\frac{6na-\left(a+b\right)\left(1+m+n\right)}{6}\\&P_{\max}^{C}=\frac{na}{k}\\&P_{le}=\frac{\left(a+b\right)\left(1+m+n\right)}{6k}\end{aligned}\right\}\Rightarrow Sc_{le}^{C}=\frac{1}{2}\left(\frac{na}{k}-\frac{\left(a+b\right)\left(1+m+n\right)}{6k}\right)\times\left(\frac{6na-\left(a+b\right)\left(1+m+n\right)}{6}\right)$$

$$Sc_{le}^{C}=\frac{1}{2k}\left(\frac{6na-\left(a+b\right)\left(1+m+n\right)}{6}\right)^{2}\qquad(13).$$

Producer surplus in country C

$$\left.\begin{aligned} Sp_{le}^{C} &= \frac{1}{2}\left(P_{le} - P_{\min}^{C}\right)\times Q_{sle}^{C} \\ P_{le} &= \frac{(a+b)(1+m+n)}{6k} \\ P_{\min}^{C} &= \frac{nb}{k} \\ Q_{sle}^{C} &= \frac{-6nb+(a+b)(1+m+n)}{6} \end{aligned}\right\} \Rightarrow Sp_{le}^{C} = \frac{1}{2}\left(\frac{(a+b)(1+m+n)}{6k} - \frac{nb}{k}\right)\times\left(\frac{-6nb+(a+b)(1+m+n)}{6}\right)$$

$$Sp_{le}^{C} = \frac{1}{2k}\left(\frac{-6nb+(a+b)(1+m+n)}{6}\right)^{2} \quad (14).$$

Customs revenue

$$R_{le}^{C} = 0 \text{ because } t = 0 \quad (15).$$

Welfare or social surplus of the country C

$$W_{le}^{C} = Sc_{le}^{C} + Sp_{le}^{C} \quad (16).$$

International Equilibrium in the presence of customs duties

To determine the characteristics of the equilibrium in the presence of customs duties, it is necessary to explain the nature of the countries in world trade. To do this, we need to study the order of magnitude between the four prices determined above, namely: $P_a^A; P_a^B; P_a^C; P_{le}$.

Nature of countries A, B and C

In particular, we need to calculate $\left(P_a^A - P_a^B\right); \left(P_a^A - P_a^C\right); \left(P_a^A - P_{le}\right); \left(P_a^B - P_a^C\right)$ and $\left(P_a^B - P_{le}\right)$ or $\left(P_a^C - P_{le}\right)$.

- $P_a^B - P_a^A = \frac{m(a+b)}{2k} - \frac{(a+b)}{2k} = \frac{(a+b)(m-1)}{2k} > 0$ because $m > 1$ by hypothesis. So, $P_a^B > P_a^A$.
- $P_a^C - P_a^B = \frac{n(a+b)}{2k} - \frac{m(a+b)}{2k} = \frac{(a+b)(n-m)}{2k} > 0$ because $n > m$ by hypothesis. So, $P_a^C > P_a^B$.

- $P_{le} - P_a^C = \frac{(a+b)(1+m+n)}{6k} - \frac{n(a+b)}{2k} = \frac{(a+b)(1+m+n-3n)}{6k} = \frac{(a+b)(1+m-2n)}{6k} < 0$ because $2n > m+1$. Indeed, $m > 1 \Rightarrow 2m > m+1$ or $n > m \Rightarrow 2n > 2m \Rightarrow 2n > m+1$. So, $P_{le} < P_a^C$.
- $P_{le} - P_a^B = \frac{(a+b)(1+m+n)}{6k} - \frac{m(a+b)}{2k} = \frac{(a+b)(1+m+n-3m)}{6k} = \frac{(a+b)(1+n-2m)}{6k}$.

Two situations are possible: 1) $P_{le} - P_a^B > 0$, (the economies of countries B and C are both less competitive than the global economy) and 2) $P_{le} - P_a^B < 0$ (global productivity is framed by that of the two countries).[4]

We can see that: 1) $P_{le} - P_a^B > 0$ if and only if $n > 2m-1$ and 2) $P_{le} - P_a^B < 0$ if and only if $n < 2m-1$. We will therefore assume that:

1) $n > 2m-1$ (17).

2) $n < 2m-1$ (18).

Two possible situations therefore need to be taken into account:

$$P_a^A < P_a^B < P_{le} < P_a^C \quad (19).$$

$$P_a^A < P_{le} < P_a^B < P_a^C \quad (20).$$

The import price of the homogeneous good in country C is as follows:

$$P_t^C = P_{le}(1+t) = \frac{(a+b)(1+m+n)(1+t)}{6k} \quad (21).$$

Quantity requested in country C

$$\left.\begin{aligned} Q_{dt}^C &= na - kP_t^C \\ P_t^C &= \frac{(a+b)(1+m+n)(1+t)}{6k} \end{aligned}\right\} \Rightarrow Q_{dt}^C = na - k\left[\frac{(a+b)(1+m+n)(1+t)}{6k}\right]$$

$$Q_{dt}^C = \frac{6na - (a+b)(1+m+n)(1+t)}{6} \quad (22).$$

Quantity produced in country C

[4] These two situations can be interpreted in several ways. In particular, they can reflect countries' level of development. They can also reflect the level of comparative advantage of countries. In either interpretation, they make it possible to model the various situations opposing economic/trade integration between developing countries on the one hand (case 1) and economic/trade integration between developed countries alone or mixed economic/trade integration (involving developed and developing countries) on the other (case 2).

$$\left.\begin{aligned} Q_{st}^{C} &= -nb + kP_t^{A} \\ P_t^{C} &= \frac{(a+b)(1+m+n)(1+t)}{6k} \end{aligned}\right\} \Rightarrow Q_{st}^{C} = -nb + k\left[\frac{(a+b)(1+m+n)(1+t)}{6k}\right]$$

$$Q_{st}^{C} = \frac{-6nb + (a+b)(1+m+n)(1+t)}{6} \quad (23).$$

Let's demonstrate by absurdity that $Q_{dt}^{C} > 0$ and $Q_{st}^{C} > 0$.

Quantity imported by country C

$$\begin{aligned} M_t^{C} &= Q_{dt}^{C} - Q_{st}^{C} \\ &= \frac{6na - (a+b)(1+m+n)(1+t)}{6} - \frac{-6nb + (a+b)(1+m+n)(1+t)}{6} \\ &= \frac{6n(a+b) - 2(a+b)(1+m+n)(1+t)}{6} \end{aligned}$$

$$M_t^{C} = \frac{2(a+b)\left(3n - (1+m+n)(1+t)\right)}{6} \quad (24).$$

We can see that $M_t^{C} > 0$ if and only if $3n > (1+m+n)(1+t)$. We now assume that:

$$3n > (1+m+n)(1+t) \quad (25).$$

Consumer surplus in country C

$$\begin{aligned} Sc_t^{C} &= \frac{1}{2}\left(P_{\max}^{C} - P_t^{C}\right)\cdot Q_{dt}^{C} \\ &= \frac{1}{2}\left(\frac{na}{k} - \frac{(a+b)(1+m+n)(1+t)}{6k}\right)\left(\frac{6na - (a+b)(1+m+n)(1+t)}{6}\right) \end{aligned}$$

$$Sc_t^{C} = \frac{1}{2k}\left[\frac{6na - (a+b)(1+m+n)(1+t)}{6}\right]\left[\frac{6na - (a+b)(1+m+n)(1+t)}{6}\right]$$

$$Sc_t^{C} = \frac{1}{2k}\left(\frac{6na - (a+b)(1+m+n)(1+t)}{6}\right)^{2} \quad (26).$$

We can see that $Sc_t^{C} > 0$, which is expected at this level.

Producer surplus in country C

$$Sp_t^C = \frac{1}{2}\left(P_t^C - P_{\min}^C\right)Q_{st}^C$$

$$Sp_t^C = \frac{1}{2}\left(\frac{(a+b)(1+m+m)(1+t)}{6k} - \frac{nb}{k}\right)\left(\frac{(a+b)(1+m+n)(1+t)-6nb}{6}\right)$$

with

$$P_{\min}^C = \frac{nb}{k};\ \ P_t^C = \frac{(a+b)(1+m+n)(1+t)}{6k}$$

$$Sp_t^C = \frac{1}{2k}\left(\frac{(a+b)(1+m+n)(1+t)-6nb}{6}\right)^2 \quad (27).$$

We can see that $Sp_t^C > 0$, which is expected at this level.

Country's customs revenue C

Country C's only source of government revenue is assumed to be its customs revenue. Its revenue will therefore be its customs revenue. These are given by the following relationships.

$$\left.\begin{aligned} R_t^C &= \left(P_t^C - P_{le}\right)\times M_t^C \\ P_t^C &= \frac{(a+b)(1+m+n)(1+t)}{6k} \\ P_{le} &= \frac{(1+m+n)(a+b)}{6k} \\ M_t^C &= \frac{2(a+b)\left[3n-(1+m+n)(1+t)\right]}{6} \end{aligned}\right\} \Rightarrow$$

$$R_t^C = \left(\frac{(a+b)(1+m+n)(1+t)}{6k} - \frac{(1+m+n)(a+b)}{6k}\right)\times\left(\frac{2(a+b)\left(3n-(1+m+n)(1+t)\right)}{6}\right)$$

After arrangement, we obtain the following relationship:

$$R_t^C = \frac{1}{k}\left(\frac{2t(a+b)^2(1+m+n)\left(3n-(1+m+n)(1+t)\right)}{6^2}\right) \quad (28).$$

We can see that $R_t^C > 0$ if and only if $3n > (1+m+n)(1+t)$, which is true according to equation 25.

Welfare or social surplus of the country C

The level of social welfare in country A in the presence of customs duties is as follows:

$$\left.\begin{aligned} W_t^C &= Sc_t^C + Sp_t^C + R_t^C \\ Sc_t^C &= \frac{1}{2k}\left(\frac{2na-(a+b)(1+m+n)(1+t)}{6}\right)^2 \\ Sp_t^C &= \frac{1}{2k}\left(\frac{(a+b)(1+m+n)(1+t)-2nb}{6}\right)^2 \\ R_t^C &= \frac{1}{k}\left(\frac{2t(a+b)^2(1+m+n)(3n-(1+m+n)(1+t))}{6^2}\right) \end{aligned}\right\} \Rightarrow$$

$$W_t^C = \frac{1}{2k}\left[\begin{aligned} &\left(\frac{2na-(a+b)(1+m+n)(1+t)}{6}\right)^2 + \left(\frac{(a+b)(1+m+n)(1+t)-2nb}{6}\right)^2 \\ &+\left(\frac{4t(a+b)^2(1+m+n)(3n-(1+m+n)(1+t))}{6^2}\right) \end{aligned}\right]$$

$$W_t^C = \frac{1}{2k}\left[\begin{aligned} &\left(\frac{2na-(a+b)(1+m+n)(1+t)}{6}\right)^2 + \left(\frac{(a+b)(1+m+n)(1+t)-2nb}{6}\right)^2 \\ &+\left(\frac{4t(a+b)^2(1+m+n)(3n-(1+m+n)(1+t))}{6^2}\right) \end{aligned}\right]$$

(29).

We can see that $W_t^C > 0$, which is expected at this level.

Equilibrium in the presence of a customs union between countries B and C

Now suppose that countries A and B form a customs union. Let's then assume that the level of the common external tariff vis-à-vis country C is always the same $t \in [0,1]$. What are the characteristics of this equilibrium?

Price of the good in country C

Note that the fact that countries B and C form a customs union means that the price of the good imported from country B into country C is equal to its production price in country B in autarky, i.e. $P_{UD}^B = P_a^B = P_{UD}^C$. The value of this price is given by the following relationship:

$$P_{UD}^C = P_a^B = \frac{m(a+b)}{2k} \qquad (30).$$

Quantity of goods demanded in country C

The quantity of goods demanded in the presence of a customs union becomes:

$$Q_{dUD}^{C} = na - kP_{UD}^{C}$$

$$Q_{dUD}^{C} = na - k\left(\frac{m(a+b)}{2k}\right)$$

$$Q_{dUD}^{C} = \frac{2na - m(a+b)}{2} \quad (31).$$

Quantity of goods produced in the country C

To assess this impact, let's first determine the quantity produced in the presence of customs duties. The quantity produced in the presence of a customs union becomes:

$$\left.\begin{aligned} Q_{sUD}^{C} &= -nb + kP_{UD}^{C} \\ P_{UD}^{B} &= \frac{m(a+b)}{2k} \end{aligned}\right\} \Rightarrow Q_{sUD}^{C} = -nb + k\left(\frac{m(a+b)}{2k}\right)$$

$$Q_{sUD}^{C} = \frac{-2nb + m(a+b)}{2} \quad (32).$$

Let's demonstrate by absurdity that $Q_{dUD}^{C} > 0$ and $Q_{sUD}^{C} > 0$

Country's customs revenue C

In the presence of a customs union, government revenue is zero by definition, i.e. $R_{UD}^{C} = 0$ because $t_{B}^{C} = 0$ is the rate of customs duty that country C imposes on its imports from country B.

Imports from country C

Imports in a customs union are represented by the difference between demand and supply. They are determined by the following relationship:

$$\left.\begin{aligned} M_{UD}^{C} &= Q_{dUD}^{C} - Q_{sUD}^{C} \\ Q_{dUD}^{C} &= \frac{2na - m(a+b)}{2} \\ Q_{sUD}^{C} &= \frac{-2nb + m(a+b)}{2} \end{aligned}\right\} \Rightarrow M_{UD}^{C} = \frac{2na - m(a+b)}{2} - \frac{-2nb + m(a+b)}{2}$$

$$M_{UD}^{C} = \frac{2(a+b)(n-m)}{2} \quad (33).$$

This value is positive. Indeed if $M_{UD}^{C} > 0$ because by definition we have $n > m$.

Consumer surplus in country C

The expression for consumer surplus is as follows:

$$Sc_{UD}^{C} = \frac{1}{2}\left(P_{\max}^{C} - P_{UD}^{C}\right)Q_{dUD}^{C}$$

$$Sc_{UD}^{C} = \frac{1}{2}\left(\frac{na}{k} - \frac{m(a+b)}{2k}\right)\times\left(\frac{2na - m(a+b)}{2}\right)$$

After arrangement, we obtain the following relationship:

$$Sc_{UD}^{C} = \frac{1}{2k}\left(\frac{2na - m(a+b)}{2}\right)^{2} \quad (34).$$

Note that this surplus is a positive value.

Producer surplus in country C

The expression for producer surplus is as follows:

$$Sp_{UD}^{C} = \frac{1}{2}\left(P_{UD}^{C} - P_{\min}^{C}\right)Q_{sUD}^{C}$$

$$Sp_{UD}^{C} = \frac{1}{2}\left(\frac{m(a+b)}{2k} - \left(\frac{nb}{k}\right)\right)\times\left(\frac{-2nb + m(a+b)}{2}\right)$$

$$Sp_{UD}^{C} = \frac{1}{2k}\left(\frac{-2nb + m(a+b)}{2}\right)^{2} \quad (35).$$

Note that this surplus is a positive value.

Social surplus or welfare of the country C

The expression for the social surplus or welfare of country A is:

$$\left.\begin{array}{l} W_{UD}^{C} = Sc_{UD}^{C} + Sp_{UD}^{C} + R_{UD}^{C} \\ R_{UD}^{C} = 0 \\ Sc_{UD}^{C} = \frac{1}{2k}\left(\frac{2na - m(a+b)}{2}\right)^{2} \\ Sp_{UD}^{C} = \frac{1}{2k}\left(\frac{-2nb + m(a+b)}{2}\right)^{2} \\ R_{UD}^{C} = 0 \end{array}\right\} \Rightarrow W_{UD}^{A} = \frac{1}{2k}\left(\frac{2na - m(a+b)}{2}\right)^{2} + \frac{1}{2k}\left(\frac{-2nb + m(a+b)}{2}\right)^{2}$$

(36).

This value is necessarily positive $\left(W_{UD}^{C} > 0\right)$ since it is the sum of positive values.

The effects of a customs union for country C assessed in relation to the equilibrium in the presence of customs duties

What is the effect of this customs union on the welfare of country A when the reference situation is the equilibrium in the presence of customs duties?

To answer this question, we will evaluate the effects of the implementation of a customs union between countries B and C on demand, supply and domestic imports in country C. We will then evaluate the effects on consumer surplus, producer surplus and customs revenue in country C. Next, we will assess the effects on consumer surplus, producer surplus and customs revenue in country C. Finally, we assess the net effects on social welfare in country C. All this is done with reference to the international equilibrium in the presence of customs duties.

Impact on the quantity requested by country C

The effect of the customs union should be positive on demand in country C according to Viner (1950). The variation in demand in country C following the formation of the customs union will be as follows:

$$\left.\begin{aligned}\Delta Q^C_{dUD\leftarrow t} &= Q^C_{dUD} - Q^C_{dt}\\ Q^C_{dUD} &= \frac{2na - m(a+b)}{2}\\ Q^C_{dt} &= \frac{6na - (a+b)(1+m+n)(1+t)}{6}\end{aligned}\right\} \Rightarrow \Delta Q^C_{dUD\leftarrow t} = \frac{2na - m(a+b)}{2} - \frac{6na - (a+b)(1+m+n)(1+t)}{6}$$

$$\Delta Q^C_{dUD\leftarrow t} = \frac{(a+b)\left((1+m+n)(1+t) - 3m\right)}{6} \quad (37).$$

If $P_a^B < P_{le}$ by following equation 16, we can show that $\Delta Q^C_{dUD\leftarrow t} > 0$.

Indeed, according to equation 16, we have $n > 3m-1$. Hence $n > 2m-1 \Rightarrow n+m > 3m-1 \Rightarrow n+m+1 > 3m \Rightarrow (n+m+1)(1+t) > 3m$ (38).

To sum up, if $P_a^B < P_{le}$, then:

$$\Delta Q^C_{dUD\leftarrow t} > 0 \quad (39).$$

The formation of a customs union between countries B and C increases the volume of aggregate demand in country C.

If $P_{le} < P_a^B \Rightarrow n < 2m-1$ then $\Delta Q^C_{dUD\leftarrow t} > 0$ if and only if $t > 0$.

$$\begin{aligned}\Delta Q^C_{dUD\leftarrow t} > 0 &\Rightarrow \left((1+m+n)(1+t) - 3m\right) > 0\\ &\Rightarrow (1+m+n) + (1+m+n)t - 3m > 0\\ &\Rightarrow (1+m+n)t > -(1+m-n) + 3m\\ &\Rightarrow t > \frac{-(1+m+n)}{1+m+n} + \frac{3m}{1+m+n}\\ &\Rightarrow t > -1 + \frac{3m}{1+m+n} \quad (a)\end{aligned}$$

That's right,

According to equation 17, we have:

$$n < 2m-1 \Rightarrow n+1 < 2m \Rightarrow n+1+m < 3m \Rightarrow 1 < \frac{3m}{n+m+1} \quad (b)$$

(a) et $(b) \Rightarrow t > 0$ (40).

In other words, if $P_{le} < P_a^B$ and $t > 0$, then:

$$\Delta Q_{dUD \leftarrow t}^C > 0 \quad (41).$$

The formation of a customs union between countries B and C increases the volume of aggregate demand in country C.

Impact on the quantity produced by country C

The effect of the customs union on the supply of country C should be negative according to Viner (1950). The variation in production supply will be as follows:

$$\left.\begin{array}{l} \Delta Q_{sUD \leftarrow t}^C = Q_{sUD}^C - Q_{st}^C \\ Q_{sUD}^C = \dfrac{-2nb + m(a+b)}{2} \\ Q_{st}^C = \dfrac{-6nb + (a+b)(1+m+n)(1+t)}{6} \end{array}\right\} \Rightarrow \Delta Q_{sUD \leftarrow t}^C = \frac{-2nb + m(a+b)}{2} - \frac{-6nb + (a+b)(1+m+n)(1+t)}{6}$$

$$\Delta Q_{sUD \leftarrow t}^C = \frac{(a+b)(3m - (1+m+n)(1+t))}{6} \quad (42).$$

We show that $\Delta Q_{sUD \leftarrow t}^C < 0$ if $P_a^B < P_{le}$ (equation17), which implies that $n > 3m - 1$. Hence, we can establish the following relationship:

$$n > 2m - 1 \Rightarrow n + m > 3m - 1 \Rightarrow n + m + 1 > 3m \Rightarrow 3m < (1+m+n)(1+t) \quad (43).$$

Si $P_{le} < P_a^B \Rightarrow n < 2m - 1$ (equation 18). Hence, we show that $\Delta Q_{sUD \leftarrow t}^C < 0$ if and only if $t > 0$. This is because,

$$\Delta Q_{sUD \leftarrow t}^C < 0 \Rightarrow 3m - (1+m+n)(1+t) < 0 \Rightarrow (1+m+n)(1+t) - 3m > 0 \Rightarrow t > 0$$

(equation 40).

In short,

$$\Delta Q_{sUD \leftarrow t}^C < 0 \text{ than } P_a^B < P_{le} \text{ or } P_{le} < P_a^B \quad (44).$$

In conclusion, the formation of a customs union by countries B and C leads to a fall in the quantity produced of the homogeneous good in country C (the least competitive country).

Impact on the country's customs revenue C

The effect of the customs union on government revenue will be determined by the difference between the value of customs revenue in the presence of the customs union (new situation) and in the presence of customs duty (initial situation).

$$\left.\begin{array}{l}\Delta R_{UD\leftarrow t}^{C}=R_{UD}^{C}-R_{t}^{C}\\ R_{UD}^{C}=0\\ R_{t}^{C}=\dfrac{1}{k}\left(\dfrac{2t\left(a+b\right)^{2}\left(1+m+n\right)\left(3n-\left(1+m+n\right)\left(1+t\right)\right)}{6^{2}}\right)\end{array}\right\}\Rightarrow$$

$$\Delta R_{t}^{C}=-\frac{1}{k}\left(\frac{2t\left(a+b\right)^{2}\left(1+m+n\right)\left(3n-\left(1+m+n\right)\left(1+t\right)\right)}{6^{2}}\right)$$

So $\Delta R_{UD\leftarrow t}^{C}<0$ because according to equation 25, $3n>\left(1+m+n\right)\left(1+t\right)$

$$\Delta R_{UD\leftarrow t}^{C}<0 \qquad (45).$$

Conclusion: the formation of a customs union between countries B and C reduces customs revenues for country C.

Impact on the country's imports C

The effect of the customs union on imports will be determined by the difference between the volume of imports in the presence of the customs union (new situation) and in the presence of customs duties (final situation).

$$\left.\begin{array}{l}\Delta M_{UD\leftarrow t}^{C}=M_{UD}^{C}-M_{t}^{C}\\ M_{UD}^{C}=\dfrac{2\left(a+b\right)\left(n-m\right)}{2}\\ M_{t}^{C}=\dfrac{2\left(a+b\right)\left(3n-\left(1+m+n\right)\left(1+t\right)\right)}{6}\end{array}\right\}\Rightarrow \Delta M^{C}=\frac{6\left(a+b\right)\left(n-m\right)}{6}-\frac{2\left(a+b\right)\left(3n-\left(1+m+n\right)\left(1+t\right)\right)}{6}$$

$$\Delta M_{UD\leftarrow t}^{C}=\frac{\left(a+b\right)\left(3\left(n-m\right)-\left(3n-\left(1+m+n\right)\left(1+t\right)\right)\right)}{3}$$

$$\Delta M_{UD\leftarrow t}^{C}=\frac{\left(a+b\right)\left(\left(1+m+n\right)\left(1+t\right)-3m\right)}{3} \qquad (46).$$

This value is positive if and only if $\left(1+m+n\right)\left(1+t\right)-3m>0$ which is the case if $t>0$ (equation 40).

So $\Delta M_{UD\leftarrow t}^{C}>0$ (47).

Conclusion: the formation of a customs union by countries B and C increases the overall volume of imports into country C (the least competitive country).

Impact on consumer surplus in country C

The effect of the customs union on consumer surplus will be measured by the difference between the value of consumer surplus in the presence of the customs union (new situation) and in the presence of customs duties (initial situation).

$$\left.\begin{aligned}\Delta Sc_{UD\leftarrow t}^{C} &= Sc_{UD}^{C} - Sc_{t}^{C}\\ Sc_{UD}^{C} &= \frac{1}{2k}\left(\frac{2na - m(a+b)}{2}\right)^{2}\\ Sc_{t}^{C} &= \frac{1}{2k}\left(\frac{2na - (a+b)(1+m+n)(1+t)}{2}\right)^{2}\end{aligned}\right\}\Rightarrow$$

$$\Delta S_{UD\leftarrow t}^{C} = \frac{1}{2k}\left[\left(\frac{2na - m(a+b)}{2}\right)^{2} - \left(\frac{2na - (a+b)(1+m+n)(1+t)}{2}\right)^{2}\right]$$

We can see that $\Delta Sc_{UD\leftarrow t}^{C} > 0$ if and only if $2na - m(a+b) > 2na - (a+b)(1+m+n)(1+t)$, which is the case.

That's right,

$$m(a+b) < (1+m+n)(1+t)(a+b) \Rightarrow -m(a+b) > -(1+m+n)(1+t)(a+b)$$
$$\Rightarrow 2na - m(a+b) > 2na - (1+m+n)(1+t)(a+b)$$

Conclusion

$$\Delta Sc_{UD\leftarrow t}^{C} > 0 \qquad (48).$$

The formation of a customs union by countries B and C has a positive effect on consumer surplus in country C.

Impact on producer surplus in country C

The effect of the customs union between countries A and B on the producer surplus is the difference between the producer surplus in the presence of the customs union and in the presence of customs duties.

$$\left.\begin{aligned}\Delta Sp_{UD\leftarrow t}^{C} &= Sp_{UD}^{C} - Sp_{t}^{C}\\ Sp_{UD}^{C} &= \frac{1}{2k}\left(\frac{-2nb + m(a+b)}{2}\right)^{2}\\ Sp_{t}^{C} &= \frac{1}{2k}\left(\frac{-2nb + (a+b)(1+m+n)(1+t)}{2}\right)^{2}\end{aligned}\right\}$$

$$\Rightarrow \Delta Sp_{UD\leftarrow t}^{C} = \frac{1}{2k}\left[\left(\frac{m(a+b) - 2nb}{2}\right)^{2} - \left(\frac{(1+m+n)(1+t)(a+b) - 2nb}{2}\right)^{2}\right]$$

We can see that $\Delta Sp_{UD\leftarrow t}^{C} < 0$, in fact, $m(a+b) < (1+m+n)(1+t)(a+b)$.

Conclusion.

$$\Delta Sp^{C}_{UD\leftarrow t} < 0 \quad (49).$$

The formation of a customs union by countries B and C has a negative impact on (worsens) the surplus of producers in country C (less competitive country).

Impact on the country's level of welfare or social surplus C

The effect of the customs union between countries B and C on the social surplus (welfare) of country C is the difference between the social surplus (welfare) of country C in the presence of a customs union and in the presence of a customs duty.

$$\Delta W^{C}_{UD\leftarrow t} = W^{C}_{UD} - W^{C}_{t} = \Delta Sc^{C}_{UD\leftarrow t} + \Delta Sp^{C}_{UD\leftarrow t} + \Delta R^{C}_{UD\leftarrow t}$$

It can be shown (see Appendix 1) that for either $P^{B}_{a} < P_{le}$ or $P_{le} < P^{B}_{a}$, the change in welfare or social surplus in country C following the creation of a customs union with country B is positive.

$$\Delta W^{C}_{UD\leftarrow t} > 0 \quad (50).$$

Several conclusions can be drawn from these results. Firstly, we can say that Viner was not right because it is possible to predict a priori (without taking account of the creation and diversion of traffic) the conditions under which a given country will benefit from a process of economic integration if the reference equilibrium is that in the presence of customs duties. Indeed, the net effect of setting up a customs union between countries B and C on the welfare of country C is positive compared to the international equilibrium in the presence of customs duties. It should also be noted that the demonstrations were carried out without the use of any special or additional hypotheses.

Secondly, the results show that economic/trade integration between developing countries only is beneficial to them, contrary to Venables' (1999) assertion that economic/trade integration is beneficial to its members if they are developed countries only or mixed. They support the idea that the processes of economic/trade integration between developing countries alone are no different from the processes of economic/trade integration between developed or mixed countries.

Thirdly, they suggest that a precise determination of the world price level is important in assessing the effects of economic/trade integration, as has been argued in analyses defending a general equilibrium rather than a partial equilibrium approach, so that they reinforce Michael's (1976) view of Viner's limitations. According to Michael (1976), Viner's analysis does not take demand into account. However, our results show that it is not a question of setting the world price arbitrarily.

The question then arises as to whether it is not the nature of the reference or initial equilibrium that explains Viner's conclusion. To answer this question, we analyse the effects of the customs union in relation to the free trade equilibrium.

The effects of a customs union for country C assessed in relation to the free trade equilibrium

What is the net effect of this customs union on the welfare of country A compared with total and unilateral liberalisation by country A?

To answer this question, we will evaluate the effects of the implementation of a customs union between countries B and C on demand, supply and domestic imports in country C. We will then evaluate the effects on consumer and producer surpluses in country C. We will then assess the effects on consumer and producer surpluses in country C. Finally, we assess the net effects on social welfare in country C. All of this will be based on the free trade equilibrium.

Impact on the quantity requested by country C

The effect of the customs union on demand in country C will be as follows:

$$\left.\begin{aligned}\Delta Q^{C}_{dUD\leftarrow le} &= Q^{C}_{dUD} - Q^{C}_{dle}\\ Q^{C}_{dUD} &= \frac{2na - m(a+b)}{2}\\ Q^{C}_{dle} &= \frac{6na - (a+b)(1+m+n)}{6}\end{aligned}\right\} \Rightarrow \Delta Q^{C}_{dUD\leftarrow le} = \frac{2na - m(a+b)}{2} - \frac{6na - (a+b)(1+m+n)}{6}$$

$$\Delta Q^{C}_{dUD\leftarrow le} = \frac{(a+b)(1+m+n) - 3m(a+b)}{6}$$

Let's look at the two situations: $1) P^{B}_{a} < P_{le}$ and $2) P_{le} < P^{B}_{a}$

It can be shown that $\Delta Q^{C}_{dUD\leftarrow le} > 0$ (51).

According to equation 16, we have:

Case 1, if $P^{B}_{a} < P_{le} \Rightarrow n > 2m-1$ (equation 17 in other words, the economies of countries B and C are both less competitive than the global economy).

Yet,

$$n > 2m-1 \Rightarrow n+m > 3m-1 \Rightarrow n+m+1 > 3m \Rightarrow (a+b)(1+m+n) - 3m(a+b) > 0 \Rightarrow \Delta Q^{C}_{dUD\leftarrow le} > 0$$

Si $P_{le} < P^{B}_{a} \Rightarrow n < 2m-1$ (equation 18 in other words, global productivity is determined by that of the two countries).

Yet, $n < 2m-1 \Rightarrow m+n+1 < 3m \Rightarrow \Delta Q^{C}_{dUD\leftarrow le} < 0$ this is quite coherent, since moving from a situation of free trade to a situation of customs union actually corresponds to a situation of tariff rearmament. The result is an increase in the price of the good in country C, which should lead to a reduction in the quantity of the good demanded. The good has become more expensive.

Impact on the quantity produced by country C

The effect of the customs union on the supply of country C will be as follows:

$$\left.\begin{aligned}\Delta Q^{C}_{sUD\leftarrow le} &= Q^{C}_{sUD} - Q^{C}_{sle}\\ Q^{C}_{sUD} &= \frac{-2nb + m(a+b)}{2}\\ Q^{C}_{sle} &= \frac{-6nb + (1+m+n)(a+b)}{6}\end{aligned}\right\} \Rightarrow \Delta Q^{C}_{sUD\leftarrow le} = \frac{-2nb + (a+b)}{2} - \frac{-6nb + (1+m+n)(a+b)}{6}$$

$$\Rightarrow \Delta Q^{C}_{sUD\leftarrow le} = \frac{(a+b)(2-m-n)}{6}$$ this value is necessarily negative because

$$\left.\begin{aligned}m &> 1\\ n &> 1\end{aligned}\right\} \Rightarrow n+m > 2 \Rightarrow 2-m-n < 0$$ and this is true whether $P^{B}_{a} < P_{le}$ or $P_{le} < P^{B}_{a}$. So,

$$\Delta Q^{C}_{sUD\leftarrow le} < 0$$ (52).

Impact on the country's imports C

The effect of the customs union on imports will be determined by the difference between the volume of imports in the presence of the customs union (new situation) and in the presence of customs duties (final situation).

$$\left.\begin{aligned}\Delta M_{UD\leftarrow le}^{C} &= M_{UD}^{C} - M_{le}^{C} \\ M_{UD}^{C} &= \frac{2(a+b)(n-m)}{2} \\ M_{le}^{C} &= \frac{2(a+b)(2n-m-1)}{6}\end{aligned}\right\} \Rightarrow \Delta M_{UD\leftarrow le}^{C} = \frac{2(a+b)(n-m)}{2} - \frac{2(a+b)(2n-m-1)}{6}$$

$$\Delta M_{UD\leftarrow le}^{C} = \frac{2(a+b)(n-m+1)}{6} \tag{53}.$$

We can see that $\Delta M_{UD\leftarrow le}^{C} > 0$ if and only if $n > m-1 \Rightarrow P_{le} > P_a^B$, but $\Delta M_{UD\leftarrow le}^{C} < 0$ if and only if $n < m-1 \Rightarrow P_{le} < P_a^B$. This result is also consistent because if country B is more competitive than the world economy $\left(P_{le} > P_a^B\right)$, it stands to reason that the introduction of a customs union by countries B and C will lead to a fall in the price of the good in C, so all other things being equal, it will have a positive effect on demand for the good in country C. However, if the global economy is more competitive than country B $\left(P_{le} < P_a^B\right)$, it is also clear that the introduction of a customs union by countries B and C will lead to an increase in the price of the good in country C. All other things being equal, this will have a negative effect on the demand for the good in country C.

Impact on the country's customs revenue C

The effect of the customs union on government revenue will be determined by the difference between the value of customs revenue in the presence of the customs union (new situation) and in the presence of customs duty (initial situation). Under these conditions, we will have:

$$\Delta R_{UD\leftarrow le}^{C} = 0 \tag{54}.$$

Impact on consumer surplus in country C

The effect of the customs union on consumer surplus will be measured by the difference between the value of consumer surplus in the presence of the customs union (new situation) and in the presence of customs duties (initial situation).

$$\left.\begin{aligned}\Delta Sc_{UD\leftarrow le}^{C} &= Sc_{UD}^{C} - Sc_{le}^{C} \\ Sc_{UD}^{C} &= \frac{1}{2k}\left(\frac{2na - m(a+b)}{2}\right)^2 \\ Sc_{le}^{C} &= \frac{1}{2k}\left(\frac{6na - (a+b)(1+m+n)}{6}\right)^2\end{aligned}\right\} \Rightarrow$$

$$\Delta Sc_{UD\leftarrow le}^{C} = \frac{1}{2k}\left(\frac{2na - m(a+b)}{2}\right)^2 - \frac{1}{2k}\left(\frac{6na - (a+b)(1+m+n)}{6}\right)^2 \tag{55}.$$

It can be shown that:

1. $\Delta Sc^{C}_{UD\leftarrow le} > 0$ if and only if $n > 2m-1 \Rightarrow P_{le} > P^{B}_{a}$;
2. $\Delta Sc^{C}_{UD\leftarrow le} < 0$ if and only if $n < 2m-1 \Rightarrow P_{le} < P^{B}_{a}$.

Impact on producer surplus in country C

The effect of the customs union between countries A and B on the producer surplus is the difference between the producer surplus in the presence of a customs union and in free trade.

$$\left.\begin{aligned} &\Delta Sp^{C}_{UD\leftarrow le} = Sp^{C}_{UD} - Sp^{C}_{le} \\ &Sp^{C}_{UD} = \frac{1}{2k}\left(\frac{-2nb + m(a+b)}{2}\right)^2 \\ &Sp^{C}_{le} = \frac{1}{2k}\left(\frac{-6nb + (a+b)(1+m+n)}{6}\right)^2 \end{aligned}\right\} \Rightarrow$$

$$\Delta Sp^{C}_{UD\leftarrow le} = \frac{1}{2k}\left(\frac{-2nb + m(a+b)}{2}\right)^2 - \frac{1}{2k}\left(\frac{-6nb + (a+b)(1+m+n)}{6}\right)^2 \quad (56).$$

It can be shown that:

1. $\Delta Sp^{C}_{UD\leftarrow le} < 0$ if and only if $n > 2m-1 \Rightarrow P_{le} > P^{B}_{a}$;
2. $\Delta Sp^{C}_{UD\leftarrow le} > 0$ if and only if $n < 2m-1 \Rightarrow P_{le} < P^{B}_{a}$.

Impact on the country's social surplus or welfare C

The effect of the customs union between countries B and C on the social surplus (welfare) of country C is the difference between the social surplus (welfare) of country C with a customs union and with free trade.

$$\Delta W^{C}_{UD\leftarrow le} = W^{C}_{UD} - W^{C}_{le} = \Delta Sc^{C}_{UD\leftarrow le} + \Delta Sp^{C}_{UD\leftarrow le} + \Delta R^{C}_{UD\leftarrow le} \text{ with } \Delta R^{C}_{UD\leftarrow le} = 0 \quad (59).$$

To know the direction of the change in welfare in country C, we need to remember that consumer surplus and producer surplus vary in opposite directions. In particular, there are two possible situations: 1) $P_{le} > P^{B}_{a}$ and 2) $P_{le} < P^{B}_{a}$.

It can be shown (Appendix 3) that $\Delta W^{C}_{UD\leftarrow le} > 0$ if $n > m$ et $a > b$ when $P_{le} > P^{B}_{a}$ (case 1), but that it is impossible to establish that $\Delta W^{C}_{UD\leftarrow le} > 0$ when $P_{le} < P^{B}_{a}$.

In sum, the net effect on social welfare in country C of the formation of a customs union by countries B and C can only be positive, when the initial equilibrium is a free trade equilibrium, if the international free trade equilibrium price is framed by their respective autarkic prices.

Two main conclusions emerge from these results. Firstly, from a strictly national point of view, tariff reform is not a good trade policy because it leads to a deterioration in the country's social welfare. The World Trade Organisation's (WTO) requirement that MFN tariffs be available for the year before and the year of entry into force of trade agreements as part of its transparency mechanism is therefore relevant.

Secondly, these results tend to confirm that the free trade equilibrium is better than the protectionist equilibrium, even if the latter is achieved through discriminatory liberalisation. So free trade at global level is preferable to discriminatory trade liberalisation.

CONCLUSION

In this paper, our objective was to show that it is possible to determine a priori the net effect of trade integration on the welfare of the populations of the countries concerned. In particular, the aim was to show that the creation and diversion of trade flows are not involved in determining the net effect of trade integration on the welfare of the countries concerned.

We have shown that, compared with an initial situation of international trade equilibrium in the presence of customs duties, the formation of a customs union has a positive effect on the welfare of the countries concerned. In other words, not only do the final conditions of the net effect of trade integration not depend on the effects of the creation and diversion of trade flows, but they are also unrelated to the nature of the trade policy implemented. So Jacob Viner (1950) was wrong and Krugman (1991) was not right either.

Similarly, our results confirm the point of view of classical economists, namely that in a world where the presence of customs barriers reduces both the welfare of the population and world real income, any action (in particular a customs union) which removes these barriers between certain countries leads ineluctably towards free trade for all in international trade, even if during the adjustment it does not raise the welfare of the population and world real income to their maximum level.

We have also analysed the possibility that trade integration between developing countries and trade integration between developed countries have fundamentally different effects, as argued by Venables (1999). Our results also invalidate this conclusion since, compared to an initial situation of international trade equilibrium in the presence of tariffs, the formation of a customs union has a positive effect on the welfare of the countries concerned, regardless of their level of development. However, this is true if the initial international trade equilibrium is a free trade equilibrium.

Finally, to go further, it would be useful to analyse Viner's conclusion from the perspective of global social welfare. But this would require additional hypotheses and developments beyond those contained in this document.

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APPENDICES

Appendix 1

$$\Delta W^C_{UD\leftarrow t} = W^C_{UD} - W^C_t = \Delta Sc^C_{UD\leftarrow t} + \Delta Sp^C_{UD\leftarrow t} + \Delta R^C_{UD\leftarrow t}$$

$$\left.\begin{aligned}
\Delta Sc^C_{UD\leftarrow t} &= \frac{1}{2k}\left[\left(\frac{2na - m(a+b)}{2}\right)^2 - \left(\frac{2na-(a+b)(1+m+n)(1+t)}{2}\right)^2\right] \\
\Delta Sp^C_{UD\leftarrow t} &= \frac{1}{2k}\left[\left(\frac{m(a+b)-2nb}{2}\right)^2 - \left(\frac{(1+m+n)(1+t)(a+b)-2nb}{2}\right)^2\right] \\
\Delta R^C_{UD\leftarrow t} &= -\frac{1}{k}\left(\frac{2t(a+b)(1+m+n)(1+t)}{6^2}\right)
\end{aligned}\right\} \Rightarrow$$

$$\Delta W^C_{UD\leftarrow t} = \frac{1}{2k}\left[\left(\frac{2na - m(a+b)}{2}\right)^2 - \left(\frac{2na-(a+b)(1+m+n)(1+t)}{2}\right)^2\right]$$
$$+\frac{1}{2k}\left[\left(\frac{m(a+b)-2nb}{2}\right)^2 - \left(\frac{(1+m+n)(1+t)(a+b)-2nb}{2}\right)^2\right]$$
$$-\frac{1}{k}\left(\frac{2t(a+b)^2(1+m+n)(3n-(1+m+n)(1+t))}{6^2}\right) \qquad (45).$$

$\Delta W^C_{UD\leftarrow t} > 0$ if only if

$$\frac{1}{2k}\left[\left(\frac{2na - m(a+b)}{2}\right)^2 - \left(\frac{2na-(a+b)(1+m+n)(1+t)}{2}\right)^2\right] >$$
$$\frac{1}{2k}\left[\left(\frac{m(a+b)-2nb}{2}\right)^2 - \left(\frac{(1+m+n)(1+t)(a+b)-2nb}{2}\right)^2\right]$$
$$-\frac{1}{k}\left[\frac{2t(a+b)^2(1+m+n)(3n-(1+m+n)(1+t))}{6^2}\right]$$

After adjustment, this inequality becomes as follows:

$$\left(\frac{2na - m(a+b)}{2}\right)^2 - \left(\frac{2na-(a+b)(1+m+n)(1+t)}{2}\right)^2 >$$
$$\left(\frac{m(a+b)-2nb}{2}\right)^2 - \left(\frac{(1+m+n)(1+t)(a+b)-2nb}{2}\right)^2$$
$$-\frac{4t(a+b)^2(1+m+n)(3n-(1+m+n)(1+t))}{6^2}$$

Observing that:

$\left(\frac{2na-m(a+b)}{2}\right)^2>0;\ \left(\frac{2na-(a+b)(1+m+n)(1+t)}{2}\right)^2>0;\ \left(\frac{m(a+b)-2nb}{2}\right)^2>0$

$\left(\frac{(1+m+n)(1+t)(a+b)-2nb}{2}\right)^2>0$ et $\frac{4t(a+b)^2(1+m+n)(3n-(1+m+n)(1+t))}{6^2}>0$ then the condition for $\Delta W^C_{UD\leftarrow t}>0$ can be rewritten as follows:

1- $\left(\frac{2na-m(a+b)}{2}\right)^2>\left(\frac{m(a+b)-2nb}{2}\right)^2$

And

$\left(\frac{2na-(a+b)(1+m+n)(1+t)}{2}\right)^2\leq\left(\frac{(1+m+n)(1+t)(a+b)-2nb}{2}\right)^2+$

2- $\frac{4t(a+b)^2(1+m+n)(3n-(1+m+n)(1+t))}{6^2}$

Stage 1

$n>m\Rightarrow 2n>2m$

$\Rightarrow 2n(a+b)>2m(a+b)$

$\Rightarrow 2na+2nb>m(a+b)+m(a+b)$

$\Rightarrow 2na-m(a+b)>m(a+b)-2nb$

$\Rightarrow\left(\frac{2na-m(a+b)}{2}\right)^2>\left(\frac{m(a+b)-2nb}{2}\right)^2$

So, 1 is true.

Stage 2

Condition 2 can be verified by simply establishing that $2na-(a+b)(1+m+n)(1+t)<(a+b)(1+m+n)(1+t)-2nb$. To do this, we will subtract from the value on the left of the inequality the value on the right of the inequality.

$(2na-(a+b)(1+m+n)(1+t))-((a+b)(1+m+n)(1+t)-2nb)$

$=2na+2nb-2(a+b)(1+m+n)(1+t)$

$=2na+2nb-2(a+b)(1+m+n)-2(a+b)(1+m+n)t$

$=2n(a+b)-2n(a+b)-2m(a+b)-2(a+b)-2(a+b)(1+m+n)t$

$=-2(a+b)(m+1+(1+m+n)t)<0$

Consequently, $(2na-(a+b)(1+m+n)(1+t))<((a+b)(1+m+n)(1+t)-2nb)$.

We can therefore state that the second condition is satisfied.

Appendix 2

$$\left.\begin{aligned}\Delta W^{C}_{UD\leftarrow le} &= \Delta Sc^{C}_{UD\leftarrow le} + \Delta Sp^{C}_{UD\leftarrow le}\\ \Delta Sc^{C}_{UD\leftarrow le} &= \frac{1}{2k}\left[\left(\frac{2na-m(a+b)}{2}\right)^2-\left(\frac{6na-(a+b)(1+m+n)}{6}\right)^2\right]\\ \Delta Sp^{C}_{le} &= \frac{1}{2k}\left[\left(\frac{-2nb+m(a+b)}{2}\right)^2-\left(\frac{-6nb+(a+b)(1+m+n)}{6}\right)^2\right]\end{aligned}\right\}\Rightarrow$$

$$\Delta W^{C}_{UD\leftarrow le} = \frac{1}{2k}\left[\left(\frac{2na-m(a+b)}{2}\right)^2-\left(\frac{6na-(a+b)(1+m+n)}{6}\right)^2\right]+$$

$$\frac{1}{2k}\left[\left(\frac{-2nb+m(a+b)}{2}\right)^2-\left(\frac{-6nb+(a+b)(1+m+n)}{6}\right)^2\right]$$

Appendix 3

See Appendix 2 for an analysis of the conditions governing the direction of change in social welfare in country C.

Case 1: $P_{le} > P^{B}_{a} \Rightarrow \Delta Sc^{C}_{UD\leftarrow le} > 0$ and $\Delta Sp^{C}_{UD\leftarrow le} < 0$

We can see that $\Delta W^{C}_{UD\leftarrow le} > 0$ if and only if

$$\frac{1}{2k}\left[\left(\frac{2na-m(a+b)}{2}\right)^2-\left(\frac{-6na+(a+b)(1+m+n)}{6}\right)^2\right] >$$

$$\frac{1}{2k}\left[\left(\frac{-2nb+m(a+b)}{2}\right)^2-\left(\frac{-6nb+(a+b)(1+m+n)}{6}\right)^2\right]$$ this condition will be fulfilled if:

1- $\left(\frac{2na-m(a+b)}{2}\right)^2 > \left(\frac{-2nb+m(a+b)}{2}\right)^2$ which is true because $n > m$

2- $\left(\frac{-6nb+(a+b)(1+m+n)}{6}\right)^2 > \left(\frac{-6na+(a+b)(1+m+n)}{6}\right)^2$ which is true because $a > b$.

Case 2: $P_{le} < P^{B}_{a} \Rightarrow \Delta Sc^{C}_{UD\leftarrow le} < 0$ et $\Delta \mathrm{Sp}^{C}_{UD\leftarrow le} > 0$

We can see that $\Delta W^{C}_{UD\leftarrow le} > 0$ if and only if

$$\frac{1}{2k}\left[\left(\frac{2na-m(a+b)}{2}\right)^2-\left(\frac{-6na+(a+b)(1+m+n)}{6}\right)^2\right] <$$

$$\frac{1}{2k}\left[\left(\frac{-2nb+m(a+b)}{2}\right)^2-\left(\frac{-6nb+(a+b)(1+m+n)}{6}\right)^2\right]$$ this condition will be fulfilled if:

1- $\left(\frac{2na-m(a+b)}{2}\right)^2 < \left(\frac{-2nb+m(a+b)}{2}\right)^2$ which is impossible because $n > m$

2- $\left(\frac{-6nb+(a+b)(1+m+n)}{6}\right)^2 < \left(\frac{-6na+(a+b)(1+m+n)}{6}\right)^2$ which is impossible because $a > b$.