A SECOND ELEMENTARY PROPOSITION CONCERNING
THE FORMATION OF CUSTOMS UNIONS

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First version: April 1998  
Revised version: June 1998

Abstract

The conclusions of the 1976 Kemp-Wan proposition are shown to be substantially valid even if all tariff vectors, both pre-union and post-union, are optimally chosen.

JEL classification: F02; F12; F13; F15

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THE FORMATION OF CUSTOMS UNIONS*

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1. Introduction

Kemp and Wan (1976, 1986) showed that, given any initial competitive but tariff-ridden world equilibrium, it is possible for any subset of two or more countries to form a customs union with a common tariff vector and with compensatory lumpsum intra-union transfers such that no individual, whatever his country of residence, is made worse off and such that, if a strict convexity condition on preferences is satisfied, all individuals within the customs union are better off. However Kemp and Wan assumed that excluded or non-member countries do not respond to the formation of the union by adjusting their tariffs; the latter are maintained at their pre-union levels.

In the present paper, we propose an extended Kemp-Wan (KW henceforth) proposition. Specifically, it shows that the KW conclusions remain substantially valid even if, before and after the formation of the Union, each excluded country chooses an optimal tariff vector. As will become clear, the extended KW proposition can be viewed as a straightforward implication of the original proposition.
2. Proof of the extended KW proposition

Let there be \( J \) trading countries; and let there be \( N + 1 \) goods, numbered from 0 to \( N \), all tradeable internationally and with good 0 serving as numéraire (so that its world price is unity). Let \( P \equiv (1, p) \equiv (1, p_1, \ldots, p_N) \) denote the world price vector; let \( \tau^j \equiv (\tau^j_0, \tau^j_1, \ldots, \tau^j_N) \) denote the specific tariff vector imposed by country \( j \), \( j=1, \ldots, J \), so that \( P^j + \tau^j = (1 + \tau^j_0, p + \tau^j_1, \ldots, p + \tau^j_N) \) denotes the domestic price vector of country \( j \). Finally, it is assumed that the welfare of each country is described by a social utility function. Let us denote by \( u^j \) the utility level of country \( j \).

Our analysis rests on two basic assumptions. First, it is assumed that, for any given set of \( J \) tariff vectors, there exists a tariff-ridden world equilibrium. \(^{(1)}\) Let us denote the equilibrium world price vector by \( p(\tau^1, \ldots, \tau^J) \). Second, it is assumed that, before the formation of a customs union, the government of country \( j \) chooses \( \tau^j \) to maximize \( u^j \), given \( \tau^k \) \( (k \neq j) \) and that the tariff-setting game has a (not necessarily unique) solution in pure strategies. \(^{(2)}\) Let us indicate the equilibrium values by asterisks: \( u^j, \tau^j \). As is well-known, any equilibrium vector \( \tau^j \) is subject to an inconsequential one-dimensional indeterminacy, of which Lerner's symmetry theorem is a particular manifestation; see Kemp (1969, p.298) and Lerner (1936).

The pre-union Nash equilibrium is disturbed when the first \( K \) \( (2 \leq K < J) \) countries form a customs union. From the original KW proposition, if the preferences of at least one member individual are strictly convex and if non-member countries retain their pre-union tariffs then there is a common external tariff vector (CET henceforth)

\[
\tau^{CET} = \bar{\tau} \left( p(\tau^1, \ldots, \tau^J), \tau^{K+1}, \ldots, \tau^J \right)
\]

\[
\equiv \tau^j(\bar{\tau}^1, \ldots, \bar{\tau}^J)
\]
and a balanced or self-financing scheme of lumpsum transfers \( \Delta \equiv (\Delta^1, \ldots, \Delta^K) \), from member countries to the union, such that all member countries are better off than in the pre-union equilibrium. If, as we now suppose, non-member countries are prepared to adjust their tariff vectors so that they remain optimal in the post-union situation, the Kemp-Wan proposition is no longer directly relevant to the choice of a CET. However the union may confront non-member countries with the CET function

\[
\tau^{CET} = \tilde{\tau} \left( \rho(\tau^1, \ldots, \tau^K, \tau^{K+1}, \ldots, \tau^J) \right) \\
= \tau \left( \tau^1, \ldots, \tau^K, \tau^{K+1}, \ldots, \tau^J \right)
\]

It is then optimal for each non-member country \( j \) to choose its pre-union tariff vector if all other non-member countries do so. For, from the original KW arguments, country \( j \) knows that the post-union world price vector is \( \rho(\tau^1, \ldots, \tau^{j-1}, \tau^j, \tau^{j+1}, \ldots, \tau^J) \); and it then follows from the definition of Nash equilibrium that country \( j \) will choose its pre-union tariff vector \( \tau^*_j \).

**Extended KW Proposition**  If the preferences of at least one member individual are strictly convex then there exist a common tariff vector and a self-financing scheme of internal lumpsum transfers such that each member country is exactly as well off as in the pre-union situation.

The argument culminating in our proposition implies that the set

\[
\Omega_K = \left\{ (u^1, \ldots, u^K) : u^j \geq u^*_j, j = 1, \ldots, K, \sum_{j=1}^K \Delta^j (u^1 \ldots u^K) \geq 0 \right\},
\]

is non-empty and, if the strict convexity condition is satisfied, contains an interior point. Hence any post-union equilibrium maximizes an individualistic Bergson-Samuelson social welfare function, say \( W_K = W^K(u^1, \ldots, u^K) \), subject to the constraint
\( \tau^{\text{CET}} = \tau(\tau^1, \ldots, \tau^J) \) and can be viewed as a generalized point of tangency between the upper boundary of \( \Omega_K \) and a level contour of \( W^K(\cdot) \). This makes it clear that the post-union equilibrium is not Nash. It might be described as constrained Nash.

**Corollary to the Extended KW Proposition:** Given \( J \) independent trading countries and an initial Nash equilibrium in tariffs, there exist sequences of, at most, \( J - 1 \) steps in the first of which any two or more countries form a customs union without harm to either member or to any excluded country, in the second of which one or more additional countries join the union, with the same outcome, and so on. At the end of any such sequence, world free trade prevails and each country, whatever its place in the sequence of entrants, is as well off as in the Nash equilibrium in tariffs. If the preferences of an individual in a founding country are strictly convex, and if at each subsequent enlargement the same is true of the preferences of an individual in an acceding country then, in the worldwide free trade attained at the end of the sequence, all countries are better off than in the initial Nash equilibrium.

It might be thought that the implementation of the union’s strategy requires more information under present circumstances than under the circumstances envisaged by Kemp and Wan. This is not so. In each case, implementation presupposes global information about the preferences and technologies of member countries. In addition, implementation requires, in the Kemp-Wan Case, the assurance that non-members will maintain their pre-union tariff vectors and, in the present case, the assurance that non-members will maintain optimal tariff vectors.

### 3. Final remarks

Kemp and Wan showed that, given any competitive but tariff-ridden world equilibrium and given the strict convexity condition on preferences, already mentioned, it
is possible for any two or more countries to form a customs union with a common tariff vector and with a scheme of compensatory intra-union transfers such that each individual, whatever his residence, is made better off. We have shown that the conclusion reached by Kemp and Wan remains valid even when the tariff-setting governments of excluded countries respond optimally to the formation of a customs union. Almost needless to say, the same conclusion is available in the mixed case in which some excluded countries always choose the same tariff vector and others always choose an optimal tariff structure.

Richardson (1995) has provided a numerical example which suggests that, if non-member countries behave optimally, the formation of a customs union can be harmful to member countries. However his example is not incompatible with our conclusions. Richardson assumes that the union’s strategy set contains CET functions \( \bar{\tau}(\tau^{K+1}, \ldots, \tau^J) \) and is specific in the sense that each function in the set maps every vector \( (\tau^{K+1}, \ldots, \tau^J) \) to the same constant CET vector. No such restriction is imposed on our argument.
FOOTNOTES

(*) We have benefitted from the comments of Pascalis Raimondos-Møller, Martin Richardson, Peter Robertson, Henry Y. Wan, Jr and Alan Woodland. Early work on the paper was completed during a visit by Kemp to the Economic Policy Research Unit of the Copenhagen Business School during December 1997 and January 1998. The hospitality of the Unit is gratefully acknowledged.

(1) For conditions sufficient for existence, see Sontheimer (1971, Theorem 1). Mantel (1974) and Shafer and Sonnenschein (1976), which focus on closed economies, are also relevant.

(2) Generally speaking, the existence of a general equilibrium cannot lightly be assumed in a context of oligopolies. However comparative statics of the kind considered in this paper presuppose the existence of an initial equilibrium; without existence the problems considered are meaningless.
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