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Product Market Imperfections and Customs Unions Theory

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I. Introduction

In his pathbreaking work on customs unions theory, Viner (1950) draws a fundamental distinction between the trade-creating and the trade-diverting welfare effects of a customs union. He demonstrates that trade creation improves the home country's welfare while trade diversion lowers it. Lipsey (1957) and Gehrels (1956) explored the implications of consumption substitution for trade diversion, while Melvin (1969) and Bhagwati (1971) allowed production substitution in their analysis by incorporating the increasing opportunity cost assumption into the standard two-commodity, two-factor model of international trade. They advanced the proposition that trade diversion is not necessarily detrimental to national welfare as Viner had thought. Batra (1973) rigorously corroborated the above well-known propositions within the standard framework of international trade. The implications of factor market imperfections and production distortions for customs unions theory were, however, examined by Yu and Scully (1975), Yu (1981, 1982), and Choi and Yu (1984). A principal result is that while trade diversion may still be welfare-improving, trade creation may reduce the home country's welfare, depending upon not only the nature of distortions, but also on the types of trade diversion and trade creation.

The purpose of the present paper is to examine the traditional theory of customs unions in the presence of product market imperfections. Recently, there is a growing amount of literature on general equilibrium and trade under conditions of imperfect competition and increasing returns to scale.[1] By integrating increasing returns and domes-

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1. The implications of monopoly within the theory of international trade were first discussed in two important and pioneering papers by Batra (1972) and Melvin and Warne (1973), while Herberg and Kemp (1969) were first to show the implications of variable returns to scale. See, Ethier (1982), Markusen and Melvin (1981), Markusen (1981) and Panagariya (1980) for the related major studies.

tic production monopoly into the three-country, two-commodity and two-factor model of customs unions, we analyze the welfare change associated with two types of trade diversion and two types of trade creation as defined by Yu (1981, 1982). The problem we consider is especially interesting and important to the less-developed countries in which market structures are imperfect in some industries while, at the same time, others are highly effecient.[2] It will be demonstrated that in the presence of product market imperfections, trade creation I and trade creation II may entail welfare loss, while trade diversion I and trade diversion II may be welfare-improving.

II. Assumptions and The Model

We employ the three-country, two-commodity and two-factor trade model. Within this framework, the production of X_1 industry in the home country is subject to increasing returns to scale while monopoly is assumed to be present in the X_2 industry. It is important to emphasize that there is no conflict between the assumption of increasing returns to scale and monopoly. Following Herberg and Kemp (1969), Panagariya (1980) and most recently, Markusen and Melvin (1981), it is assumed that increasing returns to scale is caused by output-generated economies of scale that is external to the individual firm and internal to the industry. Suppose that there are only three countries in the world, the home country A, and its possible union partners, B and C. Each country produces two goods, X_1 and X_2, using capital and labor as the factors of production. Assume that A is the highest-cost producer and C is the lowest-cost producer of X_2. Also assume that countries B and C are similar but do not trade with each other. Furthermore, A is assumed to be a small country which exports X_1 to both B and C but imports X_2 from only one country. In addition, A is initially under autarky due to a prohibitive tariff levied against both B and C[3].

The production side of the model is developed with the specifications of the following production functions:

$$X_1 = (X_1^e)F(K_{i1}, L_{i1}) = (X_1^e)L_{i1}f(k_{i1}), k_{i1} = \frac{K_{i1}}{L_{i1}} \tag{1}$$

where X_1 is the output of a typical firm in industry 1. F is homogeneous of degree one; and

2. Scitovsky (1958), Corden (1972) and Choi and Yu (1984), among others, have discussed the competition-increasing effect and economies of scale effect of customs unions. Recently, Tironi (1982) studied the cost and benefits that result from the formation of customs unions when foreign-owned firms are involved in the integration process.

3. We have Closely followed the work of Yu (1981, 1982), Choi and Yu (1984) and extended the increasing returns analysis by integrating both increasing returns and domestic production monopoly into the three-country, two-commodity and two factor model of customs unions.

K_{i1}, L_{i1} are the quantities of capital and labor employed by the ith firm in X_1 industry. X_1^e is the external-economy effect in the X_1 industry. Summing over the individual firms, we obtain total industry outputs for industry 1

$$X_1 = \sum_i X_{i1} = (X_1^e)\sum_i L_{i1} f(k_{i1}) = (X_1^e) L_1 f(k_1) \tag{2}$$

and for industry 2

$$X_2 = L_2 g(k_2) \tag{3}$$

where L_1 and L_2 are industry inputs of labor, k_1 and k_2 are the industry capital to labor ratios. Equation (2) can be rewritten as:

$$X_1 = (L_1 f(k_1))^{e^*} \quad \text{where } e^* = \frac{1}{1-e} > 1 \tag{4}$$

The industry production for X_1 is thus homogeneous of degree e^* while g function for X_2 industry is homogeneous of degree one.

Note that economies of scale are external to the individual firms but internal to the industry. In the presence of monopoly, it is known that the real reward of each factor (in monopoly) equals marginal revenue product rather than the value of marginal product. Marginal revenue in the X_2 industry is defined as:

$$MR_2 = P_2^*\left(1 - \frac{1}{\eta}\right)$$

where η is the price elasticity of demand for the second commodity. It follows that

$$\text{w} = (f - k_1 f')X_1^e = P^*\left(1 - \frac{1}{\eta}\right)(g - k_2 g'), \text{ where } P^* \equiv \frac{P_2^*}{P_1^*} \tag{5}$$

$$\text{r} = f' X_1^e = P^*\left(1 - \frac{1}{\eta}\right) g' \tag{6}$$

where a prime indicates the partial derivative; w, r and P^* stand for, respectively, the wage, rental rate and the domestic price of the second commodity in terms of the first commodity. $(f - k_1 f')X_1^e$ and $f' X_1^e$ are the marginal products of labor and capital for individual firms in the X_1 industry while $P^*(1 - \frac{1}{\eta})\ (g - k_2 g')$ and $P^*(1 - \frac{1}{\eta})g'$ are the marginal revenue products of labor and capital for the X_2 industry in the model integrating both increasing returns and monopoly. With full employment of inelastic factor supplies we obtain:

$$L_1 + L_2 = \bar{L} \tag{7}$$

$$K_1 + K_2 = \bar{K} \tag{8}$$

where $\bar{L}$ and $\bar{K}$ denote fixed supplies of labor and capital respectively. From (5) and (6) we have

$$P^* = f' X_1^e \Big/ \left(1 - \frac{1}{\eta}\right) g' = (f - k_1 f') X_1^e \Big/ \left(1 - \frac{1}{\eta}\right)(g - k_2 g') \tag{9}$$

and the marginal-rate-substitution conditions:

$$\omega = \frac{W}{\mathrm{r}} = (f/f' - k_1) = (g/g' - k_2) \tag{10}$$

The slope of the efficient production frontier can be solved for by maximizing X_1 for various levels of X_2;

$$\text{Max } [(L_1 f(k_1))^{e^*} + \lambda(\bar{X}_2 - (\bar{L} - L_1) g(k_2)] \tag{11}$$

where λ is a Lagrangian multiplier. From the first-order conditions we obtain:

$$\text{MRT} = -\frac{dX_1}{dX_2} = \frac{1}{\lambda} = (f' X_1^e) e^* / g' = (f - k_1 f') X_1^e \, e^* / (g - k_2 g') \tag{12}$$

where MRT is the marginal rate of transformation. From (9) and (12) we obtain

$$\frac{dX_1}{dX_2} = -e^* P^* \left(1 - \frac{1}{\eta}\right) \tag{13}$$

since both $e^* > 1$ and $\infty > \eta > 1$, the production will not be at a point of tangency between the production frontier and a price line or a community indifference curve is only true if e^* does not equal $\eta/(\eta - 1)$.[4]

The demand side of the model is characterized by a strictly quasi-concave social utility function:

$$U = U(C_1, C_2) \tag{14}$$

where C_1 and C_2 are the domestic demands for the two products in the home country and $U_i \ (= \partial U / \partial C_i) > 0$ and $U_{ii} < 0$. Since the home country exports the first commodity and imports the second, we write

4. The non-tangency between the commodity price line and the transformation curve was first shown by Herberg and Kemp (1969, equation (25)).

$$C_1 = X_1 - E_1 \tag{15}$$

$$C_2 = X_2 + E_2 \tag{16}$$

where E_1 and E_2 represent the export of the first commodity and the import of the second commodity, respectively.

Assuming that the balance of trade is always in equilibrium we have $E_1 = PE_2$; where $P = P_2/P_1$ is the world price of the second commodity in terms of the first commodity. If country A imposes a tariff (t) on the imports of the second commodity, the domestic price ratio becomes $P^* = P(1 + t)$.

The model represented by equations (1)–(16) will be used to analyze the welfare implications of customs unions in a model integrating increasing returns and monopoly.

III. Welfare Analysis

Applying the procedure by Batra (1973), the model consisting of (1)–(16) can be utilized to examine the welfare implications of customs unions in a model allowing for increasing returns and monopoly. Taking the total differential of (14) and utilizing the consumer equilibrium condition $U_2/U_1 = P^*$, we obtain

$$\frac{dU}{U_1} = dC_1 + P^*dC_2 \tag{17}$$

From (15) and (16) we have

$$dC_1 = dX_1 - dE_1 \tag{18}$$

and

$$dC_2 = dX_2 + dE_2 \tag{19}$$

Substituting (18) and (19) into (17) and utilizing (13) we obtain

$$\frac{dU}{U_1} = P^*\left[1 - e^*\left(1 - \frac{1}{\eta}\right)\right]dX_2 - dE_1 + P^*dE_2 \tag{20}$$

We know that the quantity of the second commodity imported and the quantity domestically produced depend on the tariff level and the relative world price of X_2 in terms of X_1. Thus, $E_2 = E_2(\text{t.p})$ and $X_2 = X_2(\text{t.p})$. Therefore,

$$dE_2 = \left(\frac{\partial E_2}{\partial t}\right)dt + \left(\frac{\partial E_2}{\partial P}\right)dP$$

and

$$dX_2 = \left(\frac{\partial X_2}{\partial t}\right)dt + \left(\frac{\partial X_2}{\partial P}\right)dP$$

Since $P^* = P(1 + t)$ we have

$$\frac{\partial P^*}{\partial t} = P \text{ and } \frac{\partial P^*}{\partial P} = (1 + t).$$

We also know that $E_1 = PE_2$, which implies:

$$dE_1 = PdE_2 + E_2dP$$

By substitution and by making use of the above expression, we obtain

$$\begin{aligned}\frac{dU}{U_1} &= \left\{PP^*\left[\frac{\eta - e^*(\eta - 1)}{\eta}\right]\frac{\partial X_2}{\partial P^*} + \mathrm{p}^2t\,\frac{\partial E_2}{\partial P^*}\right\}dt \\ &\quad + \frac{P^*}{\mathrm{p}^2}\left\{PP^*\left[\frac{\eta - e^*(\eta - 1)}{\eta}\right]\frac{\partial X_2}{\partial P^*} + \mathrm{p}^2t\,\frac{\partial E_2}{\partial P^*} - \frac{PE_2}{(1 + t)}\right\}dP \\ &\equiv \alpha dt + \beta dP \qquad (21)\end{aligned}$$

Equation (21) furnishes the key expression for decomposing the welfare effects of trade creation and trade diversion into its various components. Yu (1981, 1982) has refined and further classified Viner's definition of trade creation and trade diversion into two types of trade creation and trade diversion according to the way in which trade is created or diverted[5]. We assume that prior to the formation of the customs unions, A is under autarky due to a prohibitive tariff levied against both B and C. Trade creation I refers to A's switch of its consumption of imports from the highest cost domestic producers to the lowest-cost producers in country C; tarde creation II is identified with A's shift of its consumption of imports from B's medium-cost producers to C's lowest-cost producers. Similarly, trade diversion I refers to A's switch of its consumption of imports from lowest-cost producers in C to medium-cost producers in B via discriminatory removal of the tariff in favor of B; trade diversion II is identified with A's switch of its consumption of imports from c's

5. We realized that such classification may not be essential in the standard model of customs unions. But trade creation and trade diversion of various types in our framework have profound implications over the home country's welfare.

producers to B's producers through the imposition of a discriminatory tariff against C only.

The first term in braces on the light-hand side of (21) indicates the change in welfare as a result of a discriminatory change in the tariff rate, given that terms of trade remain constant; the second term in braces represents the welfare effect of an exogenous shift in the terms of trade at constant tariff. The signs of the coefficients of dt and dP in (21) can be ascertained as follows: consider a dynamically stable system in which the output of a commodity responds positively to an increase in its relative price—$\partial X_2/\partial P^* > 0$. The first brace in (21) contains two terms. The first term, $PP^*[\eta - e^*(\eta - 1)]/\eta\, \partial X_2/\partial P^*$, captures the production effect of a change in the tariff rate via increasing returns and increasing competition. Since $e^* > 1$ and $\infty > \eta > 1$, it is clear that the first term is positive if $\eta > e^*(\eta - 1)$, and negative if $\eta < e^*(\eta - 1)$[6]. The term is equal to zero if $\eta \rightarrow \infty$. Hence, the production effect which results from the removal of a domestic distortion is dependent upon the relative magnitudes of demand elasticity (η) and the adjusted elasticity of returns to scale ($e^*(\eta - 1)$). With the full employment of resources, increased competition in the X_2 industry, due to a tariff rate reduction, creates a reallocation of resources by which the external-economy effect in the X_1 industry is likely to be dampened. The second term, $p^2t\, \partial E_2/\partial P^*$, captures both production and consumption effects of a tariff rate change which is negative in the absence of the consumption of inferior goods.

The second brace in (21) contains three terms. The first term, $PP^*[\eta - e^*(\eta - 1)/\eta]\, \partial X_2/\partial P^*$, indicates the production effect of changes in the terms of trade via increasing returns and increasing competition. The second term, $p^2t\, \partial E_2/\partial P^*$, then captures the direct effect of the terms of trade on production and consumption. The last term, $-PE_2/(1 + t)$ represents the terms of trade effect via changes in the value of imports. As discussed earlier, $\partial X_2/\partial P^* > 0$, $e^* > 1$ and $\infty > \eta > 1$, and the first term is positive if $\eta > e^*(\eta - 1)$ and negative if $\eta < e^*(\eta - 1)$. Both the second and third terms are negative. Using equation (21), we now analyze the welfare implications of each of the two types of trade creation and trade diversion.

Consider first trade creation I. A switches its consumption of the imported commodity from the highest-cost domestic producers to the lowest-cost producers in country C by reducing its tariff against B and C such that A trades with C only at C's terms of trade. In this case, $dt < 0$ and $dp = 0$ which implies that $dU/U_1 = \alpha dt$. Note that $p^2t\partial E_2/\partial P^* dt$, is negative. If the industries in the economy operate under constant returns to scale and perfect competition (product market perfection), the first term in α reduces to zero. We

6. The ambiguity in the movement of monopoly output in relation with tariff is discussed in Finger (1971).

then obtain the standard result that trade creation I is welfare-increasing. But even in the presence of product market imperfections, $dU/U_1 > 0$ if $\eta < e^*(\eta - 1)$. However, if $\eta > e^*(\eta - 1)$ then $dU/U_1 \gtreqless 0$; the standard result breaks down. Thus,

Proposition 1: In the presence of product market imperfections, trade creation I may be welfare-reducing.

Trade Diversion I occurs if A completely removes tariffs against B only, thus switching consumption of the imported commodity from the lowest-cost producers in C to the medium-cost producers in B. Since A trades with B at B's terms of trade, A's terms of trade therefore deteriorate. In this case, $dt < 0$ and $d\text{p} > 0$. In view of (21), the welfare-improving tariff reduction effect and welfare-reducing terms-of-trade deterioration effect of trade diversion I are retained if $\eta < e^*(\eta - 1)$. However, if $\eta > e^*(\eta - 1)$, $\alpha dt \gtreqless 0$ and $\beta dP \gtreqless 0$, then a lower tariff may lower welfare and a deterioration in the terms of trade may increase welfare. We immediately obtain the following result:

Proposition 2: In the presence of product market imperfections, trade diversion I may be welfare-improving.

Trade creation II occurs when A switches A's consumption of the imported commodity from the medium-cost producers in B to the lowest-cost producers in C by removing A's tariffs against C. This implies that $d\text{p} < 0$ and $dt = 0$ because A's terms of trade improve when it engages in trade with C only and imposes no tariff on B prior to trade with C. Therefore, (21) reduces to $dU/U_1 = \beta dP > 0$ if $\eta < e^*(\eta - 1)$; i.e. trade creation II is necessarily welfare-improving. However, if $\eta > e^*(\eta - 1)$, $dU/U_1 = \beta dP \gtreqless 0$. Thus,

Proposition 3: In the presence of product market imperfections, trade creation II may be welfare-reducing.

Finally, trade diversion II occurs when A levys a discriminatory tariff only against country C, thereby switching the consumption of the imported commodity from C to B; this implies a deterioration in A's terms of trade. It is assumed that prior to trade diversion II, customs union is formed--A imposes non-discriminatory tariffs on B and C. In this case, $dt = 0$ and $dP > 0$. If $\eta < e^*(\eta - 1)$ and $dU/U_1 = \beta dP < 0$ then trade diversion II is necessarily welfare-reducing. However, if $\eta > e^*(\eta - 1)$ and $dU/U_1 = \beta dP \gtreqless 0$, then

Proposition 4: In the presence of product market imperfections, trade diversion II may be welfare-improving.

IV. Conclusion

This paper has examined the welfare implications of customs unions formation within a framework which integrates increasing returns to scale and domestic monopoly in production into the standard customs unions theory. We have shown that, in the presence of product market imperfections, trade creation I and trade creation II may entail welfare loss, while trade diversion I and trade diversion II may be welfare-improving. It should be pointed out that (1) the types of trade creation and trade diversion and (2) the relative magnitudes of demand elasticity and the adjusted scale elasticity are crucial factors in determining the welfare effects of customs unions.

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