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Endogenous Wage Differentials, Imperfect Labor Mobility and Customs Unions Theory

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Abstract

This paper investigates the welfare consequences of forming a trade-creating or trade-diverting customs union in the presence of endogenous wage differential arising from labor immobility. Specifically, it is demonstrated that the direction of the wage differential ditermines whether trade creation I will improve or lower welfare. The wage differential also plays a crucial role in determining the welfare effects of trade creation II and trade diversion II. However, trade diversion I may have any welfare effects in the presence or absence of the wage differential.

I. Introduction

Most of the studies in the area of factor market imperfections have dealt with factor price differentials of exogenous nature. The assumption of constant factor price differentials, however, may not always be supported by empirical observations. In a recent important study, Casas (1984) relaxed the assumption of an exogenous wage differential and examined the implications of an endogenously determined intersectoral wage differential arising from imperfect labor mobility[1]. Casas analyzed the validity of several standard trade theorems in light of the changed assumption and showed that the traditional H-O-S trade models with or without exogenous factor price differentials,

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1. For a related recent analysis of factor immobility, see Hill and Mendez (1983).

as well as the specific-factor or Ricardo-Viner model turned out to be special cases of his general model.

The standard theory of customs unions was developed by Viner (1950) and later refined by Gehrels (1956) and Lipsey (1957). Recently, the theory was reexamined by Yu(1982) under the assumption of general unemployment caused by wage rigidities, and also by Choi and Yu (1984) for an economy with variable returns to scale production conditions. The purpose of this paper is to examine the normative implications of the formation of a customs union in Casas' model of imperfect labor mobility.

The paper is developed as follows. Section II describs the model and its assumptions. Section III analyzes the welfare effects of trade creation and trade diversion in the presence of an endogenous wage differential. Some concluding remarks are offered in section IV.

Ⅱ. The Model and Assumptions

In this section, we develop the standard three-country, two-commodity and two-factor model by explicitly incorporating an endogenous wage differential resulting from labor immobility. Let the world consist of the home country, A and its two potential union partners, B and C. All three countries produce two goods, X_1 and X_2, using two primary factors of production, capital (K) and labor (L). For the purpose of analytical convenience, it is assumed that A is the highest-cost and C is the lowest-cost source of A's importable good, X_2. Countries B and C are similar, but different from A, and hence do not trade with each other. In addition, A is a small country, so that if A engages in trade it exports X_1 to B and C, and imports X_2 from B or C.

On the production side of the model, we assume neoclassical production functions, perfectly competitive factor pricing, and full employment of both factors. We thus specify the following equations.

$$X_j=F_j(K_j, L_j),\ j=1, 2. \tag{1}$$

$$p_{dj}X_j=L_jw_j+K_jr_j \tag{2}$$

$$\overline{L}=\sum L_j \tag{3}$$

$$\overline{K}=\sum K_j \tag{4}$$

Here K_j and L_j are the sectoral allocations of capital and labor respectively, while p_{dj} is the domestic price of commodity j. We assume perfect capital mobility as between two sectors (so that $r_1=r_2=r$) in the home country. Labor is, however, assumed to be imperfectly mobile between the two sectors. Labor movement due to an expansion of a sector does not necessarily lead to an elimination of intersectoral wage differential caused by the expansion. Observers believe that the labor markets are characterized by some inertia due to various factors such as locational preferences, and high costs of moving. Thus, an endogenous wage differential between two sectors becomes a built-in phenomenon even in the long run under the assumption of imperfect labor mobility. Casas has formalized this phenomenon by assuming a constant elasticity of labor mobility[2]. Following Casas' original notations, we write.

$$L_1/L_2=k(1/b\mu)^{\varepsilon} \tag{5}$$

where k, $b>0$ are constants, $\mu=w_2/w_1$ the wage ratio; and $\varepsilon\geq 0$ is the constant elasticity of labor mobility. Note that $\varepsilon=0$ when labor is completely immobile, and $\varepsilon=\alpha$ when there is perfect labor mobility. We define elasticity of factor substitution,

$$\sigma_j=d\ln(K_j/L_j)/d\ln(w_j/r)=(K_j^*-L_j^*)/(w_j^*-r^*). \tag{6}$$

An asterisk over a variable denotes its percentage change.
We differentiate equations (1) through (5) totally and obtain

$$X_j^*=\theta_{Lj}L_j^*+\theta_{Kj}K_j^* \tag{7}$$

$$p_{d1}=\theta_{L1}w_1^*+\theta_{K1}r^* \tag{8}$$

$$p_{d2}^*=\theta_{L2}w_1^* +\theta_{K2}r^* {}_1+\theta_{L2}\mu^* \tag{9}$$

$$0=\sum\lambda_{Lj}l_j^* \tag{10}$$

$$0=\sum_{Kj}K_j^* \tag{11}$$

2. For more on this assumption, see Lancaster (1958), Pitchford (1967), Manning and Sgro (1975) and Casas (1984).

$$-\varepsilon\mu^* = L_1^* - L_2^* \tag{12}$$

Note that λ_{ij} is the proportion of the i-th factor used in j-th sector, whereas θ_{ij} is the distributive share of i-th factor in the j-th industry. Furthermore, from the definition of μ,

$$w_2^* = w_1^* + \mu^* \tag{13}$$

We substitute (13) in (6) and solve the system of equations (6), (10) and (11) to obtain the following.

$$K_j^* = (-1)^j\lambda_{Ki}[\{\sigma_2\lambda_{L2} + \sigma_1(\sigma_2/\varepsilon + \lambda_{L1})\}\ (w_1^* - r^*)]/D,\ j \neq i. \tag{14}$$

$$L_j^* = (-1)^j\lambda_{Li}[\{\sigma_1\lambda_{k1} + \sigma_2\lambda_{K2}\}\ (w_1^* - r^*)]/D,\ j \neq i. \tag{15}$$

Here D is the coefficient determinant of the system and

$$D = |\lambda| + (\sigma_2\lambda_{K2}/\varepsilon), \text{ and } |\lambda| = \lambda_{L1}\lambda_{K2} - \lambda_{L2}\lambda_{K1}$$
$$= \lambda_{L1} - \lambda_{K1}$$
$$= \lambda_{K2} - \lambda_{L2}.$$

Now we substitute (15) in (12) and then solve the system of equations (8), (9) and (12) to obtain

$$(w_1^* - r^*) = \varepsilon D/[\varepsilon|\theta|\ D + \theta_{L2}(\sigma_1\lambda_{K1}\ \sigma_2\ \lambda_{K2})]\ p_d^*. \tag{16}$$

Here $|\theta| = \theta_{L1}\theta_{K2} - \theta_{K1}\theta_{L2}$, and $p_d^* = p_{d2}^* - p_{d1}^*$ i.e., the percentage change in the domestic relative price of good 2. Finally, we use (16) in equations (14) and (15) to solve equations (7) and obtain

$$X_1^*/p_d^* = -\sigma_1\sigma_2\lambda_{K2}\theta_{K1} + \varepsilon[\sigma_1(\lambda_{L1}\lambda_{K2}\theta_{K1} + \lambda_{K1}\lambda_{L2}\theta_{L1}) + \sigma_2\lambda_{K2}\lambda_{L2}]/\Omega \tag{17}$$

$$X_2^*/p_d^* = \sigma_1\sigma_2\lambda_{K1}\theta_{K2} + \varepsilon[\sigma_1\lambda_{L1}\lambda_{K1} + \sigma_2(\lambda_{L1}\lambda_{K2}\theta_{L2} + \lambda_{K1}\lambda_{L2}\theta_{K2})]/\Omega \tag{18}$$

where $\Omega = \varepsilon|\lambda|\ |\theta| + \sigma_2\lambda_{K2}\theta_{L1} + \sigma_1\lambda_{K1}\theta_{L2}$. Note that equations (17) and (18) are equivalent

to (20) and (21), respectively in Casas. We assume stability, and therefore $\Omega>0$ [see Neary(1978) for details of stability conditions for a small open economy under factor market distortions].

What we have presented so far is a simple variant of Casas model. Now we depart from Casas analysis and concentrate on the normative implications of the formation of a customs union in this model. For this purpose, we first derive the domestic marginal rate of product transformation (MRT). Divide (17) through (18) to obtain

$$dX_1/dX_2=-\beta p_d \tag{19}$$

where $\beta=A/B$, and

$A=rK_1K_2\sigma_1\sigma_2\bar{L}+\varepsilon[\sigma_1L_1K_1p_{d2}X_2+\sigma_2K_2L_2p_{d1}X_1+\sigma_1L_1K_1L_2(1-\mu)w_1]$,

$B=rK_1K_2\sigma_1\sigma_2\bar{L}+\varepsilon[\sigma_1L_1K_1p_{d2}X_2+\sigma_2K_2L_2p_{d1}X_1-\sigma_2K_2L_2L_1(1-\mu)w_1]$.

In deriving relation (19), we have used equations (2) and also the definition of μ. From the definition of β above, it is evident that β is greater than, equal to or less than 1 according as $(1-\mu)$ is greater than, equal to or less than 0, or in other words, according as w_1 is greater than, equal to or less than w_2. Thus, the commodity price line, as expected, will intersect the transformation frontier so long as $w_1=w_2$. In particular, the MRT$(=-dX_1/dX_2)$ exceeds (falls short of) the domestic price ratio p_d, if the first sector pays a higher (lower) wage rate than the second sector. Hence the wage distortion resulting from imperfect labor mobility leads to a production distortion.

On the demand side of the model, the social welfare of the economy is represented by a strictly quasi-concave utility function:

$$U=U(D_1, D_2) \tag{20}$$

where D_i is the consumption demand for the i-th commodity, and $U_i>0$, and $U_{ii}<0$ for $i=1, 2$. It should be pointed out in this context that one could alternatively specify the utility function by explicitly incorporating leisure demand (negative of sectoral labor supply, L_1 and L_2) also in the utility function (a la Casas). The qualitative nature of the results would, however, remain unchanged under this alternate formulation [see Yu and Parai (1989)].

Since the home country exports the first commodity and imports the second, we

have

$$D_1=X_1-E_1 \tag{21}$$

$$D_2=X_2+E_2 \tag{22}$$

where E_1 and E_2 are the export of the first good and import of the second good respectively. We assume balance of trade equilibrium so that

$$E_1=pE_2 \tag{23}$$

where p is the world price of the second good in terms of the first good. We close the model by relating the foreign price ratio to the domestic price ratio via the tariff rate, t. So we have

$$p=p_d/(1+t). \tag{24}$$

Ⅲ. Analytical Results

The welfare consequences of trade creation and trade diversion can be analyzed by adopting the procedure developed by Batra (1973). Differentiating (20) and using the consumer equilibrium conditions, we obtain

$$dU/U_1=dD_1+p_d dD_2. \tag{25}$$

Now we differentiate equations (21) through (23) and use equation (19) to rewrite equation (25) as follows.

$$dU/U_1=(1-\beta)p_d dX_2+ptdE_2-E_2dp \tag{26}$$

Note that $E_2=E_2(p, t)$ and $X_2=X_2(p, t)$. Differentiation of E_2, X_2 and also of equation (24), and substitution of these in (26) would yield the following.

$$\begin{aligned} dU/U_1=&[(1-\beta)pp_d(\delta X_2/\delta p_d)+p^2t(\delta E_2/\delta p_d)]dt \\ &+[(1+t)\ (1-\beta)pp_d(\delta X_2/\delta p_d)+pt(\delta E_2/\delta p_d)-\{E_2/(1+t)\}]dp \end{aligned} \tag{27}$$

Equation (27) is instrumental for ascertaining the welfare consequences of various types of economic integrations. Note that the bracketed coefficient of dt on the right hand side of the equation captures the welfare effect of a discriminatory change in tariff rate at constant terms of trade. The coefficient of dp, however, reflects the welfare change due to an exogenous shift in the terms of trade of the small home country at constant tariff rate.

Our next task is to interpret and to sign each of these coefficients within the braces. The first term in the coefficient of dt, $(1-\beta)pp_d$ $(\delta X_2/\delta p_d)$, shows the distortionary production effect of a change in the tariff rate in the presence of endogenous wage differential. The sign of $(1-\beta)$, as noted earlier, is a priori indeterminate. Assuming the system to be dynamically stable, the output-price relation is positive, i. e., $\delta X_2/\delta p_d > 0$. The second term, $p^2t(\delta E_2/\delta p_d)$ indicates the effect of a change in the tariff rate on import demand. Assuming commodity 2 to be normal in consumption, this expression is negative.

There are three terms in the bracketed coefficient of dp. The first term captures the distortionary production effect of a change in the terms of trade. The second term reflects the terms of trade effect on import volume. The third term, $-\{E_2/(1+t)\}$ denotes the income effect of a change in the terms of trade on social welfare. While the first term may have any sign, the second and third terms are both negative.

In the orthodox Vinerian theory of customs unions, trade creation is defined as a switch of the home country's consumption of importables from a higher-cost source to a lower-cost source, and trade diversion as that from a lower-cost source to a higher-cost source of supply. This traditional definition has been modified by Yu (1981). Two types of trade creation and trade diversion are reported by Yu, depending on the manner in which trade is created or diverted. In short, trade creation I is defined as a switch in A's consumption of importable from higher-cost domestic source to lower-cost producers in C, and trade diversion I as a switch in A's consumption of importable from the lower-cost producers in C to higher-cost producers in B [see Yu (1981) or Parai and Yu (forthcoming) for details]. Trade diversion I occurs when A removes tariffs on B but maintains tariffs on C. Note that the notions of trade creation I and trade diversion I here are identical to those utilized in the traditional analysis of customs unions issues, e. g., Gehrels (1956), Lipsey (1957), and Batra (1973). Now trade creation II is a switch in A's consumption of importable from the higher-cost producers in B to their lower-cost counterparts in C, whereas trade diversion II is a switch in A's consumption of X_2 from C's producers to those in B. In the former case, A removes

tariffs on C, while in the latter A imposes tariff on C only. Taking advantage of equation (27), we can now analyze the welfare effects of each type of trade creation and trade diversion. The results are reported in table 1.

Table 1

Welfare Effects of Trade Creation and Trade Diversion under Endogenous Wage Differential Types of Trade Creation and

Trade Diversion	Walfre Effects
Trade Creation I (dp=0, dt<0)	$[(1-\beta)pp_d\delta X_2/\delta p_d+p^2t\delta E_2/\delta p_d]dt$
Trade Diversion I (dp>0, dt>0)	Equation (27)
Trade Creation II (dp<0, dt=0)	$(1+t)[(1-\beta)pp_d\delta X_2/\delta p_d+ pt\delta E_2/\delta p_d-E_2/(1+t)]dp$
Trade Deversion II (dp>0, dt=0)	$(1+t)[(1-\beta)pp_d\delta X_2/\delta p_d+ pt\delta X_2/\delta p_d-E_2/(1+t)]dp$

Recall that β is greater than, equal to, or less than 1 according as w_1 is greater than, equal to or less than w_2. Furthermore, $\delta X_2/\delta p_d>0$ and $\delta E_2/\delta p_d<0$. So from row 1 of table 1, $dU/U_1>0$ if $w_1>w_2$ and dU/U_1 may be negative when $w_1<w_2$ · Thus, we may now state the following proposition.

Proposition 1 : If labor immobility gives rise to higer wage rate in the exportable (importable) sector, trade creation I will enhance (may lower) welfare.

The intuitive interpretation of this result will be the same as in Parai and Yu (forthcoming) where both labor and capital are imperfectly mobile. Consider the special case of no endogenous wage differential. Here $\beta=1$ and, hence MRT=p_d and dU/U_1 will be positive. This is the standard result that trade creation always improves welfare as long as the discriminatory reduction of tariff rises import demand. If there are endogenous wage differentials such as one favoring the exportable sector, β will exceed unity and hence the MRT or the social marginal cost of the importable will exceed its private marginal cost (=p_d). Evidently then there will occur a production bias against the first industry, because at the give market price first sector's output would have been higher had there been no distortions (i. e., $\beta=1$) [see Batra (1973) for the details of this argument]. Under normal price-output response and stability, the output of the first industry would increase and move closer to the no-distortion level once the formation of the customs union leads to a reduction in the tariff on import and a consequent increase in the relative price of exportable. This production

gain plus the consumption gain associtated with the tariff reduction would unambiguously increase home welfare. By following the same argument, one can show that when the wage differential is paid by the importable sector, the production bias will be against the second sector. And the discriminatory reduction in tariff following the formation of the customs union would create additional production loss. This production loss would come in conflict with the consumption gain associated with the tariff reduction. If the production loss were lower than the favorable consumption gain, trade creation I would increase welfare. On the contrary, if the production loss were stronger than the consumption gain, trade creation would lead to a reduction in welfare.

Under trade diversion I, country A removes its tariff on B ($dt<0$) and switches from lower-cost source of import in C to a higher-cost source in B. This leads to an adverse movement in A's terms of trade, i. e., $dp>0$. The welfare effects of trade diversion I are given in row 2 of table 1 or equation (27). When w_1 exceeds w_2, the two bracketed terms associated with dt and dp are both negative. So dU will be positive or negative according as the favorable effect of tariff elimination outweighs (is outweighed by) adverse terms of trade effect. Conversely, if $w_1 < w_2$, the signs of the two bracketed terms become ambiguous, and therefore, dU becomes sign indeterminate. We then have the following proposition.

Proposition 2 : Given labor immobility and the associated higher wage rate in the exportable sector, trade diversion I improves (reduces) welfare if the tariff reduction effect dominates (is dominated by) the terms of trade deterioration effect. Given lower wage rate in the exportable sector, trade diversion I may also improve welfare.

From rows 3 and 4 of table 1 we obtain propositions 3 and 4, respectively.

Proposition 3 : If labor immobility gives rise to higher wage rate in the exportable sector, trade creation II is always welfare-improving. Conversely, if the wage rate in the exportable sector falls short of the wage rate in the importable sector, trade creation II may reduce welfare.

Proposition 4 : If labor immobility gives rise to higher wage rate in the exportble sector, trade diversion II always reduces welfare, and if it leads to a lower wage rate in the exprotable sector, trade diversion II may improve welfare.

For the purpose of comparison, the decomposition of the welfare effects of trade creation and trade diversion are given in table 2.

Table 2
Decompositon of Welfare Effects of Trade Creation (TC)
and Trade Diversion (TD)

Types	Wage Differential	Tariff Effects	Terms of Trade Effects	Total Effects
TC−I	$w_1 > w_2$	+	0	+
	$w_1 < w_2$	?	0	?
TD−I	$w_1 > w_2$	+	−	?
	$w_1 < w_2$	?	?	?
TC−II	$w_1 > w_2$	0	+	+
	$w_1 < w_2$	0	?	?
TD−II	$w_1 > w_2$	0	−	−
	$w_1 < w_2$	0	?	?

Ⅳ. Concluding Remarks

This paper investigated the welfare consequences of forming trade-creatting and trade-diverting customs unions in the presence of endogenous wage differentials arising out of imperfect labor mobility. The study serves two important purposes. First, imperfect labor mobility is a fact of life. An increase in the wage rate in one sector or region that is caused by its expansion, does not create enough movement of labor towards the region so as to completely remove the sectoral difference in wage rate. This is because of the stronger attachment of people to a certain locality due to various factors like strong family ties, or because of individual tastes and preferences for living in one jurisdiction over the other. The importance of the implications of imperfect labor mobility in the context of trade liberalizations in general, and customs union in particular can hardly be overemphasized. The recent free trade agreement between the U. S. A. and Canada is a case in point. On the basis of the traditional trade theory which assumes perfect labor mobility as between different sectors, experts believe that this agreement would lead to an expansion of trade and welfare for both the countries. As argued in this paper, whether the gradual reduction of tariffs on each country's imports, or their eventual elimination would increase its welfare would crucially depend on the pattern of intersectoral wage differentials existing in each country. Thus, our

analysis offers another reason for caution needed in the prediction of the welfare impact of trade liberalization policies. Secondly, our paper makes a useful contribution to the existing literature on customs unions theory. In particular, by introducing the notion of endogenous wage differential in the customs unions theory, we have been able to advance the theory way beyond the world of exogenous wage differential (see e. g., Yu (1981) where for the sake of analytical convenience it is assumed that the wage differential between two sectors is parametrically given. Such an assumption is very difficult to justify in reality. The replacement of this assumption by its endogenous counterpart is more realistic, and therefore offers a meaningful addition to the existing literature.

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