Welfare Reducing Trade and Optimal Trade Policy

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Working Paper 98-WP 196
August 1998

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We would like to thank an anonymous referee for useful comments on an earlier version of this paper. The usual caveats apply.

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ABSTRACT

This paper shows that free trade reduces the welfare of a small country with unemployment unless the free trade price if the importable falls below the autarky equivalent price. A decline in the price of the importable from the autarky level not only improves the terms of trade but also reduces employment and production in the importable sector. A numerical example illustrates that the autarky equivalent price of the importable can be substantially lower than the autarky price. If an optimal tariff is used, however, restricted trade improves welfare above the autarky level.

WELFARE REDUCING TRADE AND OPTIMAL TRADE POLICY

Introduction

Trade theorists have long believed that free trade necessarily improves the welfare of a small country. In a brilliant paper Kemp (1968, p. 158) suggested the possibility of a paradox that an improvement in the terms of trade results in a welfare loss.[1] Johnson (1965) further argued that with factor price rigidity free trade may actually reduce the welfare of a small open economy, a special case of the Kemp paradox. Batra and Pattanaik (1970), however, demonstrate that even in the presence of factor price rigidity and factor immobility, free trade still dominates autarky because "production gain" is zero but "consumption gain" is positive, and further suggest that the possibility of a negative optimal tariff cannot be ruled out a priori.

The possibility of welfare reducing trade has since been largely discounted and treated only as a theoretical curiosity. Due to a growing recognition that foreign imports are the cause of high unemployment, however, the protectionist mood has been spreading in the United States. The literature has also begun to investigate the link between unemployment and trade. Specifically, Batra and Beladi (1990) investigated the impacts of unemployment on the pattern of trade, citing widespread unemployment even in developed countries such as the United Kingdom and the United States in the 1930s as well as in the 1980s. In many countries the minimum wage is considered to be set by institutional arrangements such as unions or minimum wage legislations. Chao and Yu (1990) showed that an improvement in the terms of trade need not raise welfare of an economy suffering from urban unemployment. If imports of less expensive foreign goods are to raise domestic unemployment, some trade restrictions might prove beneficial. Batra (1992) also suggested that a movement towards freer trade in America led to productivity slowdown and lower real wages since 1972, and hence for the vast majority of people whose main income comes from labor earnings, freer trade generated increased poverty in the United States.

This paper formulates a disequilibrium trade model with sticky money wages that has been generalized to fix-price economies where output prices as well as wages are fixed, independent of excess demand or supply in the labor and goods markets. This paper differs

from existing literature in two important respects. First, unlike the models that only suggest the possibility of welfare reducing trade, this paper demonstrates that a decline in the price of the importable from the autarky level caused by free trade will *necessarily* reduce the welfare of a small country with unemployment. With unemployment, the economy can enjoy consumption gain from free trade, but production gain may become negative so that it outweighs any consumption gain. That is, the Kemp paradox necessarily occurs in the neighborhood of autarky. To demonstrate this result, we assume à la Batra and Beladi (1990) and Yu (1982) that only wage is rigid, permitting interest rate flexibility.

Second, we construct a numerical example to illustrate that even if the free trade price of the importable falls substantially below the autarky level, a small country with unemployment may not recover from the negative welfare shock from the increase in unemployment. It is noteworthy that the amount of labor employed changes with the relative commodity price as a result of inequality between the marginal rate of transformation in production and the relative commodity price. As the price of the importable declines, welfare begins to improve beyond a certain point. When the price of the importable falls to the autarky equivalent price, the positive terms of trade effect exactly offsets the negative welfare effect of increased unemployment. Hence, this paper attempts to formally identify situations where tariff serves as an employment-protecting device. A numerical example illustrates a case where free trade does not improve welfare until the price of the importable declines to 50 percent of the autarky level. We also examine in this case whether autarky should be maintained, or a nonprohibitive import tariff should be used to offset the adverse welfare effect of opening trade.

After describing the model and its solution, we discuss the implications of changing tariff rates on the foreign products. We then construct a numerical example to show that our result is a possibility for many countries with unemployment, then analyze the issues of optimal tariff. We conclude with some general remarks.

Fixed Money Wage and Welfare Reducing Trade

A small open economy with unemployed resources operates inside its production possibility frontier. Unemployment arises from imperfections in the factor markets. Harberler (1950), Johnson (1965), and Jones and Norman (1979) asserted that wages tend to be rigid due to institutional limitations. In *The General Theory of Employment, Interest and Money Keynes* (1935, p. 268) argued that if money wages are inflexible "the greatest practicable fairness will be maintained between labor and the factors whose remuneration is contractually fixed in terms of money, in particular the rentier class and persons with fixed

salaries." Keynes further argued that while wage flexibility expedites resource transfers between industries, "money wage level as a whole should be maintained as stable as possible, at any rate in the short period" (p. 270). On the other hand, Keynes believed that interest rate is flexible, albeit he was uncertain about the effectiveness of monetary policy to control interest rate.

For these reasons we consider a Keynesian open economy with fixed money wage and flexible interest rate to investigate the welfare effect of free trade and optimal trade policies. To lay the basis for analyzing the welfare effects of free trade for a small country with money wage rigidity,[2] we adapt Batra and Beladi (1990) and Jones and Norman (1979) with the following assumptions:

(i) The domestic economy consists of N identical consumers.

(ii) Two factors, capital K and labor L, are used to produce two goods, the exportable z and the importable y.

(iii) The exportable is the numeraire, and the domestic price q and the foreign price q* of the exportable are equal to unity. The economy is small and the foreign price of the importable p* is exogenous.

(iv) In the short run the domestic wage w is rigid and does not respond to random changes in the domestic and foreign prices. Capital is fully employed, and mobile between sectors. The interest rate r is flexible and responds to price changes.

(v) Perfect competition prevails in product markets and the capital market.

Let Z and Y denote the domestic production of the exportable z and the importable y. Outputs of the traded goods are given by

$$Z = F(L_z,K_z), \qquad Y = G(L_y,K_y),$$

and the production functions F(@) and G(@) are assumed to be concave in inputs, where L_i and K_i denote labor and capital employed in sector i, i = z,y.[3] Producers in the export sector choose L_z and K_z to maximize profits,

$$B_z = qF(L_z,K_z) - wL_z - rK_z. \tag{1}$$

The first-order conditions are:

$$qFL - w = 0, \quad qFK - r = 0, \tag{1N}$$

where $q = q^* = 1$, and the subscripts denote partial derivatives. Similarly, producers in the import sector choose L_y and K_y to maximize profits,

$$B_y = pG(L_y,K_y) - wL_y - rK_y, \tag{2}$$

The first-order conditions are:

$$pGL - w = 0, \quad pGK - r = 0. \tag{2N}$$

It is important to note that an increase in the price of one product does not directly affect factor demands in the other sector. However, an increase in the price of the importable affects the demand for capital in that sector and increases the interest rate. Thus, an increase in the price of the importable affects labor demand in the export sector indirectly via a change in interest rate. The input demand functions can be written

$$L_z = L_z(q,w,r), \; K_z = K_z(q,w,r), \; L_y = L_y(p,w,r), \; K_y = K_y(p,w,r).$$

Consumer preferences are represented by a monotone increasing utility function, $U = U(C,X)$, where C denotes domestic consumption of the exportable and X denotes domestic consumption of the importable. The budget constraint of the consumer is $C + pX = I$, where I is income in terms of the numeraire good. The first-order condition is: $UX/UC = p$. Let $C = C(p,I)$ and $X = X(p,I)$ denote the demand functions for C and X. Then the indirect utility function is written

$$V(p,I) \equiv U[C(p,I),X(p,I)].$$

To reduce domestic unemployment the government restricts trade by imposing a tariff $t = p - p^*$ on imports. The import demand function is

$$Q(p,I) = X(p,I) - Y(p), \tag{3}$$

which implies $QI = XI$. The government revenue from trade taxes is

$$g = (p - p^*)Q. \tag{4}$$

Following the convention, the tariff revenue is rebated to consumers.

The aggregate profit, $\Pi = \Pi_z + \Pi_y$, is returned to consumers as dividends. In addition to profit dividend, Π, and tariff rebate, $(p - p^*)Q$, consumers also receive income from the sale of factor services. The consumer receives $w(L_z + L_y) + r(K_z + K_y)$ from the factor markets. Hence, consumer income is

$$I = F(L_z,K_z) + pG(L_y,K_y) + (p - p^*)Q. \tag{5}$$

Unemployment and Foreign Price of the Importable

How does free trade affect the welfare of a small country with unemployed resources? To put it differently, if a small country adopts a free trade policy ($p = p^*$), how does a change in the foreign price of the importable affect unemployment? Free trade necessarily results in a decrease in the price of the importable below the autarky level, at least in the two-good world. An increase (decrease) in the price of the importable encourages (discourages) domestic production of the importable. If the economy is operating along the production possibility frontier, the expanding import sector must attract resources from the other sector, and hence an increase in the foreign price of the importable necessarily reduces the domestic supply of the exportable.

If both factors are not fully employed, increased production of the importable can be obtained by utilizing unemployed resources without contracting the export sector. However, when labor is unemployed and capital is fully employed, a change in the price of the importable affects the production of the exportable *indirectly* via a change in the interest rate.

We first focus on the *direct* effect. For a given interest rate, an improvement in the terms of trade caused by a decline in p^* does not affect employment or production in the export sector; i.e.,

$$\partial L_z/\partial p = \partial K_z/\partial p = \partial Z/\partial p = 0. \tag{6}$$

However, we show that a decline in the import price reduces employment of normal factors in the import sector. From the first-order conditions in (2N),

$$\partial L_y/\partial p = (GKGKL - GLGKK)/p\Delta, \tag{7a}$$

$$\partial K_y/\partial p = (GLGKL - GKGLL)/\Delta, \quad (7b)$$

$$\partial Y/\partial p = GL(\partial L_y/\partial p) + GK(\partial K_y/\partial p) > 0, \quad (7c)$$

where $\Delta = GLLGKK - (GKL)^2 > 0$ by concavity of the production function, and $(\partial Y/\partial p) > 0$ by convexity of the cost function.

Consider the cost minimization problem to produce a given output $\bar{Y}$, and let $L_z(\bar{Y},w,r)$ and $K_z(\bar{Y},w,r)$ be the cost minimizing levels of inputs to produce $\bar{Y}$. Assume that both labor and capital are strictly normal factors in industry y; i.e., $dL_y/d\bar{Y} > 0$ and $dK_y/d\bar{Y} > 0$. It can be shown that labor is a normal input if $GKGKL - GLGKK > 0$. Similarly, capital is a normal input if $GLGKL - GKGLL > 0$). Thus, if K and L are normal inputs, then $\partial L_y/\partial p > 0$ and $\partial K_y/\partial p > 0$.

How does a decline in the foreign price of the importable affect domestic unemployment? Let $L = L_z + L_y$ denote the aggregate demand for labor, and $L_u = \bar{L} - L$ denote the labor unemployment. Recall that $\partial L_z/\partial p = 0$ and $\partial L_y/\partial p > 0$, and hence $\partial L_u/\partial p < 0$. Thus, for a given interest rate, *an increase in p increases aggregate demand for labor and reduces unemployment*.

Unemployment and Welfare Reducing Trade

Observe that an indirect utility, $V(p^*,Z + p^*Y)$, is inversely related to p^* but positively related with national income, $Z + p^*Y$. Thus, a decline in the price of the importable affects welfare in two opposite directions; the *terms of trade effect* on welfare is positive, but the *income effect* is negative. We show that unless the price of the importable falls below the autarky equivalent price the negative income effect dominates the terms of trade effect.

Consider how national welfare is affected by a fall in the foreign price of the importable. If $p = p^*$, the expression for national income in (5) reduces to $I = Z + p^*Y$. Recall from (1) that an increase in the price the importable does not directly affect the output of the export sector, but indirectly via a change in the interest rate.

How does an increase in r affect the factor demands and output in the export sector? Differentiating (1) yields

$$\partial L_z/\partial r = - FKL/q\Delta, \quad (8a)$$

$$\partial K_z/\partial r = FLL/q\Delta, \quad (8b)$$

where $\Delta = F_{LL}F_{KK} - (F_{KL})^2 > 0$ by concavity of production function $F(\cdot)$. Differentiating Z with respect to r gives

$$\partial Z/\partial r = F_L(\partial L_z/\partial r) + F_K(\partial K_z/\partial r) = (F_K F_{LL} - F_L F_{KL})/\Delta.$$

Using a cost minimization problem for a given output, it can be shown that $F_K - F_L(F_{KL}/F_{LL})$ is positive (negative) if K is a normal (an inferior) factor. Thus, $\partial Z/\partial r$ is negative (positive) if K is a normal (inferior) factor.

Equilibrium in the domestic capital market is given by

$$K_z(q,w,r) + K_y(p,w,r) = \bar{K}. \tag{9}$$

Equation (9) defines how the equilibrium interest rate r(p) responds to a change in p. Differentiating (9) with respect to p gives

$$dr/dp = -(\partial K_y/\partial p)/[\partial K_z/\partial r + \partial K_y/\partial r]. \tag{10}$$

Recall from (7b) that $\partial K_y/\partial p > 0$ if K is a normal input. Thus, if K is a normal input, an increase in the price of the importable increases demand for capital and raises the interest rate, $dr/dp > 0$. Observe that

$$dI/dp^* = Y + p^*(dY/dp^*) + dZ/dp^*$$

$$= Y + w(dL_y/dp^*) + r(dK_y/dp^*) + w(dL_z/dp^*) + r(dK_z/dp^*)$$

$$= Y + w(dL/dp^*), \tag{11}$$

where $L = L_z + L_y$ is aggregate demand, $L < \bar{L}$, and $dK_y/dp^* + dK_z/dp^* = 0$ since capital is fully employed.

An increase in p not only affects the labor demand in the import sector for a given interest rate (direct effect), but also affects it indirectly by raising the interest rate. Thus, the total effects on labor demands can be written

$$dL_z/dp = (\partial L_z/\partial r)(dr/dp),$$

$$dL_y/dp = (\partial L_y/\partial p) + (\partial L_y/\partial r)(dr/dp).$$

From (8a), $\partial L_z/\partial r < (>) 0$ if K and L are complements (substitutes) in the production of Z. Similarly, $\partial L_y/\partial r < (>) 0$ if K and L are complements (substitutes) in the production of Y. Thus, if K and L are complements (substitutes), the indirect effects, $(\partial L_i/\partial r)(dr/dp)$, are

negative (positive), i = y,z. If K and L are substitutes, then $dL_i/dp > 0$, but the sign of $dL/dp^* = (\partial L_z/\partial r)(dr/dp) + (\partial L_y/\partial r)(dr/dp) + (\partial L_y/\partial p)$ is indeterminate if K and L are complements. However, the direct effects are likely to more than offset the indirect effects. Hereafter, we assume that an increase in the price of the importable increases aggregate demand for labor, $dL/dp^* > 0$.

Differentiating $V(p^*, Z + p^*Y)$ with respect to p^* and using Roy's identity, $V_p = - VIX$, and (11) gives

$$dV/dp^* = VI[- Q + w(dL/dp^*)], \qquad (12)$$

which is generally indeterminate. When evaluated at the autarky price p^A, Q = 0, and hence $dV/dp^* = VI\partial w(dL/dp^*) > 0$. That is, the initial welfare impact of opening up trade depends on the employment effect.

Proposition I: Assume that money wage is fixed and interest rate is flexible. If $dL/dp^* > 0$, then a decline in the price of the importable from the autarky level initially reduces welfare of a small country.

Observe that if labor is fully employed, $dL/dp^* = d\bar{L}/dp^* = 0$ in (12), and $dV/dp^* = - VIQ$. In this case, Q > (<) 0 and $dV/dp^* < (>) 0$ for $p < (>) p^*$. Thus, indirect utility is minimized at the autarky price. However, when labor is unemployed, a minimum of indirect utility occurs at a price somewhere below the autarky price, p^A.

A Numerical Example

We have shown that there is a price interval in which a small open economy with unemployment loses from free trade. There is an autarky equivalent price p^B at which the small country is just as well off as under autarky; i.e., $V(p^B, Z + p^BY) = V(p^A, Z + p^AY)$. If the foreign price of the importable falls below the autarky equivalent price ($p^* < p^B$), the terms of trade effect dominates the negative income effect and the country gains from free trade, despite its adverse impact on unemployment.

We now construct a concrete example to illustrate that the price of the importable may have to fall substantially below the autarky price for free trade to improve the welfare of a small open economy with unemployment. Consider a utility function U(C,X) = CX, which yields equal output shares in autarky. Demand functions are given by C = I/2 and X = I/2p,

where $I = Z + p^*Y$ is consumer income under free trade. The indirect utility is

$$V = I^2/4p = [Z + p^*Y]^2/4p^*. \quad (13)$$

The import demand function is $Q = I/2p^* - Y$. Recall that if $p^* = p^A$, then $Q = 0$. Thus, p^A satisfies

$$Z = p^A Y(p^A).$$

That is, each sector produces one-half of national income in autarky. Differentiating V with respect to p^* gives

$$dV/dp^* = [p^*Y - Z + 2p^*(dZ/dp^*) + 2p^{*2}(dY/dp^*)](I/4p^{*2}).$$

Evaluating dV/dp^* at p^A and utilizing $Z = p^A Y(p^A)$ gives

$$dV/dp^* \text{?} p^A = [dZ/dp^* + p^A(dY/dp^*)]Y > 0. \quad (14)$$

That is, if free trade results in a *small* decrease in the price of the importable from the autarky level, opening up trade reduces welfare. For a large price change, however, the terms of trade effect may dominate the output effect.

The example further illustrates that the range of the price interval in which free trade is welfare reducing can be relatively wide. Recall that an increase in the price of the importable p^* increases demand for capital in the import sector and raises the interest rate, which in turn raises production cost and reduces production in the export sector; i.e., $dZ/dp^* < 0$.

To capture the indirect effect of a decrease in p^* on the production of the exportable through the flexible interest rate, consider a linear supply schedule of the exportable, $Z = 4/3 - (1/3)p^*$, and a linear supply schedule of the importable, $Y(p^*) = p^*$. Domestic income is

$I = Z + p^*Y = 4/3 - (1/3)p^* + p^{*2}$, and import demand is $Q = [4/3 - (1/3)p^* + p^{*2}]/2p^* - p^*$.

Then the indirect utility reduces to

$$V = I^2/4p = [4/3 - (1/3)p^* + p^{*2}]^2/4p^*. \quad (15)$$

At autarky $Q = 0$ or $Z = p^*Y = p^{*2}$. Thus, the autarky price of the importable is

$$p^A = 1,$$

and the level of indirect utility at autarky is

$$V^A = 1.$$

Recall from (11) that

$$w(dL/dp^*) = dZ/dp^* + p^*(dY/dp^*) = - (1/3) + p^*,$$

which is positive when $p^* = p^A = 1$, and hence a decrease in p^* below p^A increases labor unemployment. Differentiating I and V with respect to p^* gives

$$dI/dp^* = Y + (dZ/dp^*) + p^*(dY/dp^*) = - (1/3) + 2p^*.$$

$$dV/dp^* = VI[-Q + (dZ/dp^*) + p^*(dY/dp^*)].$$

When evaluated at $p^A = 1$, $Q = 0$, $dI/dp^* = 5/3$ and $dV/dp^* = (2/3)VI > 0$. Thus, opening up trade, caused by a small decrease in p^* from p^A, reduces domestic welfare. However, beyond a certain point, further decreases in p^* will improve welfare and there is an autarky equivalent price p^B at which free trade results in the same level of utility as in autarky. The autarky equivalent price is p^B . 0.5033.

The negative welfare effect of opening up trade is illustrated in Figure 1. As the price of the importable declines from the autarky level $p^A = 1$, welfare initially declines in the neighborhood of autarky. Welfare continues to fall until it reaches a minimum. As the terms of trade improve beyond this point, import volume increases and welfare begins to rise. At p^B . 0.5, free trade provides the same level of welfare as in autarky. This example demonstrates that for free trade to improve the welfare of a small open economy with unemployment, the price of the importable may have to decline significantly below the autarky level p^A. Note that since U( ) is an ordinal utility function, a monotone increasing transformation of the direct utility U or the indirect utility V has no effect on the level of p^B.

Optimal Tariff

Since the economy operates inside the production possibility curve in the short run, imports of "cheap" foreign goods increases domestic unemployment and may adversely affect national welfare. Thus, free trade may not be optimal and a small country with unemployment may use trade restrictions to lessen the adverse employment and welfare effects of imports.[4]

To correct domestic market distortions, Johnson (1965, p. 8) recommended "the simplest remedy, a tax or subsidy, imposed at the point where the distortion occurs."

Although the optimal production subsidy is theoretically superior to the optimal tariff to cope with unemployment, trade restrictions have been more popular politically.[5] A commonly cited reason for avoiding a production subsidy is that the subsidy must be appropriated annually. Since annual appropriations must be reviewed periodically and the outcome may be uncertain, producers have favored trade restrictions. Once instituted, protection tends to become automatic and irreversible.

For these reasons, we consider optimal trade restriction. Brecher (1974) earlier argued that a tariff may improve the welfare of a small country with labor unemployment. In contrast, Batra and Seth (1977) suggested the paradoxical possibility that the optimal tariff may be negative. We now investigate the properties of optimal tariff and show that *restricted trade with a positive optimal tariff dominates free trade*. The policymaker is assumed to employ only a tariff to offset the adverse welfare impacts of unemployment resulting from a decline in the foreign price. The policymaker's problem is to choose the domestic price p (/ p* + t) to maximize the indirect utility

$$J = V[p, Z + pY + (p - p^*)Q]. \tag{16}$$

The first-order condition is: dJ/dp / VI[(dZ/dp) + p(dY/dp) + (p - p*)(dQ/dp)] = 0, or

$$(dZ/dp) + p(dY/dp) + t(dQ/dp) = 0. \tag{16N}$$

From (11), dZ/dp + p(dY/dp) = w(dL/dp), and hence the optimal tariff is given by

$$t^e = - w(dL/dp)/(dQ/dp). \tag{17}$$

Note that if the wage rate is flexible and labor is fully employed, producers jointly maximize revenue R = Z + pY, and hence, (dZ/dp) + p(dY/dp) = dL/dp = 0. In this case t = 0; i.e., the optimal tariff for a small full employment economy is zero. However, if labor is not fully employed, then dL/dp > and the optimal tariff is positive for a small country operating inside its production possibility frontier.[6]

If the country uses a sufficiently high tariff it can achieve full employment. But is the full employment tariff optimal for a small country with labor unemployment? Let $t^f > 0$ be the full employment tariff and $p^f = p^* + t^f$ now be the domestic price that induces full employment. Then at p^f, producer revenue R = Z + pY is maximized, (dZ/dp) + p(dY/dp) = 0, and hence dJ/dp is negative. Thus, *the full employment tariff is higher than the optimal*

tariff ($t^f > t^e$). Recall from (16N) that the necessary condition for the optimal tariff t^e to be positive is that $w(dL/dp) = (dZ/dp) + p(dY/dp) > 0$. This implies that there is some unemployment at the optimal tariff.

If the optimal tariff is used, does restricted trade improve welfare and dominate autarky? A change in p* affects welfare directly and also indirectly through the adjustment of the optimal tariff. The objective function is written as

$$J = V[p^* + t, Z + (p^* + t)Y + tQ]. \tag{18}$$

Note that $dJ/dp^* = (\partial J/\partial p^*) + (\partial J/\partial p)(dp/dp^*)$ and that $\partial J/\partial p = 0$ by (16N). Differentiating (18) with respect to p* and using the envelope theorem yields

$$\partial J/\partial p^* = V_I \bullet [-Q + t(\partial Q/\partial p^*)], \tag{19}$$

where $\partial Q/\partial p^*$ measures the effect of a change in p* on import demand, holding p constant. From (3), if the importable is a normal good ($X_I > 0$), then $\partial Q/\partial p^* = X_I(\partial I/\partial p^*)$. Differentiating $I = Z + pY + (p - p^*)Q$ with respect to p*, holding p constant, yields

$$(\partial I/\partial p^*) = -Q + (p - p^*)(\partial Q/\partial p^*).$$

If $X_I > 0$, then $\partial Q/\partial p^* = -X_I Q/(1 - tX_I) < 0$, and it must be distinguished from $dQ/dp^* = \partial Q/\partial p^* + (\partial Q/\partial p)(dp/dp^*)$, which measures the effect of an increase in p* on import while allowing the optimal tariff t and domestic price p to adjust. At the autarky price p^A, $Q = 0$, $\partial Q/\partial p^* = \partial J/\partial p^* = 0$, and hence the indirect utility reaches a minimum. If $X_I > 0$, then $\partial Q/\partial p^* < 0$ and $\partial J/\partial p^* < 0$ for all $Q > 0$, and hence an improvement in the terms of trade necessarily increases welfare. If $Q < 0$, then $\partial Q/\partial p^* > 0$ and $\partial J/\partial p^* > 0$. Thus, the indirect utility is roughly U-shaped and reaches a minimum at autarky when the optimal tariff is employed. That is, optimally restricted trade yields higher welfare than autarky.

Proposition II: Assume that the money wage is fixed and the interest rate is flexible in a small country. Then

(i) the optimal tariff t^e is less than the full employment tariff t^f, and hence does not eliminate unemployment, and

(ii) if the importable is a normal good, restricted trade with an optimal tariff improves welfare.

It is important to note that an optimal tariff is also less than a full employment tariff in Choi

and Beladi (1993) where the interest rate is fixed. Part (ii) of this proposition is more general in that interest rate is flexible and there is no price uncertainty. The main crux of our argument in Proposition II is the assurance that with unemployment, restricted trade with optimal tariff will always be welfare-improving.

Concluding Remarks

The possibility of welfare-reducing trade has been treated only as a theoretical rarity in the literature and has not been seriously examined. This paper demonstrates that free trade initially reduces welfare of a small open economy with unemployed resources; i.e., the Kemp paradox necessarily occurs in the neighborhood of autarky. This is because opening up trade initially increases domestic unemployment when money wage is rigid. In other words, this paper highlights the existence of a trade-off between the terms of trade gain from reducing the domestic price of imports and the loss in welfare due to the decrease in domestic production of the importable good that eventually leads to a higher unemployment level.

In the numerical example the output shares of the export and import sectors are equal in autarky, and the price of the importable must fall more than 50 percent from the autarky level before the trading country becomes as well off as under autarky. Examples with different output shares can easily be constructed where the export share is rising. If the optimal tariff is employed, restricted trade improves welfare and hence autarky is not an optimal policy. These findings suggest that trade policy may be warranted to offset the negative impact of trade when labor is unemployed.

Table 1. Welfare Reducing Trade

p*	V
0.01000	44.2291
0.10000	4.29025
0.20000	2.13422
0.30000	1.45934
0.40000	1.15600
0.50000	1.00347
0.50331	1.00000
0.60000	0.92919
0.70000	0.90289
0.80000	0.91022
0.90000	0.94385
1.00000	1.00000

ENDNOTES

1. Batra and Pattanaik (1970) also observed the Kemp paradox. For more recent analyses of terms of trade shocks and welfare, see also Marjit (1990) and Choi and Beladi (1993).

2. Real wage may be rigid or flexible, depending on the choice of the numeraire. Since the nominal wage w is fixed, the real wage, w/q, is also fixed, but w/p increases as p declines.

3. To permit negatively sloped input demand curves, we assume that F(•) and G(•) are not linearly homogeneous in K and L. To harmonize with the Heckscher-Ohlin model, one may introduce a third fixed factor, land L, and that production functions are linearly homogeneous in the three factors.

4. Obviously, an ideal solution lies in eliminating the factor price rigidity. In the presence of factor price rigidity, trade restrictions can be a second best policy. Export taxes are precluded by assumption (iii).

5. It can be shown that optimal production subsidy achieves full employment. The proof is available upon request and is not included here.

6. Let pf be the domestic price at which full employment is attained and $dY(pf)/dp = 0$. The assumption of unemployment implies that the probability that the foreign price p^* is below pf is unity.

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