TARIFFS, EMPLOYMENT AND
THE CURRENT ACCOUNT:
REAL WAGE RESISTANCE AND THE
MACROECONOMICS OF PROTECTIONISM

Sweder van Wijnbergen

Tariffs, Employment and the Current Account:
Real Wage Resistance and the Macroeconomics of Protectionism

ABSTRACT

Using a standard complete specialization model of a small open economy within a rigorous intertemporal optimization framework with contract-based wage rigidity, we show that permanent tariffs may lead to a current account <u>deterioration</u> and a <u>fall</u> in employment, contradicting most of the literature of macro-economic effects of import tariffs. I show that this will always be the case if the economy is small enough. The crucial factor in this complete reversal of standard results is the impact of tariffs on domestic real product wages via wage indexation. Temporary tariffs will have less of a negative impact on the CA or potentially even a positive impact, because they increase the consumption rate of interest (the terms at which future consumption can be traded for current consumption) and so increase private savings.

Extensions towards incorporating a more general production structure, investment and the use of tariff revenues to provide wage subsidies are presented.

Sweder van Wijnbergen
Room S13-141
The World Bank
1818 H Street, NW
Washington, DC 20433

1. Introduction

The continued persistence of the post 1973 slowdown in world-wide economic growth has led to increasing pressure in many countries to maintain growth while preserving external balance by using commercial policy to protect domestic production. Much of the existing literature on macro-economic effects of tariffs seems to lend support to that approach (at least under a fixed exchange rate regime). For a recent exposition, see Dornbusch (1980) or Chalciolades (1978) who provide further references going all the way back to Metzler (1949). See furthermore, Johnson (1958), Mussa (1974a) or Boyer (1977). The argument is straightforward: higher tariffs (with revenues rebated to consumers) have a pure substitution effect leading to a higher demand for domestic goods which in turn leads to higher output, income and therefore savings. Higher savings imply a current account improvement. Under flexible exchange rates an appreciating currency may offset these effects (see Mundell (1961) and Boyer (1977)).

I will argue that implausible assumptions on wage behavior are crucial to those results. Output will only go up if the increase in tariffs succeeds in lowering the real product wage. Since the macro-economic literature on tariffs usually assumed fixed nominal wages when discussing employment effects, the results follow automatically if the tariff increase succeeds in shifting domestic demand towards our goods.

One problem with all this has to do with foreign retaliation. Another problem arises because of the issue of real wage resistance. Often real wage indexation is at the root of internal/external balance conflicts. It is not clear why commercial policy would succeed in lowering the real wage where other attempts have failed. It then becomes of interest to explore the

consequences of commercial policy when wage indexation is effective. I will

focus on tariffs in this paper.

A further problem with the macroeconomic literature on tariff policy

is that its conclusions on CA effects are based on models incorporating

arbitrary static savings functions, not a very meaningful procedure in an

analysis of a clearly intertemporal issue such as current account behavior.

An elegant exception is the note by Razin and Svensson (1983) who however

assume market clearing real wages and, in another departure from the standard

Mundell framework, exogenous terms of trade.

In what follows we will stick to the Mundell framework but introduce

contract based real wage rigidity and savings behavior derived from explicit

forward looking maximizing behavior. Section 2 derives the main results of

this paper in a two-period framework (the minimum needed to get a time

structure in). We assume contract-based real (consumption) wage rigidity in

response to unanticipated shocks. No second period shocks unanticipated at

the beginning of period two will be considered, so that period will be

characterized by full employment. In Section 3, I briefly discuss to what

extent the results depend on the special assumptions made. In particular,

introduction of aggregate investment and extension to incomplete

specialization are discussed. Section 4 discusses the possibility of using

some or all of the tariff revenues for wage subsidies to get around the wage

rigidity problem. Section 5 concludes.

2.   Tariffs, Employment and the Current Account

2.1 The Model

Consider a two country Mundell-Fleming framework where each country

produces only one good. We make two alternative assumptions about output: in

the No Wage Indexation (NWI) case, output is always at its full employment

level; in the Wage Indexation (WI) case, unemployment may result if wage

indexation prevents real product wages to fall to their market clearing level.

We assume utility U to be weakly homothetically separable in

consumption today and consumption tomorrow while the period by period

subutility indices are homothetic and identical in terms of functional form

and parameter values (the arguments may of course differ across periods).

This allows us to define unit utility expenditure functions

Π_1 and Π_2 which can be interpreted as aggregate price indices, and an

expenditure function:

(1) $E = E(\Pi_1, \delta\Pi_2, U)$

where $\delta = 1/(1+r^*)$, one over one plus the world interest rate. By choice of

normalization foreign prices are set equal to one. p_i indicates the relative

price of domestic goods in terms of foreign goods in period i (the terms of

trade). Under the assumptions made so far, $\Pi_i = \Pi_i(p_i, 1)$ with

$\partial\Pi_i/\partial p_i = C_i/Z_i$ with C_i consumption of domestic goods by domestic residents

in period i and Z_i real consumption expenditure in period i. By property of

expenditure functions, $Z_i = \partial E/\partial\Pi_i$ so that $C_i = \partial E/\partial p_i$.

Wage indexation is introduced in a simple manner: wage contracts are

negotiated at the beginning of each period, incorporating all information

available at that time. They are set at a level that will lead to full

employment if no unanticipated shocks occur during the contract period, and

are indexed on the CPI (Π_1). Since we will not consider any shocks or policy

changes in the second period that are unanticipated at the beginning of that

second period, full employment will obtain in that period. Accordingly the goods market clearing equation for period 2 is:

$$(2) \qquad \bar{X}_2 = E_{p_2} + E^*_{p_2}$$

with $\bar{X}_2$ being the full employment output level. Of course first period disequilibrium will influence the second period goods market equilibrium via the intertemporal budget constraint.

In the first period, CPI indexation yields:

$$\frac{dw}{w} = \psi_D \frac{dp_1}{p_1} + (1-\psi_D) \frac{df_1}{1+f_1}$$

We will for simplicity set the initial tariff at zero. This is, however, of no consequence for any of the results. The period one wage equation can be rearranged to give an expression for the real product wage in terms of domestic goods:

$$(3) \qquad \frac{dw}{w} - \frac{dp_1}{p_1} = (1-\psi_D) \left(df_1 - \frac{dp_1}{p_1} \right)$$

(3) indicates that, in this Mundell-Fleming context, tariffs will push up the real (domestic) product wage if the Metzler paradox does not obtain, i.e. if the tariff inclusive price of the foreign good indeed goes up in terms of the domestic good. We will assume that foreign demand elasticities are high enough to rule out the Metzler paradox.

Now that first period wages do not necessarily clear the labor market, period 1 output will not necessarily be at its full employment level. Capital in period 1 is inherited from the past, there are no

intermediate inputs, so output X_1 and first period employment, L_1, are a functions of the real product wage only:

(4a) $X_1 = X_1(w/p_1)$, $L_1 = L_1(w/p_1)$

or, differentiating,

(4b) $\dfrac{dX_1}{X_1} = - \varepsilon \dfrac{d(w/p_1)}{w/p_1}$

with $\varepsilon > 0$.

Under wage indexation, output and employment follow from the wage indexation restraint (3) and the labour demand and aggregate supply functions as listed in (4a, b).

In the full employment version of the model, wages clear the labour market:

(4c) $\bar{L}_1 = L_1(w/p_1)$, $X_1 = \bar{X}_1(\bar{L}_1)$

with $\bar{L}_1$ the (exogenous) labour supply.

The goods market equilibrium condition for period 1 then becomes:

(5) $X_1(w/p) = E_{p_1} + E_{p_1}^{*}$

The budget constraint facing domestic residents is:

(6) $p_1 X_1 + \delta P_2 X_2 + t_1 E_{f_1} + \delta t_2 E_{f_2} = E(\Pi_1(p_1, 1+t_1), \delta \Pi_2(p_2, 1+t_2), U)$

Similarly for foreigners:

$$X_1^* + \delta X_2^* = E^*(\Pi_1^*, \delta\Pi_2^*, U^*)$$

where we assumed no trade interventions in the foreign country $(\tau_i^* = 0)$. Stars indicate foreign variables. Tariff revenues are redistributed, hence the terms $t_1 E_{f_1}$ and $\delta t_2 E_{f_2}$ in the private budget constraint in the home country.

We will make one important simplifying assumption: we will assume that the relative price of foreign goods tomorrow in terms of foreign goods today (δ), is fixed, allowing Hicks-aggregation of current and future foreign goods. The market clearing equation for that Hicks-aggregate good is redundant because of Walras' law. A true two-country model would of course endogenize δ (or, equivalently, the world rate of interest), leading to two separate market clearing equations for foreign goods, one for period one and the other for period two, only one of which would be redundant. The benefits of extra generality that endogenizing δ would yield do not seem to justify the additional complexity it would also lead to, at least for the particular issue we are looking at now (Appendix B does, however, provide an outline of such a generalization).

2.2 Results

One result is immediate: if the Metzler paradox does not obtain, higher tariffs will lead to real wage pressure in the domestic goods sector. Equation (3) says that nominal wage changes equal a weighted average of tariff changes and domestic price changes; ruling out the Metzler paradox implies that $\dfrac{df_1}{1+f_1} > \dfrac{dp_1}{p_1}$ so the real (domestic) product wage goes up, and employment

and first period output go down after an increase in the tariff rate

(equations (3 & 4)). Tariff increases would lower the real wage "ex ante";

real wage indexation will, to prevent that, lead to an increase in the real

domestic product wage and therefore to unemployment (qualifications to that

result due to relaxing the Mundell-Fleming complete specialization assumption

are discussed in the next section).

Differentiation of equation (6) around the zero tariff equilibrium

indicates that:

$$(6a) \qquad dU = E_u^{-1}((X_1-E_{p_1}) \, dp_1 + (X_2-E_{p_2}) \, \delta dp_2) + E_u^{-1} \, p_1 \, X_{1w} \, d(w/p_1)$$

$$= E_u^{-1}(E_{p_1}^* \, dp_1 + E_{p_2}^* \, \delta dp_2) + E_u^{-1} \, X_{1w} \, w \, (1-\alpha_D)(dp_1 - dp_1/p_1)$$

Similarly for foreign welfare:

$$dU^* = E_u^{*-1} \, (-E_{p_1}^* \, dp_1 - E_{p_2}^* \, \delta dp_2)$$

If this is substituted into (1), simple algebra gives expressions for

the terms of trade effects dp_i caused by changes in tariffs. We distinguish

the case with wage indexation (WI), and the case without (NWI); in the latter,

all terms involving X_{1w} drop out. For the first period, terms of trade changes

induced by tariffs today and tariffs in the second period are:

$$(7a) \qquad \left. \frac{dp_1}{df_1} \right|_{NWI} = - \Delta^{-1} \, (\Sigma_{22}E_{p_1f_1} - \Sigma_{12}E_{p_2f_1}) > 0$$

$$= \Delta_1/\Delta > 0$$

and

(7b)
$$\frac{dp_1}{df_2}\Big|_{NWI} = -\Delta^{-1}(\Sigma_{22}E_{p_1 f_2} - \Sigma_{12}E_{p_2 f_2}) > 0$$

$$= \Delta_2/\Delta > 0$$

Σ_{ij} represents the world substitution matrix plus income effects of terms of trade changes:

$$\Sigma_{12} = E_{p_1 p_2} + E^*_{p_1 p_2} + E^*_{p_2}(C_{1E} - C^*_{1E}),$$

$$\Sigma^*_{22} = E_{p_2 p_2} + E^*_{p_2 p_2} + E^*_{p_2}(C_{2E} - C_{2E})$$

etc.　$C_{iE} = E_{p_i U}/E_U$, the marginal propensity to spend on domestic goods in period i. We will make the usual assumption that own substitution effects dominate income effects $(\Sigma_{11} + \Sigma_{12} < 0)$. The particular structure of the utility function guarantees that cross-terms such as $E_{p_1 f_1}$ etc. are all positive. Δ is the Jacobian of (1) after substituting in (6a) and is positive in stable configurations. The explicit expression for Δ is given in Appendix A.1 Similar expressions can be derived for $\frac{dp_2}{df_1}$ and $\frac{dp_2}{df_2}$.

The results are fairly straightforward, higher tariffs today $(df_1 > 0)$ and higher tariffs tomorrow $(df_2 > 0)$ will both put upward pressure on today's terms of trade. The Metzler paradox corresponds to $dp_1/df_1 > 1$, a possibility that cannot be excluded, although we will assume that foreign demand elasticities are high enough to rule it out.

Including wage indexation leads to similar expressions (see Appendix A.2):

$$(8a) \qquad \left.\frac{dp_1}{df_1}\right|_{WI} = \frac{\Delta_1 + d}{\Delta + d} > 0$$

and

$$(8b) \qquad \left.\frac{dp}{df_2}\right|_{WI} = \frac{\Delta_2}{\Delta + d}$$

with:

$$d = (1-\psi_D) \frac{w}{P_1} X_{1w} (\Sigma_{22}(1-C_{IE}) + \Sigma_{12} C_{2E}) > 0.$$

the latter inequality (d > 0) is established in Appendix A.2. Comparing (7a, b), and (8a, b) immediately shows that:

$$(9) \qquad \left.\frac{dp_1}{df_1}\right|_{WI} - \left.\frac{dp_1}{df_1}\right|_{NWI} = \frac{\Delta_1 + d}{\Delta + d} - \frac{\Delta_1}{\Delta} = \frac{d(\Delta - \Delta_1)}{\Delta(\Delta + d)} > 0$$

This expression is positive if $\Delta_1 < \Delta$, which will be the case if the Metzler paradox does <u>not</u> obtain $(dp_1/df_1 < 1)$. This is intuitive: with wage indexation, aggregate supply of first period home goods falls, hence a larger relative price increase is necessary to restore goods market equilibrium.

Since we have ignored investment so far, current account effects of tariffs can be derived by looking at private savings. To avoid uninteresting ambiguities, we will make a symmetry assumption on flow variables across periods: corresponding flow variables across periods (say, exports today and exports tomorrow) are assumed equal <u>per unit of time</u> in both periods before the changes in tariffs. This of course implies that their actual values may differ since the periods may correspond to time spans of very different length.

Due to the utility structure assumed, real expenditure in any given period is a function of welfare U and the consumption discount factor $\rho = \dfrac{\delta \Pi_2}{\Pi_1}$ (the inverse of one plus the consumption rate of interest):

$$(10) \qquad Z_i = E_{\Pi_i}(1, \rho, U)$$

The current account 1/ in period 1 then becomes

$$(11) \qquad CA_1 = p_1 X_1 + t_1 E_{f_1} - \Pi_1 E_{\Pi_1}$$

Consider first the effects of a temporary tariff in period 1:

$$(12) \qquad \frac{\partial CA_1}{\partial f_1} = \frac{\partial CA_1}{\partial p_1}\bigg|_{\rho=\bar{\rho}} \frac{\partial p_1}{\partial f_1} + \frac{\partial CA_1}{\partial p_2}\bigg|_{\rho=\bar{\rho}} \frac{\partial p_2}{\partial f_1} + \frac{\partial CA_1}{\partial \rho} \frac{\partial \rho}{\partial f_1}$$

$$+ X_{1w}\left[1 + \left(t_1 E_{f_1 U} - \Pi_1 E_{\Pi_1 U}\right) E_u^{-1}\right] d(w/p_1)$$

$$= \underset{(A)}{E_{p_1}^{*}(1-C_{IE}) \frac{\partial p_1}{\partial f_1}} - \underset{(B)}{E_{p_2}^{*} C_{IE} \frac{\partial p_2}{\partial f_1}} - \underset{(C)}{\Pi_1 E_{\Pi_1 \Pi_2} \frac{d\rho}{df_1}}$$

$$+ \underset{(D)}{X_{1w}\left(\delta\Pi_2 C_{\Pi E} + t_1 C_{f_1 E}\right)\left(1 - \psi_D\right)\left(df_1 - dp_1/p_1\right)}$$

1/ Since there is no initial debt, there are no first period interest payments, so the trade balance and the CA are identical in period 1.

Induced income effects in period 1 lead to a CA improvement because part of the gains will be spent tomorrow (the term above (A)). 1/ On the other hand induced income effects tomorrow have the opposite effect (the term above (B)). Under the symmetry assumptions made (A) will dominate (B) if $\frac{dp_1}{df_1} > \frac{dp_2}{df_1}$. If there is no wage indexation (NWI), (A) will thus dominate (B) if foreign goods today (against which the tariff is levied) are a closer substitute for domestic goods today than they are for domestic goods tomorrow, a reasonable assumption which we will make:

$$(13) \qquad \frac{f_1 E_{p_1 f_1}}{E_{p_1}} > \frac{f_1 E_{p_2 f_1}}{E_{p_2}} \quad .$$

But if $\frac{dp_1}{df_1} > \frac{dp_2}{df_1}$, (C) also becomes unambiguously positive: if $\frac{dp_1}{df_1} > \frac{dp_2}{df_1}$,

$$(14) \qquad \frac{1+f_1}{\rho} \; \frac{d\rho}{df_1} = \psi_D \left(\frac{dp_2}{df_1} - \frac{dp_1}{df_1}\right) - \psi_F < 0$$

where ψ_D is the expenditure share of domestic goods and ψ_F of foreign goods. (14) indicates that high but temporary tariffs (only in period 1) will decrease the discount factor (increase the consumption rate of interest). This is because they lead to a real appreciation in period 1 that will be partially reversed later on (i.e. an anticipated depreciation over time after the initial unanticipated appreciation). 2/ So temporary tariff increases in period 1 will lead to a current account improvement both because of the

---

1/ $C_{IE} = E_{1U}/E_U$, the marginal propensity to spend in period 1. Under the symmetry assumptions made, $C_{IE}/C_{IE}^* = T_1/T_2$ where T_i is the number of years in period i. Similarly, $E_{p1}^*/E_{p2}^* = T_1/T_2$.

2/ For an extensive discussion of the relation between the real exchange rate, the consumption rate of interest and the current account cf Martin and Selowsky (1983) and Dornbusch (1983).

favorable income effects of tariff induced terms of trade changes (the gains

of which will be spread out over both periods) and because they lead to an

increase in the consumption rate of interest favorably affecting private

savings. It should be stressed that the CA improvement stems from the fact

that the tariff is temporary.

The fourth term, (D), may reverse this result, since $X_{1w} < 0$. The

intuition is clear: higher tariffs cause first period unemployment and hence

low first period income in the presence of real consumption wage indexation.

Standard income smoothing arguments explain that this has a negative impact on

the first period current account.

An expression similar to (14) can be derived for _future_ temporary

tariff increases $(df_2 > 0)$. It is straightforward to show that with the

assumptions made so far, future tariff increases will lead to a period 1

current account deficit. The story is similar: income effects via favorable

terms of trade changes come in the future but are partially spent today, and

the real consumption rate of interest falls.

Taking the two results together to analyze a permanent increase in

tariffs $df_1 = df_2 = df$, we get that in the absence of real wage indexation a

permanent tariff leaves the current account unaffected:

$$(15) \qquad \left.\frac{dCA}{df}\right|_{NWI} = E^*_{P_1}(1-C_{IE})\frac{dp_1}{df} - E^*_{P_2}C_{IE}\frac{dp_2}{df} - \Pi_1 E_{\Pi_1\Pi_2}\frac{d\rho}{df}$$

(Note that $\frac{dCA_1}{df} df = \frac{dCA_1}{df_1} df_1 + \frac{dCA_1}{df_2} df_2$ etc.)

Under the symmetry assumptions made the discount factor will not change:

$$(16) \qquad \frac{d\rho}{df} = \psi_D \left(\frac{dp_2}{df} - \frac{dp_1}{df} \right) + \psi_F^2 - \psi_F^1 = 0$$

while income effects are the same in both periods. Accordingly a permanent tariff increase has no impact on the current account, independent of the type of elasticity conditions that are usually claimed to be sufficient to guarantee such an improvement (c.f. Dornbusch (1980)):

$$(15a) \qquad \left. \frac{dCA}{df} \right|_{NWI} = 0$$

The reason for this is quite straightforward: a tariff changes relative prices within the period in which it is levied, but a permanent tariff does that both today and tomorrow, leaving the relative price of consumption today in terms of consumption tomorrow (one plus the consumption rate of interest) unaffected. Accordingly, savings will not change, which explains the absence of a current account impact. The extension to endogenous investment is discussed in Section 4.

All these results are considerably modified however if real wage resistance to the tariff induced increase in the cost of living is introduced. Ignoring second round effects of real wage changes on the terms of trade and via that on the consumption rate of interest and thus on saving gives:

$$(17) \qquad \left. \frac{dCA_1}{df} \right|_{WI} \approx \left. \frac{dCA_1}{df} \right|_{NWI} + \gamma p_1 X_{1w} \frac{dw/p_1}{df_1}$$

with $\gamma = (\delta \Pi_2 C_{\Pi E} + t_1 C_{f_1 E}) > 0$.

Clearly the second term is negative, pointing to the possibility of a

negative current account response to permanent tariffs under real wage

indexation, since $\left.\dfrac{dCA_1}{df}\right|_{NWI} = 0$. Second round effects however will lead to

a higher p_1 response than obtains without wage indexation, therefore

increasing the terms of trade gains in period 1 and decreasing the discount

factor $\dfrac{\delta\Pi_2}{\Pi_1}$ (increasing the consumption rate of interest). Both these

effects will improve the CA, so, although the possibility of a negative CA

response is now there, it does not follow unambiguously.

A substantially stronger result can be obtained if we look at the

limiting case of a small country (fixed terms of trade exclusive of tariffs in

both periods). Then the only CA impact of a permanent increase in tariffs

will come via the fall in income induced by real wage pressure:

$$(18) \qquad \frac{p_1 E^*_{p_1 p_1}}{E^*_{p_1}} \;,\; \frac{p_2 E^*_{p_2 p_2}}{E^*_{p_2}} \;\to\; \infty \;=>\; \left.\frac{dCA_1}{df}\right|_{WI} = \gamma p_1 \, X_{1w} \, \frac{dw/p_1}{df}$$

$$= \gamma p_1 X_{1w} \frac{w}{p_1}\,(1-\psi_D) < 0$$

or <u>a permanent increase in tariffs in a completely specialized price taker</u>

<u>will unambiguously lead to a fall in unemployment and a current account</u>

<u>deficit under CPI wage indexation.</u>

For a temporary tariff there is the offsetting effect of the direct

impact of the first period tariff on the real discount factor; but we can

still show that even if a CA surplus results it will be smaller than without

real wage indexation:

$$(19) \qquad \frac{p_i E^*_{p_i p_i}}{E^*_{p_i}} \to \infty \;=\!> \left.\frac{dCA_1}{df_1}\right|_{NWI} \qquad = \gamma p_1 X_{1w}(1-\psi_D) - \Pi_1 E_{\Pi_1 \Pi_2} \frac{d\rho}{df_1}$$

$$= \gamma p_1 x_{1w}(1-\psi_D) + \Pi_1 E_{\Pi_1 \Pi_2} \psi_f^1 \;\overset{>}{\underset{<}{=}}\; 0$$

$$\underset{(-)}{} \qquad\qquad \underset{(+)}{}$$

$$< \;\Pi_1 E_{\Pi_1 \Pi_2}\, \psi_f^1$$

$$\underset{(+)}{}$$

$$= \left.\frac{dCA_1}{df_1}\right|_{NWI}$$

3. Some Qualifications

We will briefly discuss the consequences of relaxing the complete specialization assumption and of introducing investment.

Incomplete specialization plays no role in the full employment — NWI case: all the conclusions will carry through although one expects smaller relative price movements since these now also trigger resource shifts. The case with wage indexation, WI, needs more qualifications. If both capital and labour are mobile between sectors, Stolper-Samuelson tells us that market clearing wages will fall or rise in terms of __both__ goods (and therefore in terms of the consumption price index Π_1) depending on whether the tariff is levied on the capital or labour intensive good. Real wage indexation will lead to results similar to those obtained in Section 3 if the tariff is levied on the capital intensive good since the indexation scheme will prevent the downward adjustment in real wages necessary to maintain full employment.

The conditions under which unemployment will arise in response to tariffs in a Ricardo-Viner sector-specific capital, mobile labor model with real wage indexation are more complicated and will also involve consumption

shares. Consider the small country case $(\hat{p}_1 = 0)$. We can use the results in Mussa (1974b) to derive the condition under which a full employment equilibrium would be characterized by a lower real consumpion wage after the imposition of an import tariff:

$$\hat{w} - \psi_D\hat{p}_1 - \psi_f\hat{f}_1 = \hat{w} - \psi_f\hat{f}_1$$

$$= (\eta - \psi_f)\hat{f}_1$$

with
$$\eta = \frac{\lambda_f\sigma_f}{1-\Theta_f}\Big/\Big(\frac{\lambda_f\sigma_f}{1-\Theta_f} + \frac{\lambda_D\sigma_D}{1-\Theta_D}\Big)$$

where λ_i is the fraction of the labor force employed in sector i, σ_i is the factor substitution elasticity in sector i and Θ_i is the labor share in sector i. So the results of Section 3 would also come out in the Ricardo-Viner context if $\eta < \psi_f$. This is more likely if the import competing sector employed only a small fraction of the labor force (λ_f small) or if that sector has a comparatively low labor demand elasticity because of either relatively low factor substitutability (σ_f/σ_D small) or because of a relatively high capital share ($(1-\Theta_f)/(1-\Theta_D)$ large).

Consider now investment, while reverting to our Mundell-Fleming context of complete specialization. The natural approach complementing our optimizing savings behavior is to derive investment from a similar optimizing procedure:

(20) $$\max_{I_1} \delta p_2 \ X_2 \ (\overline{L}, K_1+I_1) - \phi_1 I_1$$

ϕ_1 is the production cost of capital, a weighted average of p_1 and $(1+f_1)$ with weight γ on p_1. If we define Q as the value of future output produced with capital in terms of the cost of capital goods:

$$(21) \qquad Q = \frac{\delta p_2}{\phi_1}$$

solving (16) gives us

$$(22) \qquad dI_1 = (- \frac{\partial^2 X_2}{\partial K^2} / \frac{\partial X_2}{\partial K}) \, dQ$$

$$= h dQ, \qquad h > 0$$

or investment will go up or down depending on which way Q moves in response to the tariff. Now

$$\frac{dQ}{Q} = \frac{dp_2}{p_2} - \gamma \frac{dp_1}{p_2} - (1-\gamma) \, df_1$$

$$= \frac{dp_2}{p_2} - \frac{dp_1}{p_1} + (1-\gamma)(\frac{dp_1}{p_1} - df_1)$$

For permanent tariffs under the symmetry assumptions made throughout, $\frac{dp_2}{p_2} = \frac{dp_1}{p_1}$ for a given level of investment in the absence of wage indexation; the impact effect will therefore be negative if the Metzler paradox does not obtain $(\frac{dp_1}{p_1} - df_1 < 0)$.

This indicates that in the Mundell-Fleming model for the case of normal tariff incidence (no Metzler paradox), investment will fall in response to permanent tariffs, leading to a current account surplus. Second round effects will lead to a smaller terms of trade improvement today as long as

$\gamma > 0$ because investment related demand for domestic goods goes down, but to a larger improvement tomorrow because the cut in investment reduces aggregate supply tomorrow. The net effect is smaller favourable income effects today, bigger ones tomorrow and an increase in the real discount factor (decrease in consumption rate of interest), all of which lead to a deterioration of the CA:

$$(23) \quad \left.\frac{dCA_1}{df}\right|_{NWI} = \{ \underbrace{(1-C_{IE})E^{*}_{P_1} + \Pi_1 E_{\Pi_1\Pi_2}\rho\psi_D - \frac{\partial^2 X_2/\partial K^2}{\partial X_2/\partial K}}_{(+)} \} \underbrace{\{ \frac{dp_1}{df} - \frac{dp_2}{df} \}}_{(-)}$$

$$- \frac{\partial^2 X_2/\partial K^2}{\partial X_2\partial K} (1-\gamma)(1-\frac{dp_1}{df})$$

(23) omits a variety of price level multiplicands by setting them equal to one via choice of normalization. (II) is the positive impact effect of higher tariffs on the CA via their negative impact on investment (which in turn is affected because of the higher cost of capital), but the terms under (I) collect all the second round effects working in the opposite direction. Once again going to the small country case allows unambiguous results:

$$(24) \quad \frac{P_i E^{*}_{P_i P_i}}{E^{*}_{P_i}} \to \infty \Rightarrow \frac{dcA_1}{df} = - \frac{\partial^2 X_2/\partial K^2}{\partial X_2/\partial K} (1-\gamma) > 0$$

or permanent tariffs will improve the CA contrary to the no-investment case, but will do so because investment declines.

Incomplete specialization will make this result conditional on the tariff being levied on the labor intensive good.

4. Wage Subsidies Financed by Tariff Revenues

At the root of the problems discussed in Section 3 is the fact that real wage indexation leads to an increase in the real domestic-product wage after an increase in tariffs. A natural response is to use the tariff revenues to drive a wedge between real product wages and real consumption wages via wage subsidies: this would allow the real consumption wage to remain constant without an increase in the real product wage.

In what follows we take a slightly different approach: part of the tariff revenues is used to keep the utility of wage earners constant. 1/ A related analysis can be found in Dixit and Norman (1980); there however one of the two factors of production receives all tariff revenues, while we give wage earners only as much as is needed to keep their utility constant.

Consider a simplified one period version of the model of Section 2. We now have to distinguish the incomes accruing to the two factors of production in the home economy. Denote the expenditure function of domestic wage earners as e and of capitalists as $\tilde{e}$. Similarly u and $\tilde{u}$ represent utility of wage earners and capitalists respectively. Accordingly, tariff revenues equal $T = t(e_f + \tilde{e}_f)$. A fraction λ of T is handed out to wage earners. λ is determined endogenously in such a way that u will not be affected by the change in tariffs.

The budget constraint of workers is:

(24a) $e(p,f,u) = w + \lambda t(e_f + \tilde{e}_f).$

1/ This approach was suggested by Avinash Dixit.

Similarly, capitalists face the constraint

(24b) $\tilde{e}(p,f,\tilde{u}) = pX - w + (1-\lambda) t(e_f + \tilde{e}_f).$

The foreign budget constraint is

(24c) $E^*(p,1,U^*) = X^*$

Finally goods market clearing implies

$$e_p + \tilde{e}_p + E^*_p = X$$

λ will be set in such a way that $u = \bar{u}$, allowing the real product wage $\omega = w/p$ to remain at its full employment level. [1] Clearly, domestic output will not be affected under this set up. Simple differentiation of 24a,b,c around the zero tariff equilibrium yields:

(24d) $e_u du = (\omega - e_p)dp + (\lambda \tilde{e}_f - (1-\lambda)e_f)df$

(24e) $\tilde{e}_u d\tilde{u} = (X - \omega - \tilde{e}_p)dp + ((1-\lambda)e_f - \lambda \tilde{e}_f)df$

So an increase in tariffs is good because you get reimbursed for outlays you did not make ($\lambda \tilde{e}_f$ for wage earners and $(1-\lambda)e_f$ for capitalists) and bad because you are only incompletely reimbursed for costs you do incur ($-(1-\lambda)e_f$ for wage earners and $-\lambda \tilde{e}_f$ for capitalists). [1]

_____

[1] Keep in mind we are once again in the complete specialization framework.

[1] In deriving 24d we also used homogeneity properties of e and $\tilde{e}$.

(21d) tells us that wage earners utility will not be affected by the tariff (du/df = 0) if they receive a share of tariff revenues equal to:

$$(25a) \qquad \lambda^* = \frac{e_f(1-\varepsilon_f^p)}{e_f + \tilde{e}_f}$$

where $\varepsilon_f^p = \frac{f}{p}\frac{dp}{df}$. The Metzler effect corresponds to $\varepsilon_f^p > 1$. Accordingly in the case of normal tariff incidence a positive share smaller than one will suffice to maintain workers utility at the pre-tariff level.

What will happen to capitalists welfare? We can define $\hat{\lambda}$ as the wage earners share that would keep capitalists' utility constant:

$$(25b) \qquad \hat{\lambda} = \frac{e_f + \tilde{e}_f \varepsilon_f^p}{e_f + \tilde{e}_f}$$

Clearly $\tilde{u}$ is decreasing in λ (since λ is the wage earners share); also $\tilde{\lambda} > \lambda^*$ from (22a,b). Therefore if λ is set at λ^*, capitalists welfare will always increase (as long as $\varepsilon_f^p > 0$; see below).

Another way of seeing this is by assigning equal weight to welfare gains and looking at national income (in terms of foreign goods) for any choice of λ (and therefore also for λ^*):

$$e_u \frac{du}{df} + \tilde{e}_u \frac{d\tilde{u}}{df} = (X - e_p - \tilde{e}_p)\frac{dp}{df} + (\lambda\tilde{e}_f - (1-\lambda)e_f + (1-\lambda)e_f - \lambda\tilde{e}_f)$$

$$(26) \qquad\qquad\qquad = E^*_p \frac{dp}{df}$$

$$(27) \qquad \lambda = \lambda^* \Rightarrow \tilde{e}_u \frac{d\tilde{u}}{df} = E^*_p \frac{dp}{df}$$

which of course is a familiar result. Since λ^* is set to make $e_u \frac{du}{df} = 0$,

(23) immediately gives us the expression for capitalists' welfare: This

establishes my claim that capitalists' welfare will always increase as long as

$\varepsilon_f^p > 0$.

So using part of the tariff revenues to finance wage subsidies does

provide a way around the problems of Section 3. Extension to two periods is

straightforward and will show a positive CA response. Before jumping to

conclusions however, a cautionary note is in order. Affecting the current

account calls for intervention to change the terms of trade between goods

today and goods tomorrow (the real interest rate). Achieving this end by also

introducing within period relative price distortions such as a temporary

tariff is clearly suboptimal under the assumption made.

5. Conclusions

The main purpose of this paper is to show that the traditional

analysis of current account and employment effects of tariffs in the "open

economy model" literature is very sensitive to arbitrary assumptions

habitually made about wage and savings behavior. Section 2 analysed the

current account response to temporary and permanent tariffs under savings

behavior derived from intertemporal optimization rather than arbitrary

consumption functions; wages follow a contract theory type real wage

indexation rule. We kept the structure of the Mundell-Fleming model

traditionally used in macro-oriented discussions of tariffs to facilitate

comparison with that literature.

In the case of labour market clearing real wages a permanent increase

in tariffs is shown to leave the current account unaffected under reasonable

symmetry assumptions, since the income effects caused by tariffs induced terms

of trade changes are the same (per unit of time) in both periods and the consumption rate of interest does not change. A temporary tariff increase "today" however leads to a stronger term of trade induced income effect today than tomorrow; moreover, the current period apreciation caused by a temporary tariff is larger than the second period terms of trade improvement, leading to an increase in the consumption rate of interest. Both factors lead to a CA improvement as a consequence of temporary first period tariffs.

Real wage indexation is shown to potentially modify these results. In the Mundell-Fleming context of complete specialization, tariffs are shown to increase the domestic real product wage if wages are indexed on the CPI. This in turn implies that an increase in tariffs, if unanticipated at the time first period wage contracts were concluded, will inevitably lead to unemployment via the resulting upward pressure on the real domestic product wage. This holds for both temporary and permanent increases in tariffs. As a consequence first period output and therefore income declines, contributing a negative element to the current account response. In the limiting case of an infinite foreign demand elasticity (small country assumption) this negative element is shown to dominate: <u>in that case a permanent increase in tariffs will lead to more unemployment, a fall in first period real output and a current account deficit.</u>

Temporary first period increases in tariffs will under real wage indexation also lead to more unemployment and less first period real output, but the increase in the real consumption rate of interest they also cause may (or may not) offset the negative effect on the current account of the fall in first period income associated with the increase in unemployment. Even if the CA response is positive it will always be less than the corresponding CA response to temporary tariffs without real wage indexation.

References:

Boyer, R.S. (1977), "Commercial Policy under Alternative Exchange Rate
        Regimes", The Canadian Journal of Economics, May 1977.

Chalciolades (1978), International Monetary Theory and Policy, McGrawhill, New
        York.

Dixit, A. and V. Norman (1980), Theory of International Trade, Cambridge,
        NISBET.

Dornbusch, R. (1980). Open Economy Macro-economics, Basic Books, New York

Dornbusch, R. (1983), "Real Interest Rates, Home Goods and Optimal External
        Borrowing," Journal of Political Economy.

Johnson, H. (1958), "Towards a general Approach to the Balance of
        Payments,"Journal of Political Economy.

Martin, R. and M. Selowsky (1983), "Energy Prices, Substitution and Optimal
        Borrowing in the Short Run," Journal of Development Economics.

Metzler, L. (1949), "Tariffs, the Terms of Trade, and the Distribution of
        National Income," Journal of Political Economy.

Mundell, R. (1961), "Flexible Exchange Rates and Employment Policy," the
        Canadian Journal of Economics.

Mussa, M. (1974a), "A Monetary Approach to Balance of Payment
        Analysis,"Journal of Money, Credit and Banking.

Mussa, M. (1974b), "Tariffs and the distribution of income: the Importance of
        Factor Specificity, substitutability and intensity in the Short and
        Long Run," Journal of Political Economy.

Razin, A. and L. Svensson (1983), "An asymmetry between Import and Export
        Taxes," Economic Letters.

van Wijnbergen, Sweder (1986), "Fiscal Policy, Trade Intervention and World
        Interest Rates", in J. Frenkel (ed.), International Aspects of Fiscal
        Policy, NBER and University of Chicago Press.

Appendix A:

Tariff induced terms of trade changes with and without wage indexation

1. **No wage indexation**

Differentiating 4, 5 and 6 after eliminating U and U* through substituting in the budget constraints (2) gives for the case of no wage indexation:

$$
\begin{bmatrix} \Sigma_{11} & \Sigma_{12} \\ \Sigma_{21} & \Sigma_{22} \end{bmatrix}
\begin{bmatrix} dp_1 \\ dp_2 \end{bmatrix}
=
\begin{bmatrix} - E_{p_1 f_1} df_1 - E_{p_1 f_2} df_2 \\ - E_{p_2 f_1} df_1 - E_{p_2 f_2} df_2 \end{bmatrix}
$$

where Σ_{ij} is defined on page 5.

Applying Cramer's rule immediately yields

$$
\left. \frac{dp_1}{df_1} \right|_{NWI} = \frac{\Delta_1}{\Delta}
$$

with $\Delta_1 = E_{p_2 f_1} \Sigma_{12} - E_{p_1 f_1} \Sigma_{22} > 0$

$\Delta = \Sigma_{11} \Sigma_{22} - \Sigma_{21} \Sigma_{12} > 0$

Δ_1 , Δ are the symbols used on p.7.

2. Wage indexation

Incorporating wage indexation yields:

$$
\begin{aligned}
&\sum_{11} + (1-C_{1E})(1-\psi)\frac{w}{P_1}X_{1w} & \sum_{12} & \quad dp_1 & \quad -(E_{P_1f_1} - (1-C_{1E})(1-\psi)\frac{w}{P_1}X_{1w})df_1 - E_{P_1f_2}df_2 \\
&&&\quad = \\
&\sum_{21} - C_{2E}\frac{w}{P_1}X_{1w}(1-\psi) & \sum_{22} & \quad dp_2 & \quad -(E_{P_2f_1} + C_{2E}\frac{w}{P_1}X_{1w}(1-\psi))df_1 - E_{P_2f_2}df_2
\end{aligned}
$$

Once again applying Cramer's rule gives

$$
\frac{dp_1}{df_1}\bigg|_{WI} = \frac{\Delta_1 + d}{\Delta + d}
$$

$$
d = (1-\psi)\frac{w}{P_1}X_{1w}(\sum_{22}(1-C_{1E}) + \sum_{12}C_{2E}) \cdot
$$

$$
X_{1w} < 0 \; ; \; 1-C_{1E} = C_{2E} + C_{f_1E} + C_{f_2E} > C_{2E};
$$

finally the stability condition $\sum_{11}\sum_{22} - \sum_{21}\sum_{12} > 0$ coupled with the symmetry conditions imply that $\sum_{22}(1-C_{1E}) + \sum_{12}C_{2E} < 0$; putting all that together establishes $d > 0$, as claimed in the text.

Appendix B:

Endogenizing the World Interest Rate

Endogenizing the world interest rate r (or, equivalently, the world discount factor δ) is straightforward. We will provide only a sketch of the results one should expect; a full discussion of the interaction between commercial policy and world interest rates can be found in van Wijnbergen (1986).

If current and future goods are imperfect substitutes, we need to incorporate one of the two commodity market clearing conditions for foreign goods. We choose the one for current (as opposed to future) foreign goods:

$$(B.1) \qquad X_1 = E_{f_1} + E_{f_1}^{'}$$

Manipulation of B.1, budget constraints and the first period home goods equilibrium equation yields an equivalent condition that the first period world current account has to equal zero: [1]/

$$(B.2) \qquad CA_1 + CA_1^* = 0$$

Or:

$$(B.3) \qquad P_1 X_1 + t_1 E_{f_1} - \pi_1 E_{\pi_1} + X_1^* - \pi_1^* - E_{\pi_1}^* = 0$$

A straightforward result follows from (15a). If a permanent tariff changes p_1 as much as it changes p_2, it will leave both CA_1 and CA_1^* unaffected for given world interest rates. But then, if B.2 held before the change in commercial policy, it will also hold after the change in commercial policy. Hence, in that case, the world interest rate will be unaffected.

A second simple result emerges in the case where current domestic and foreign goods are close substitutes, so that the tariff change does not affect the terms of trade very much. Equation (18) shows an _ex ante_ CA decline for

---

[1]/   Private budget constraints at home an abroad guarantee that, if B.2 holds, the world CA will also equal zero in period two.

given world interest rates in that case; to restore equilibrium in world

capital markets (so that B.2 holds again), the world interest rate needs to

rise. Unbalanced initial CA (and offsetting CA*) positions will add income

effects in a predictable manner.