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

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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 lead to a current account deterioration and a fall in employment, contradicting most of the literature on macro-economic effects of import tariffs. 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.

I. 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 view (at least under a fixed exchange rate regime). For a recent exposition, see Dornbusch (1980) or Chalciolades (1981) 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), Boyer (1977).

I will argue here however 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 (1982) 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 sets a benchmark by analyzing the full employment case in a two-period framework (the minimum needed to get a time structure in). I analyze both temporary and permanent tariff changes. Section 3 introduces 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 4, I briefly discuss to what extent the results depend on the special assumptions made. More in particular introduction of aggregate investment and extension to incomplete specialization are discussed. Section 5 discusses the possibility of using some or all of the tariff revenues for wage subsidies to get around the wage rigidity problem. Section 6 concludes.

2. Tariffs and the CA under full employment

Consider a two country Mundell-Fleming framework where each country produces only one good. Since in this section factors of production are always fully utilized output is at its full employment level.

For simplicity 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:

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

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 $C_i = \partial E/\partial p_i$.

If we define a similar expenditure function for foreigners and indicate it by E*, we can write the domestic goods market clearing condition in each period as:

$$X_1 = E_{p_1} + E^*_{p_1} \tag{1a}$$

$$X_2 = E_{p_2} + E^*_{p_2} \tag{1b}$$

where $E_{\Pi_i} = \partial E/\partial \Pi_i$, and X_i is output of "our" good in period i. If there are tariffs on foreign goods in period i, $\Pi_i = \Pi_i(p_i, f_i)$ where $f_i = 1+t_i$, one plus the tariff rate.

The budget constraint facing domestic residents is:

$$p_1X_1 + \delta P_2X_2 + t_1E_{f_1} + \delta t_2 E_{f_2} = E(\Pi_1(p_1, 1+t_1), \delta\Pi_2(p_2, 1+t_2), U) \tag{2}$$

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 $t_1E_{f_1}$ and $\delta t_2E_{f_2}$ 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.

Differentiation of (2) around the zero tariff equilibrium indicates that

$$dU = E_u^{-1}((X_1 - E_{p_1})\, dp_1 + (X_2 - E_{p_2})\, \delta dp_2) \tag{2a}$$

$$= E_u^{-1}(E^*_{p_1} dp_1 + E^*_{p_2} \delta dp_2)$$

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. For the first period, terms of trade changes induced by tariffs today and tariffs in the second period are:

$$\frac{dp_1}{df_1} = -\Delta^{-1}\,(\Sigma_{22} E_{p_1 f_1} - \Sigma_{12} E_{p_2 f_1}) > 0$$

and (3)

$$\frac{dp_1}{df_2} = -\Delta^{-1}\,(\Sigma_{22} E_{p_1 f_2} - \Sigma_{12} E_{p_2 f_2}) > 0$$

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

$$\Sigma_{12} = E_{p_1 p_2} + E^*_{p_1 p_2} + E^*_{p_2}\,(C_{1E} - C^*_{1E}),\ \Sigma_{22} = E^*_{p_2 p_2} + E_{p_2 p_2} + E^*_{p_2}\,(C_{2E} - C^*_{2E})$$

etcetera. $C_{iE} = E_{p_i U}/E_U$, 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 (2a) and is positive in stable configurations. 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 in the next section that foreign demand elasticities are high enough to rule it out.

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 $\rho = \frac{\delta \Pi_2}{\Pi_1}$ (the inverse of one plus the consumption rate of interest):

$$Z_i = E_{\Pi_i}(1, \rho, U) \tag{4}$$

The current account 1/ in period 1 then becomes

$$CA_1 = p_1X_1 + t_1E_{f_1} - \Pi_1E_{\Pi_1} \tag{5}$$

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

$$\frac{\partial CA_1}{\partial f_1} = \frac{\partial CA_1}{\partial p_1}\bigg|_{\rho=\bar{\rho}} \frac{\partial p_1}{\partial f_1} + \frac{\partial CA_1}{\partial p_2}\bigg|_{\rho=\bar{\rho}} \frac{\partial p_2}{\partial f_1} + \frac{\partial CA_1}{\partial \rho}\frac{\partial \rho}{\partial f_1} \tag{5a}$$

$$= \underset{(A)}{E^*_{p_1}(1-C_{IE})\frac{\partial p_1}{\partial f_1}} - \underset{(B)}{E^*_{p_2}C_{IE}\frac{\partial p_2}{\partial f_1}} - \underset{(C)}{\Pi_1E_{\Pi_1\Pi_2}\frac{d\rho}{df_1}}$$

Induced income effects in period 1 lead to a CA improvement because part of the gains will be spent tomorrow (the term above (A)). 2/ 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 $\frac{dp_1}{df_1} > \frac{dp_2}{df_1}$. This will be the case if foreign goods today (against which the tariff is levied) are a closer substitute for domestic goods today than

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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.

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

they are for domestic goods tomorrow, a reasonable assumption which we will make:

$$\frac{f_1 E_{p_1 f_1}}{E_{p_1}} > \frac{f_1 E_{p_2 f_1}}{E_{p_2}} .$$

If that is so, (C) also becomes unambiguously positive: if $\frac{dp_1}{df_1} > \frac{dp_2}{df_1}$,

$$\frac{1+f_1}{\rho} \frac{d\rho}{df_1} = \psi_D \left(\frac{dp_2}{df_1} - \frac{dp_1}{df_1}\right) - \psi_F < 0 \qquad (6)$$

where ψ_D is the expenditure share of domestic goods and ψ_F of foreign goods. (6) indicates that high but temporary tariffs (only in period 1) will decrease the discount factor (increase the consumption rate of interest) since 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). 1/ So temporary tariff increases in period 1 will lead to a current account improvement both because of the 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.

An expression similar to (5) can be derived for <u>future</u> temporary tariff increases ($df_2 > 0$). It is straightforward to show that with the

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1/ 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) or Dornbusch (1983).

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 the result that a permanent tariff leaves the current account unaffected:

$$\frac{dCA}{df} = E^*_{P_1}(1-C_{IE})\frac{dp_1}{df} - E^*_{p_2}\, C_{IE}\frac{dp_2}{df} - \Pi_1 E_{\Pi_1 \Pi_2}\frac{d\rho}{df} \tag{7}$$

(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

$$\frac{d\rho}{df} = \psi_D\left(\frac{dp_2}{df} - \frac{dp_1}{df}\right) + \psi^2_F - \psi^1_F = 0 \tag{8}$$

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)).

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. That is the subject of the next section.

3. Real wage indexation and macro-economic effects of tariff changes

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 remains

$$X_2 = E_{p_2} + E^*_{p_2} \tag{9}$$

Of course first period disequilibrium will influence the second period goods market equilibrium via the intertemporal budget constraint.

In the first period CPI indexation of wages gives us

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

We will for simplicity set the initial tariff at zero. The period one wage equation can be rearranged to give an expression for the real product wage in

terms of domestic goods:

$$\frac{dw}{w} - \frac{dp_1}{p_1} = (1-\psi_D)\left(df_1 - \frac{dp_1}{p_1}\right) \tag{10}$$

(10) 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 is not necessarily at its full employment level. Capital in period 1 is inherited from the past, there are no intermediate inputs, so output is a function of the real product wage only:

$$X_1 = X_1(w/p_1)$$

or, differentiating, (11)

$$\frac{dX_1}{X_1} = -\varepsilon \frac{d(w/p_1)}{w/p_1}$$

with $\varepsilon > 0$. Replacing (1^a) by (10) and (11) gives the new model incorporating wage indexation.

One result is immediate: if the Metzler paradox does not obtain, higher tariffs will lead to real wage pressure in the domestic goods sector. Equ. 10 says that nominal wage changes equal a weighted average of tariff changes and domestic price changes, ruling out the Metzler paradox implies that $\frac{df_1}{1+f_1} > \frac{dp_1}{p_1}$ so <u>the real (domestic) product wage goes up, and employment</u>

goes down (equ. (11)). 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).

As one might expect, the cut back in aggregate supply because of the tariff induced real wage pressure will lead to more upward pressure on the first period relative price of domestic goods than obtains without wage indexation (WI refers to the wage indexation case, NWI refers to the no wage indexation case):

$$\left.\frac{dp_1}{df_1}\right|_{WI} - \left.\frac{dp_1}{df_1}\right|_{NWI} = \frac{\Delta_1+d}{\Delta+d} - \frac{\Delta_1}{\Delta} = \frac{d}{(\Delta+d)\Delta}(\Delta-\Delta_1) > 0 \qquad (12)$$

if $\Delta_1 < \Delta$ (i.e. no Metzler paradox or $\frac{dp_1}{df_1} < 1$); d is positive, see the appendix for precise expressions. Showing that the same result holds for permanent tariffs is straightforward.

The impact wage indexation has on the second period terms of trade response to tariffs is less clear cut: on the one hand higher first period terms of trade will lead to more substitution towards tomorrow's goods, on the other hand the cut in first period income and employment leads to a reduction in demand for all goods, inclusive tomorrow's domestic good. Accordingly, indicating permanent tariff change by df,

$$\left.\frac{dp_2}{df}\right|_{WI} - \left.\frac{dp_2}{df}\right|_{NWI} \gtrless 0$$

with similar ambiguities obtaining with respect to temporary first period tariffs.

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

$$\left.\frac{dCA_1}{df}\right|_{WI} \approx \left.\frac{dCA_1}{df}\right|_{NWI} + p_1 X_{1w} \frac{dw/p_1}{df_1} \quad \underline{1/} \tag{13}$$

Clearly the second term is negative pointing to the possibility of a negative current account response to permanent tariffs under real wage indexation, since $\left.\frac{dCA_1}{df}\right|_{NWI} = 0$. 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 $\frac{\delta \Pi_2}{\Pi_1}$ (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:

$$\frac{p_1 E^*_{p_1 p_1}}{E^*_{p_1}}, \frac{p_2 E^*_{p_2 p_2}}{E^*_{p_2}} \to \infty \Rightarrow \left.\frac{dCA_1}{df}\right|_{WI} = p_1 X_{1w} \frac{dw/p_1}{df} \tag{14}$$

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

or <u>a permanent increase in tariffs in a completely specialized price taker will unambiguously lead to a fall in unemployment and a current account deficit under CPI wage indexation.</u>

1/ $X_{1w} = \partial X_1 / \partial w$

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:

$$\frac{p_i \; E^*_{p_i p_i}}{E^*_{p_i}} \to \infty \Rightarrow \left.\frac{dCA_1}{df_1}\right|_{NWI} = p_1 X_{1w}(1-\psi_D) - \Pi_1 E_{\Pi_1 \Pi_2} \frac{d\rho}{df_1} \tag{15}$$

$$= \underset{(-)}{p_1 X_{1w}(1-\psi_D)} + \underset{(+)}{\Pi_1 E_{\Pi_1 \Pi_2}} \; \psi_f^1 \gtrless 0$$

$$< \underset{(+)}{\Pi_1 E_{\Pi_1 \Pi_2}} \; \psi_f^1$$

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

4. Some Qualifications

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

Incomplete specialization plays no role in Section 2: all the conclusions will carry through although one expects smaller relative price movements since these now also trigger resource shifts. Section 3, with wage indexation, 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 consumption 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 $\eta = \frac{\lambda_f \sigma_f}{1-\Theta_f} / \left(\frac{\lambda_f \sigma_f}{1-\Theta_f} + \frac{\lambda_D \sigma_D}{1-\Theta_D}\right)$

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:

$$\max_{I_1} \delta p_2 X_2 (\bar{L}, K_1 + I_1) - \phi_1 I_1 \tag{16}$$

ϕ_1 is the reproduction 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:

$$Q = \frac{\delta p_2}{\phi_1} \tag{17}$$

solving (16) gives us

$$dI_1 = \left(-\frac{\partial^2 X_2}{\partial K^2} \Big/ \frac{\partial X_2}{\partial K}\right) dQ \tag{18}$$

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

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

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

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

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

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:

$$\left.\frac{dCA_1}{df}\right|_{NWI} = \{(1-C_{IE})E^*_{p_1} + \underset{(+)}{\Pi_1 E_{\Pi_1 \Pi_2} \rho\psi_D} - \underset{(I)}{\frac{\partial^2 X_2/\partial K^2}{\partial X_2/\partial K}}\} \{\underset{(-)}{\frac{dp_1}{df} - \frac{dp_2}{df}}\}$$

$$- \underset{(II)}{\frac{\partial^2 X_2/\partial K^2}{\partial X_2 \partial K}} (1-\gamma)\left(1-\frac{dp_1}{df}\right) \tag{19}$$

(19) 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:

$$\frac{p_i E^*_{p_i p_i}}{E^*_{p_i}} \to \infty \Rightarrow \frac{dCA_1}{df} = -\frac{\partial^2 X_2/\partial K^2}{\partial X_2/\partial K}(1-\gamma) > 0 \tag{20}$$

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.

5. 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:

$$e(p,f,u) = w + \lambda t(e_f + \tilde{e}_f). \tag{21a}$$

1/ This approach was suggested by Avinash Dixit.

Similarly, capitalists face the constraint

$$\tilde{e}(p,f,\tilde{u}) = pX - w + (1-\lambda)\ t(e_f + \tilde{e}_f). \tag{21b}$$

The foreign budget constraint is

$$E^*(p,1,U^*) = X^* \tag{21c}$$

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 21a,b,c around the zero tariff equilibrium yields:

$$e_u du = (\omega - e_p)dp + (\lambda\tilde{e}_f - (1-\lambda)e_f)df \tag{21d}$$

$$\tilde{e}_u d\tilde{u} = (X - \omega - \tilde{e}_p)dp + ((1-\lambda)e_f - \lambda\tilde{e}_f)df \tag{21e}$$

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

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

$(-(1-\lambda)e_f$ for wage earners and $-\lambda\tilde{e}_f$ for capitalists) 1/

(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:

$$\lambda^* = \frac{e_f(1-\varepsilon_f^p)}{e_f + \tilde{e}_f} \tag{22a}$$

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:

$$\hat{\lambda} = \frac{e_f + \tilde{e}_f\varepsilon_f^p}{e_f + \tilde{e}_f} \tag{22b}$$

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^*):

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

$$= E_p^* \frac{dp}{df} \tag{23}$$

1/ In deriving 21d,e we also used homogeneity properties of e and $\tilde{e}$.

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:

$$\lambda = \lambda^* \Rightarrow \tilde{e}_u \frac{d\tilde{u}}{df} = E^*_p \frac{dp}{df} \tag{24}$$

This establishes my claim that capitalists' welfare will always increase as long as $\varepsilon^p_f > 0$.

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.

6. 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 labour market clearing and savings behavior derived from intertemporal optimization rather than arbitrary consumption functions; section 3 replaced the labour market clearing condition by a contract theory type real wage indexation rule, maintaining the

optimizing approach to savings. 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.

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Appendix: Tariff induced terms of trade changes with and without wage indexation

1. No wage indexation

Differentiating $(1^{a,b})$ after substituting in the budget constraint (2) gives:

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

where λ_{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 $\Delta_1 = E_{p_2 f_1} \lambda_{12} - E_{p_1 f_1} \lambda_{22} > 0$

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

Δ_1 , Δ are the symbols used on p.12.

2. Wage indexation

Replacing (1a) by (10) and (11) yields

$$\begin{matrix} \lambda_{11} + (1-C_{1E})(1-\psi)\frac{w}{p_1}X_{1w} & \lambda_{12} \\ \lambda_{21} - C_{2E}\frac{w}{p_1}X_{1w}(1-\psi) & \lambda_{22} \end{matrix} \begin{matrix} dp_1 \\ dp_2 \end{matrix} = \begin{matrix} -(E_{p_1f_1} - (1-C_{1E})(1-\psi)\frac{w}{p_1}X_{1w})df_1 - E_{p_1f_2}df_2 \\ -(E_{p_2f_1} + C_{2E}\frac{w}{p_1}X_{1w}(1-\psi))df_1 - E_{p_2f_2}df_2 \end{matrix}$$

Once again applying Cramer's rule gives

$$\left.\frac{dp_1}{df_1}\right|_{WI} = \frac{\Delta_1 + d}{\Delta + d}$$

$$d = (1-\psi)\frac{w}{p_1}X_{1w}(\lambda_{22}(1-C_{1E}) + \lambda_{12}C_{2E}) .$$

$X_{1w} < 0$; $1-C_{1E} = C_{2E} + C_{f_1E} + C_{f_2E} > C_{2E}$; finally the stability condition

$\lambda_{11}\lambda_{22} - \lambda_{21}\lambda_{12} > 0$ coupled with the symmetry conditions imply that

$\lambda_{22}(1-C_{1E}) + \lambda_{12}C_{2E} < 0$; putting all that together establishes $d > 0$, as claimed in the text.