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GRADUAL TRADE REFORM AND THE CURRENT ACCOUNT —THE ROLE OF INTERMEDIATE GOODS

Sugata MARJIT

Centre for Studies in Social Sciences, Calcutta, India

Saibal KAR

Northern Illinois University, U.S.A.

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Abstract: We study the implication of gradual trade reform on the current account of a small open economy, focusing on imported intermediates and investment. Contrary to the conventional wisdom, gradual trade reform tends to worsen the current account under plausible assumptions.

1. INTRODUCTION

This paper studies the implications of gradual trade reform on the current account of a small open economy. Authors working in this area have been influenced by the Mexican Debt problem and have focused their analyses on this example. Papers by Razin and Svensson (1983), Edwards and van Wijnbergen (1986), van Wijnbergen (1992) deal with differential impact of 'gradualist' and 'drastic' tariff-cuts on the current account adjustment using suitable intertemporal models. Razin and Svensson (1983) pointed out that a permanent reduction in tariffs leaves the intertemporal relative prices and private savings unchanged. Gradual tariff reduction makes current consumption relatively expensive and encourage private savings. Edwards and van Wijnbergen (1986) makes a case for gradualism on this basis when capital market imperfections exist. However, van Wijnbergen (1992) comments "It is this body of theory that, for all its theoretical elegance, seems firmly at variance with empirical facts." To look for a way be which gradual tariff cut may lead to a current account deficit, van Wijnbergen (1992) develops an elegant model with policy reversal in a non-expected utility framework. This paper is a humble attempt towards this goal.

The purpose of this paper is not to suggest yet another interpretation of the Mexican Debt problem. Instead it takes a closer look at the literature by modifying the general set up in a somewhat realistic way so that something different could be said regarding the relationship between the sequencing of the trade reform and the current account

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adjustment. It builds on the previous analyses but differs from the rest on two counts.[1]

First, we would like to focus on the traded intermediate goods as opposed to final consumption goods. Trade reform in many occasions is pursued in the form of altering the tariff rates on the intermediates rather than on the final goods. This also does justice to the idea that the bulk of international trade consists of intermediate goods, capital goods, semi-finished products etc. Second, we shall bring in domestic investment as an important factor in the current account adjustment. The empirical premise of such an analysis is built in part on the current Indian experiment with trade reform whereby import-duties on imported capital goods have been drastically reduced and further cuts have been promised in the recent future.[2]

With intermediates being targeted for reform, current account adjustment assumes a different outlook relative to a situation where trade in final goods is liberalized. The usual intertemporal substitution mechanism that determines the current consumption relative to future, is absent in a framework where intermediates can not be stored. However, a different intertemporal relationship emerges when capital interacts with the imported intermediates to determine the profitability of investment. Even if one ignores investment, there is a presumption that the gradualist policy should lead to a current account deficit in such a structure.

The plan of the paper is as follows. The second section describes the basic model and results. The last section concludes the paper.

2. MODEL AND RESULTS

Consider a small open economy which pecializes in an export good X and imports its consumption good from the rest of the world. X uses capital and an imported input from abroad. Agents in the economy live for two periods and start off with a given endowment of capital having the option to increase it via investment which yields output in the future and then depreciates fully. We assume that there is no trade restriction on importing the final consumption good. But a tariff on the intermediate input is sought to be reduced through a policy of trade reform. Zero tariff on final consumption good is assumed to highlight the impact of tariff cuts on the intermediate imports.

Following symbols are used in the formal model with 'i' denoting the time period, $i = 1, 2$.

C_i – Consumption in the ith period.
X_i – Production in the ith period.
M_i – Intermediate import in the ith period.
t_i – Tariff in the ith period $= t$, in steady state.
I – Investment.
K_1 – Initial Capital Stock.
r – Real Interest Rate.
β – Utility rate of discount $o < \beta < 1$.

[1] For a lucid survey of the intertemporal models of current account adjustment see Sen (1994).

[2] See Bhagwati and Srinivasan (1993) and Marjit and Raychaudhuri (1997).

We are in a small open economy. Hence all prices are exogenous and normalized to unity, r is also exogenously given. Production of X requires capital and intermediate input. All capital is domestically owned and we rule out foreign investment.

To make our point as clear as possible we go for a closed form solution and assume the following utility function to define our consumption of the ith period.

$$U(C_i) = \log C_i \quad i = 1, 2 \tag{1}$$

We also assume that the production function is concave.
The representative agent faces the following maximization problem

$$\text{Max } U(C_1) + \beta U(C_2)$$

subject to:

$$(X_1(K_1, M_1) - M_1 - C_1 - I)(1 + r) + X_2(K_2 + I) - M_2 - C_2 = 0$$

Note that in the budget constraint, the tariff does not appear explicitly as the tariff revenue of $t_1 M_1$ and $t_2 M_2$ are given back by the government through lump-sum transfers. However, the choices of the variables would depend on the tariff rates. The first order conditions are

$$\frac{C_2}{C_1} = \beta(1 + r) \tag{2}$$

$$\frac{\delta X_i}{\delta M_i} = (1 + t_i) \quad i = 1, 2 \text{ (Profit maximization)} \tag{3}$$

$$\frac{\delta X_2}{\delta I} = 1 + r \tag{4}$$

$$(X_1(K_1, M_1) - M_1 - C_1 - I)(1 + r) + X_2(K_2 + I) - M_2 - C_2 = 0 \tag{5}$$

The first order conditions along with the production functions determine C_1, C_2, X_1, X_2, M_1, M_2 and I. The second order conditions are satisfied from the curvature assumption of the utility and production functions. At this stage note that the change in real income in any period at a given C_1 or C_2 is determined by the change in the following surplus,

$$Y_i = X_i(K_i, M_i) - M_i \tag{6}$$

Where,

$$K_2 = K_1 + I$$

Thus,

$$\frac{dY_i}{dt_i} = \frac{\delta X_i}{\delta K_i}\frac{dK_i}{dt_i} + \frac{\delta X_i}{\delta M_i}\frac{dM_i}{dt_i} - \frac{dM_i}{dt_i} \tag{7}$$

$$\frac{dY_1}{dt_1} = \frac{\delta X_1}{\delta M_1}\frac{dM_1}{dt_1} - \frac{dM_1}{dt_1} = t\frac{dM_1}{dt_1} \tag{8}$$

And

$$\frac{dY_2}{dt_2} = t_2\frac{dM_2}{dt_2} + \frac{\delta X_2}{\delta I}\frac{dI}{dt_2} \tag{9}$$

Solving explicitly for C_1 from (2) and (5) in terms of the optimally chosen values of other variables.

$$(X_1 - M_1 - C_1 - I)(1+r) + X_2 - M_2 - C_1\beta(1+r) = 0$$
$$C_1 = \frac{(X_1 - M_1 - I)(1+r) + X_2 - M_2}{(1+\beta)(1+r)} \tag{10}$$

This expression is nothing but,

$$C_1 = \frac{(Y_1 - I)(1+r) + Y_2}{(1+\beta)(1+r)} \tag{11}$$

The current account in period 1 is defined as,

$$\begin{aligned} CA_1 &= Y_1 - C_1 - I \\ &= \frac{\beta}{(1+\beta)}(Y_1 - I) - \frac{Y_2}{(1+\beta)(1+r)} \end{aligned} \tag{12}$$

As the bench mark case, let us start from the stationary state by assuming $\beta = \frac{1}{(1+r)}$, $t_1 = t_2 = t$. This would imply $C_1 = C_2$, $Y_1 = Y_2$, $I = 0$. We can examine how the current account changes following a change in t, with t_1 and t_2 changing by different magnitudes. To capture the case of gradual reform we assume the following,

$$dt_1 < 0, \quad dt_2 < 0, \quad |dt_1| < |dt_2|$$

Now changes in the current account can be represented by

$$\begin{aligned} dCA_1 &= \frac{\beta t}{(1+\beta)}dM_1 - \frac{\beta t}{(1+\beta)}dM_2 - \frac{\beta}{(1+\beta)}dI \cdot \frac{1}{\beta} - \frac{\beta}{(1+\beta)}dI \\ &= \frac{\beta t}{(1+\beta)}(dM_1 - dM_2) - dI \end{aligned} \tag{13}$$

One has to use

$$\frac{\delta X_1(M_1)}{\delta M_1} = 1 + t_1$$
$$\frac{\delta X_2(K_1 + I, M_2)}{\delta M_2} = 1 + t_2 \tag{14}$$

and

$$\frac{\delta X_2}{\delta I} = 1 + r$$

to get the standard expression for dM_1, dM_2 and dI. The explicit solutions of these and the second order conditions are given in the appendix. Differentiating the above equations and simplifying we get some conventional answers.

$$dM_1 = \frac{dt_1}{q} > 0, \quad dM_2 = \frac{dt_2 \cdot s_1}{qs_1 - s_2} > 0$$

where,

$$q = \frac{\delta^2 X_i}{\delta M_i^2} \quad \text{(Note that we are starting from a stationary state)}$$

$$s_1 = \frac{\delta^2 X_2}{\delta I^2}, \quad s_2 = \left(\frac{\delta^2 X_2}{\delta M_2 \delta I}\right)^2$$

From concavity of production functions, we know $s < 1, 0$, $q < 0$ and $(qs_1 - s_2) > 0$. One can similarly show that $dI > 0$ provided $\frac{\delta^2 X_2}{\delta M_2 \delta I} > 0$. At this stage we shall assume $dI > 0$.

$$dCA_1 = \frac{\beta t}{(1+\beta)}\left[\frac{dt_1}{q} - \frac{dt_2 \cdot s_1}{(qs_1 - s_2)}\right] - dI \tag{15}$$

$$dCA_1 < 0, \; \mathit{iff} \; \frac{\beta t}{(1+\beta)}\left[\frac{dt_1}{q} - \frac{dt_2 \cdot s_1}{(qs_1 - s_2)}\right] - dI < 0$$

or,

$$\frac{\beta t}{(1+\beta)}\left[dt_1 - \frac{dt_2 \cdot q \cdot s_1}{(qs_1 - s_2)}\right] - qdI > 0 \tag{16}$$

(16) is satisfied as $\frac{qs_1}{(qs_1 - s_2)} > 1$, $qdI < 0$ and $|dt_1| < |dt_2|$. This leads to the following proposition.

PROPOSITION. *A gradual trade reform must worsen the current account in the first period.*

Proof. See the discussion above and (16). QED.

The intuition behind the result goes as follows. A decline in t_1 increases real income by $t \cdot dM_1$ and a drop in t_2 increases it by $t \cdot dM_2$. Since K_1 is given, M_1 increases from a decline in its price i.e. t_1. But as I increases, M_2 not only increases because t_2 drops, but also because I increases. An increase in I always deteriorates the current account. If the rise in M_2 is greater than in M_1, due to consumption smoothing current account tends to go into a deficit. M_2 increases more than M_1 because t_2 drops more than t_1. But M_2 increases even further because I increases. This suggests that in (16) even if $|dt_1| = |dt_2| = |dt|$, we would still have $dCA_1 < 0$ as $dI > 0$ and $\frac{s_2}{qs_1} < 1$. $\left(\text{As, } \frac{s_2}{qs_1} > 0, \; dt < 0.\right)$.

An increase in investment follows from the assumption that I and M are substitutes in production i.e. $\frac{\delta^2 X_2}{\delta M_2 \delta I} > 0$. However, one can conceive of a situation where $\frac{\delta^2 X_2}{\delta M_2 \delta I} \leq 0$. Firstly, if the cross effect is zero, $dI = 0$ and our result continues to hold. It should also be noted that with $dI = 0$, change in the current account would depend on the magnitude of dt_1 and dt_2. Again if, $dI < 0$ i.e. when the factors are complements, we may have a neutralizing effect on the current account. But the general point, that with a gradual reform the rise in the future income is greater than the rise in the current income suggesting a worsening of the current account, remains valid. Although any permanent tariff cut would leave the current account unchanged, with all gradual reforms $[|dt_1| < |dt_2|]$ it will deteriorate. Lastly, once we allow $dI > 0$, even a permanent tariff cut $[|dt_1| = |dt_2| = |dt|]$ would lead to current account deficit. (Check the appendix).

3. CONCLUDING REMARKS

Our model can be made complicated by bringing in an import-competing sector and a negative investment response there because the protection is removed. But investment in the expanding sector and disinvestment in the contracting sector would tend to offset each other and may lead us back to a case with $dI = 0$. As we argue, the point regarding changes in permanent income through a fall in t and its effect on current consumption would still be valid. The main point of the paper is that we can take recourse to a standard two period intertemporal model to provide a satisfactory explanation of the relationship between gradual trade reform and current account adjustment for a small open economy.

APPENDIX

From the first order conditions in (14), we derive the second order conditions as follows:

$$\frac{\delta^2 X_1}{\delta M_1^2}\frac{dM_1}{dt_1} + 0 \cdot \frac{dM_2}{dt_1} + 0 \cdot \frac{dI}{dt_1} = 1$$

$$0 \cdot \frac{dM_1}{dt_1} + \frac{\delta^2 X_2}{\delta M_2^2}\frac{dM_2}{dt_1} + \frac{\delta^2 X_2}{\delta M_2 \delta I}\frac{dI}{dt_1} = \frac{dt_2}{dt_1}$$

$$0 \cdot \frac{dM_1}{dt_1} + \frac{\delta^2 X_2}{\delta I \delta M_2}\frac{dM_2}{dt_1} + \frac{\delta^2 X_2}{\delta I^2}\frac{dI}{dt_1} = 0$$

The principal minors of the coefficient matrix should alternate in sign. Hence, the determinant $|D| = q(qs_1 - s_2) < 0$ where q, s_1 and s_2 are defined in the text and because of the concavity of the production function, $q < 0$ and $(qs_1 - s_2) > 0$. Using Cramer's Rule, we solve for

$$\frac{dM_1}{dt_1} = \frac{qs_1 - s_2}{q(qs_1 - s_2)}$$

Therefore, $dM_1 = \frac{1}{q}dt_1 > 0$, as $q < 0$ and $dt_1 < 0$ and $dM_2 = \frac{dt_2 \cdot s_1}{(qs_1 - s_2)} > 0$ as $dt_2 < 0$, $s_1 < 0$ and $(qs_1 - s_2) > 0$. Finally,

$$\frac{dI}{dt_1} = -\frac{\frac{dt_2}{dt_1}\frac{\delta^2 X_2}{\delta M_2 \delta I}}{(qs_1 - s_2)} \geq \text{or} \leq 0$$

according as,

$$\frac{\delta^2 X_2}{\delta M_2 \delta I} \leq \text{or} \geq 0$$

$$\frac{\delta^2 X_2}{\delta M_2 \delta I} < 0,$$

implies complementarity in M and I, which further implies that investment falls as tariff is lowered. Considering the situation, $dI < 0$ when $\frac{\delta^2 X_2}{\delta M_2 \delta I} < 0$, dCA_1 can still be < 0, if $qdI < \frac{\beta t}{(1+\beta)}dt_1$. It is derived as follows:

$$\frac{\beta t}{(1+\beta)}\left[dt_1 - \frac{dt_2 \cdot q \cdot s_1}{(qs_1 - s_2)}\right] > qdI$$

Or,

$$\frac{qs_1}{(qs_1 - s_2)} < \frac{dt_1}{dt_2} - \frac{(1+\beta)}{\beta}\frac{qdI}{dt_1}$$

We already know, $q < 0$, $s_1 < 0$, $qs_1 - s_2 > 0$. Therefore, $LHS > 0$, implies

$$\frac{dt_1}{dt_2} - \frac{(1+\beta)}{\beta}\frac{qdI}{dt_1} > 0$$

Or,

$$qdI < \frac{\beta t}{(1+\beta)}dt_1$$

Alternatively, if, $\frac{\delta^2 X_2}{\delta M_2 \delta I} > 0$, it implies that, $\frac{dI}{dt_1} < 0$, as t falls, I rises. By assumption of substitutability between I and M, $\frac{\delta^2 X_2}{\delta M_2 \delta I} > 0$ will ensure that,

$$dCA_1 < 0, iff \frac{\beta t}{(1+\beta)}\left[dt_1 - \frac{dt_2 \cdot q \cdot s_1}{(qs_1 - s_2)}\right] - qdI > 0$$

With $dI > 0$ and $|dt_1| < |dt_2|$, $dCA_1 < 0$ as $\frac{qs_1}{(qs_1 - s_2)} > 1$. Again, even with $|dt_1| = |dt_2| = |dt|$, $dCA_1 < 0$ iff $dI > 0$, since $qs_1 > s_2$. Finally considering the cross effect, if $\frac{\delta^2 X_2}{\delta M_2 \delta I} = 0$, it implies $\frac{dI}{dt_1} = 0$. But still, $dCA_1 < 0$, as $\left[dt_1 - \frac{dt_2 \cdot qs_1}{(qs_1 - s_2)}\right] > 0$ as $dt_1 = dt_2 < 0$ and $\frac{qs_1}{(qs_1 - s_2)} > 1$.

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