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AGGREGATE SPENDING AND THE TERMS OF TRADE: THERE IS A LAURSEN-METZLER EFFECT

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Abstract:

Using the uncertain lifetimes overlapping generations model it is argued that terms of trade changes have very different effects depending on the net foreign asset position of the country. In a creditor country the deterioration of terms of trade has the clas-sic Laursen-Metzler effect, since in order to sustain spending lending abroad is reduced. The reverse conclusion holds for a debtor country. It is also shown that these conclusions are robust with respect to the type of the terms of trade shock.

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I. Introduction

In recent years there has been a renewed interest on the so called Harberger-Laursen-Metzler (HLM) effect (see especially Obstfeld (1982), Svensson and Razin (1983), and Persson and Svensson (1985); the classics are Harberger (1950), Laursen and Metzler (1950)). The HLM effect predicts that a deterioration in the terms of trade of a country would induce an increase in the current account deficit, since the decline in real income implied by the terms of trade change would partly be reflected as a decline in savings (see the especially clear exposition in Dornbusch (1980), ch.4, appendix).

Latest research using explicit intertemporal optimization models has cast doubt on this proposition. It has been shown that it is important to distinguish between unanticipated and anticipated terms of trade changes on the one hand and between permanent and temporary changes on the other hand. E.g. Obstfeld (1982) has shown that a deterioration of terms of trade will reduce the current account deficit if the change in terms of trade is unanticipated but permanent; Persson and Svensson (1985) produce several examples on the importance of separating the various types of terms of trade shocks. The effects of terms of trade shocks have been shown also to depend crucially on the intertemporal preferences of the consumers. One of the strongest results is that if the consumers' rate of time preference increases with wealth then the decline in terms of trade will increase saving contrary to the HLM proposition and should the time preference decline with wealth then the HLM proposition holds. This is intuitively clear: deterioration in terms of trade implies a reduction in wealth and if this induces a reduction in the rate of time preference then saving increases.

The starting point for this paper is the following reasoning. Consider first a country which is a creditor internationally. If its terms of trade deteriorate then its income declines and it cannot support lending on such a scale as before the change in prices. Hence, it reduces international lending which can happen only through current account deficits, as predicted by HLM. The reverse holds if the country is a net debtor. Then a decline in terms of

trade implies that it cannot sustain the previous level of debt. Its attempts to reduce debt show as a surplus in the current account in contrast to the prediction by HLM. This intuition is formalized by using an open economy version of the Blanchard-Yaari overlapping generations model (Blanchard (1985); for open economy applications, see Buiter (1984,1986) and van Wijnbergen (1987)). In this way I avoid the problem of trying to specify how the rate of time preference behaves and can conveniently characte-rize the creditor and debtor countries. One of the main results besides giving content to the intuition above is that the intuition is robust with respect to various types of terms of trade shocks, in sharp contrast to the earlier literature.

II. The Model

All individuals consume two goods, one domestic good and a foreign good. The instantaneous utility of the individual is assumed to be of the form $\alpha \ln c_h + (1-\alpha)\ln c_f$, with c_h = consumption of the home good and c_f = consumption of the foreign good. At each instant all individuals face a constant probability of death, π. If the pure rate of time preference of all individuals is θ, then a member of generation born at s maximizes at time t the expression

$$(1) \qquad \int_t^\infty [\alpha \ln c_h(s,v) + (1-\alpha)\ln c_f(s,v)] \exp((\theta+\pi)(t-v))dv.$$

In maximization the individual faces the wealth constraint

$$(2) \qquad dw(s,t)/dt = rw(s,t) + \pi w(s,t) + y(s,t)/p - (c_h(s,t) + pc_f(s,t))/p.$$

Here w = wealth in terms of foreign goods, r = the rate of interest on savings; I assume that capital is perfectly mobile and that all assets are perfect substitutes. Hence r = the foreign rate of interest. The second term is due to the fact that the individual can insure herself against the risk of death, complete insurance markets

allow individuals to annuitize their non-human wealth. $y(s,t)$ is the income of the individual, assumed to be exogenous, p = inverse of the terms of trade, i.e. the price of the foreign good in terms of the domestic good. The income is generated from the production of the home good. I assume further that all living individuals receive the same income, i.e. the value of domestic production is divided equally among all individuals. Define $z = c_h + pc_f$ as the aggregate expenditure in terms of the home good. Then the optimization problem can be expressed as follows:

$$(3) \qquad \max\{z(s,v)\} \int_t^\infty [\ln z(s,v) - (1-\alpha)\ln p]\exp[(\theta+\pi)(v-t)]dv$$

subject to

$$(4) \qquad \int_t^\infty (z(s,v)/p)\exp[(r+\pi)(v-t)]dv = w(s,t) + h(s,t),$$

where $h(s,t) = \int_t^\infty [y(s,v)/p]\exp[(r+\pi)(v-t)]dv$ = the human wealth of the individual. (3) is derived from the assumption that at each instant of time the individual allocates the aggregate expenditure in an optimal way. (4) is derived by assuming that infinite borrowing is not possible.

The model is now exactly analogous to the model used by Blanchard (1985). Thus, by defining X as the aggregate value of any variable x the aggregate dynamics of the economy can be given as

$$(5) \qquad Z = (\theta+\pi)p(W + H)$$

$$(6) \qquad dH/dt = (r+\pi)H - Y/p$$

$$(7) \qquad dW/dt = rW + Y/p - Z/p.$$

Equation (7) gives the net acquisition of assets in the economy; hence, it equals the current account surplus in the economy. By differentiating (5) the system (5)-(7) can be reduced to the following two equation system:

(8) $dZ/dt = (r-\theta)Z - \pi(\theta+\pi)pW$

(9) $dW/dt = rW + Y/p - Z/p.$

III. Permanent Terms-of-Trade Deterioration, Aggregate Spending, and the Current Account

In this section I shall analyze the impacts of an unanticipated permanent deterioration in the terms of trade leaving the other cases to the next section. Consider first equation (8). It implies that in the stationary state aggregate spending and net foreign asset position are related by the equation

$$W = (r-\theta)Z/\pi(\theta+\pi)p.$$

Since $Z > 0$ the country is a net creditor in the steady state if $r > \theta$, i.e. if its pure rate of time preference is smaller than the world rate of interest. If $r < \theta$, then the country is a net debtor. It turns out to be important to handle these two cases separately.

1o $r > \theta$

The steady state equations of the system (8) and (9) are drawn in the phase diagram given as figure 1.

It can be shown that the economy converges to a steady state only if $r < \theta+\pi$,[1] which is assumed to hold. This explains why the curve $dZ/dt = 0$ is steeper than the curve $dW/dt = 0$. The stationary point A is a saddle point; the stable arm along which the stationary point is reached is denoted by SS. The aggregate expenditure adjusts in such a way that the economy will reach the stationary state.

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[1]This is since Y is constant and, hence, $H = Y/p(r+\pi)$. By substitution equations (5) and (7) imply that the differential equation for W is stable only if $r < \theta+\pi$.

Consider now how the economy adjusts to a permanent unexpected deterioration in its terms of trade. The steady state net foreign asset position can easily be calculated as

$$(10) \qquad \{[\pi(\theta+\pi)/(r-\theta)] - r\}W = Y/p.$$

Equation (10) directly gives that $\partial W/\partial p < 0$: a decline in the terms of trade reduces net lending in the long run. If this were not the case then all of the deterioration in income would show as a decline in expenditure. This is clearly not optimal since $r < \theta+\pi$: increased lending would not increase income to such an extent that increased consumption later would give higher utility. The solution for steady state expenditure is

$$(11) \qquad Z = (1 + r/\beta)Y$$

where β = the coefficient of W in (10). Hence, the steady state aggregate expenditure is not at all affected by the terms of trade changes. In figure 1 the stationary state associated with the terms of trade change is A'. The saddle path associated with it is S'S'. Assume that initially[2] the economy is in the steady state A. Then, after the terms of trade deterioration aggregate spending immediately increases (to point B) and turns the current account into deficit. This is exactly the traditional HLM effect. In the long run the consumers do not want to give up consumption. Since the deterioration in terms of trade increases the value of net foreign assets in terms of the home goods the level of spending can be supported by a reduced level of foreign investment. To reduce foreign investment the current account must be in deficit. This result contradicts Obstfeld (1982), whose result is based on a model where the pure rate of time preference increases with wealth (see the introduction).

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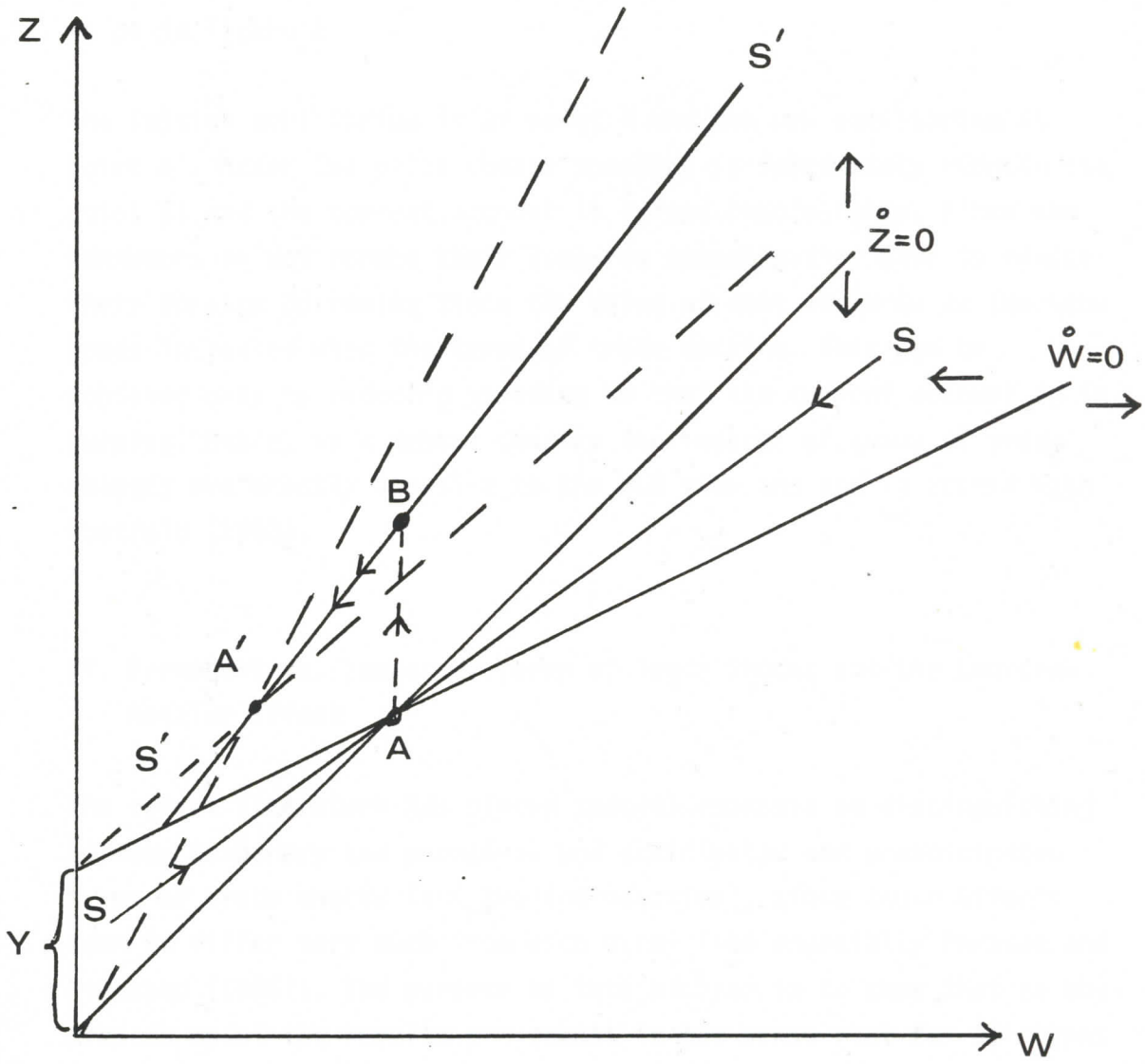
[2]It is easy to see that the aggregate spending behaves in the same way also out of the steady state, if the economy initially is on SS northeast of A or near A southwest of A. The behaviour of the current account, of course, depends cruicially on where the economy is initially located.

FIGURE 1



2o $r < \theta$

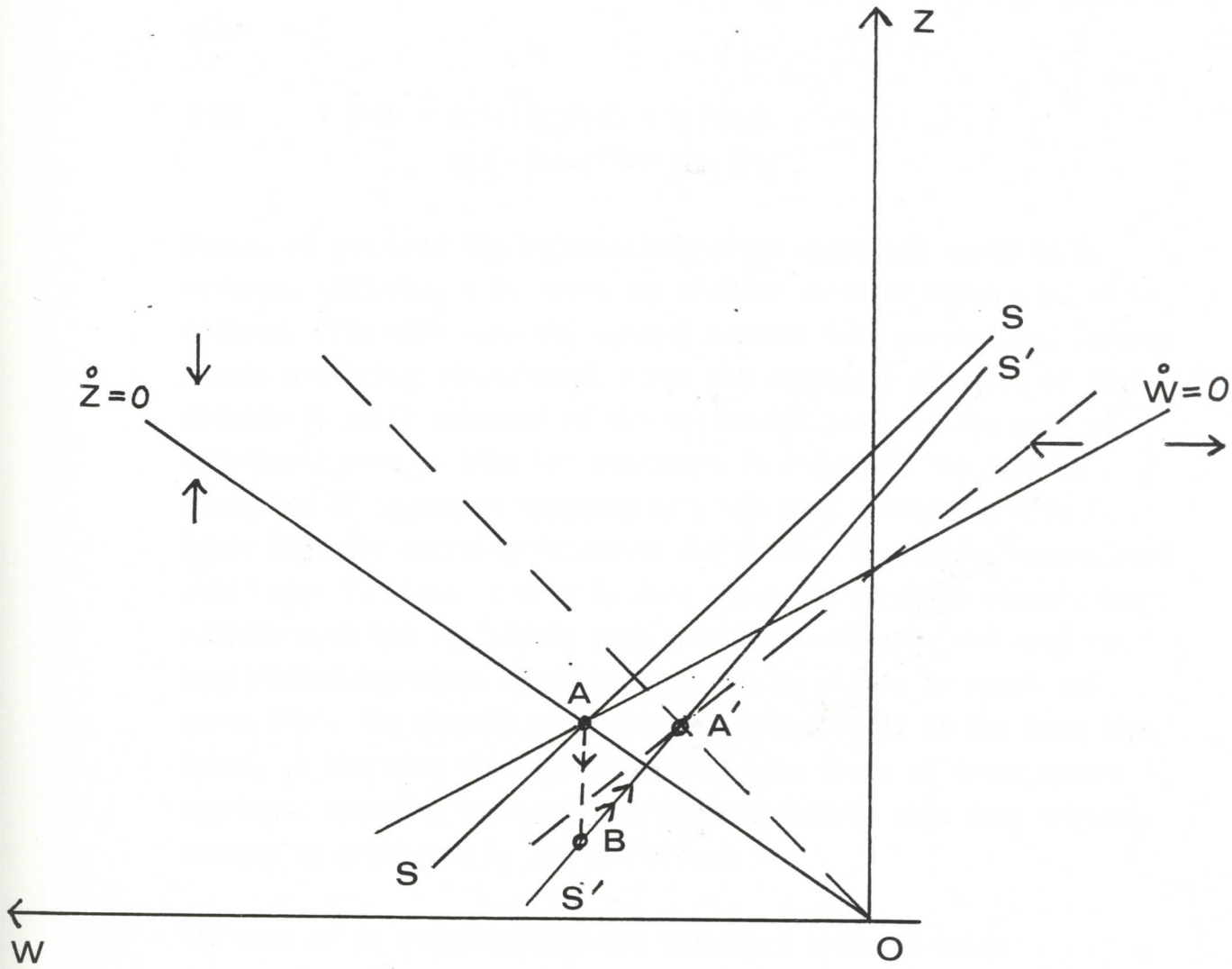
Equation (10) implies now that in the stationary state the country is a net debtor vis a vis the rest of the world, $W < 0$. The consumers discount the future more heavily than the world capital markets do and, hence, they borrow to enjoy higher utility now. Equation (10) also implies that the steady state borrowing is reduced when terms of trade deteriorate, $\partial W/\partial p > 0$. The stationary aggregate spending is again given by equation (11), and thus it is not affected by the terms of trade change. Hence the phase diagram is as in figure 2.

The initial equilibrium is at point A and the new equilibrium at point A'. After the price change spending is immediately reduced (to point B) and the current account is turned into surplus. Since the consumers do not reduce their long run spending they have to reduce their foreign borrowing since the value of debt in terms of the home goods increases when the terms of trade decline. This can be achieved only by reducing spending so that the current account is in surplus. Hence, in a debtor country the impacts of terms of trade changes are exactly opposite to the HLM view and are in accord with Obstfeld (1982).

IV. Permanent vs. Temporary Terms of Trade Shocks and the Laursen-Metzler Effect

The recent literature has placed special emphasis on distinguishing between temporary and permanent and anticipated and unanticipated terms of trade shocks (see the introduction), since their effects seem to differ very much from each other (see especially Persson and Svensson (1985)). The purpose of this section is to show that in the present model the results are robust in the sense that for all types of shocks the effect of the terms of trade shock is the same as in the previous section. The path of adjustment, of course, depends on the type of the shock.

FIGURE 2



For simplicity only I shall restrict myself to the case $r > \theta$. Consider first the case where the terms of trade are currently (t=0) expected to deteriorate permanently at time T. Then the solution to the individual maximization problem (3) and (4) can be written as

$$(12) \qquad z(s,0) = (\theta+\pi)\{p_0 w(s,0) + y/(r+\pi) + \exp[-(r+\pi)T]y(p_0-p_1)/p_1$$

where p_0 = the current terms of trade and p_1 = terms of trade for $t \geq T$, and y is the constant per capita income. Since the terms of trade are expected to deteriorate $p_1 > p_0$. (12) can be aggregated to give

$$(13) \qquad Z(0) = (\theta+\pi)\{p_0 W(0) + Y/(r+\pi) + \exp[-(r+\pi)T]Y(p_0-p_1)/p_1 \ .$$

Hence, at the time the expectations arise aggregate spending is reduced, $\partial Z(0)/\partial p_1 < 0$, since the present value of human capital is reduced. This will turn the current account into surplus and foreign assets are being accumulated. Since the aggregate dynamics of the economy is still governed by the system (8) and (9), the path of adjustment must be like the one given in figure 3. The initial reduction of aggregate spending is given by a shift from A to B. After that the spending decreases and foreign assets are accumulated until time T. Since at time T, when the terms of trade change, the economy must hit the saddle path associated with the new long run equilibrium aggregate spending increases by a jump to reach the curve S'S'. The current account turns into deficit at the same time. Hence, at the time the deterioration in the terms of trade occurs aggregate spending increases and current account goes into deficit, exactly as predicted by the HLM effect.

The case of an unanticipated but temporary terms of trade deterioration is easily formally analyzed, since it is exactly an opposite case to the expected permanent terms of trade improvement. Hence, in (12) and (13) one should look at the implications of an increase in po above p1 and interpret T now as the time at which the

terms of trade again improve. It is immediately clear that $\partial Z(0)/\partial p_o > 0$, since the value of non-human wealth in terms of home goods increases and the present value of human wealth goes up, too. Thus again, when the terms of trade deteriorate aggregate spending increases and the current account goes into deficit. Furthermore, at the time the terms of trade again improve aggregate spending is reduced to allow the economy to catch the stable path of adjustment. This is seen be reversing the argument in the previous paragraph. The HLM effect is again confirmed.

There is still one possible case, the case of an expected temporary deterioration in terms of trade. Its analysis follows exactly the paths developed above and is thus not presented here. It is easy to see that this case produces the same type of results as do the cases just analyzed.

V. Concluding Comments

The basic conclusion from this paper is that the possibility for a Harberger-Laursen-Metzler effect depends crucially on whether the economy is a net creditor or net debtor internationally. If it is a net creditor then a terms of trade deterioration can be expected to lead to an increase in aggregate spending and to an increase in current account deficit as predicted by the HLM effect. The reason is that intertemporally optimizing consumers want to place the burden of the reduced income on lending rather than on spending. For analogous reasons a debtor country must reduce borrowing in the long run in order to sustain consumption. Hence, it reduces spending and the current account goes into surplus.

The other major conclusion is that the existence of the HLM effect does not depend on the type of the terms of trade shock. Whether it is anticipated or not or whether it is temporary or permanent does not matter for the conclusions: if the country is a net creditor then at the time the terms of trade deteriorate aggregate spending increases and current account goes to deficit.

Both of the conclusions differ from the results obtained earlier in the literature. This certainly must be due to the differences in modelling. In the model used here the rate of time preference is constant whereas the earlier literature has assumed that the time preference varies with wealth. Another difference is that I have not considered the possibility of accumulation of productive capital as is done in Persson and Svensson (1985). It could be incorporated into the present model along the lines suggested by Buiter (1984).

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