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A Note on the
International Transmission
of
Business Cycles
by

Nikolaus K.A. Läufer

55

DISKUSSIONSBEITRÄGE

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In a recent article in *Kyklos* E. SOHMEN concentrates on "some simple but important defects in the construction of macroeconomic models" dealing with the relations between exchange-rate adjustments and the international transmission of business cycles. These defects seem to be held responsible for the paradox LAURSEN-METZLER finding of a negative international transmission effect of business cycles in a macroeconomic model built on the usual Keynesian assumptions when exchange rates are flexible under the special assumption of zero capital movements.

On page 524 of SOHMEN's article we read:

"The deflationary effect of foreign business expansion may be a substantial one for any country with a sizable trade volume.... But a mitigating effect will undoubtedly be at work: physical consumption is likely to increase for any given physical output level when consumers' real purchasing power rises as a result of the terms-of-trade improvement. What appears as a contractive effect when seen in the customary LAURSEN-METZLER framework (the downward shift of the nominal consumption function when the terms of trade improve, imports becoming cheaper), is seen as an expansionary force when treating the issue in terms of a consumption (or absorption) function in real (physical) units of national income and absorption."

Since SOHMEN has not presented an analysis supporting the view of a reversal of the LAURSEN-METZLER finding, it is tempting to fill in this gap.

However, we shall find that for rather weak Keynesian assumptions the result of LAURSEN-METZLER may be retained.

In addition, we shall make

explicit in a more general form the conditions under which it is possible to disprove the LAURSEN-METZLER effect.

However, we refuse to take these conditions for granted.

Our analysis is based on the assumption of

a unique and stable equilibrium position for the economy, an assumption which we shall not call in question.

We shall follow SOHMEN's suggestion to differentiate between three different measuring concepts of a country's output and absorption: measurement in physical units, measurement in values expressed in a country's own currency, and measurement in terms of foreign currency.

Expressing all values as products of quantities and prices we may formulate the following equilibrium condition for domestic national income in country 1 (of a two-country world):

$$(1) \quad pQ = p^a A(pQ/p^a) + r \frac{p^x}{r} X(p_2 Q_2 / \frac{p^x}{r}) - r p^m M(pQ/p^m r)$$

p_i = price index of the national product of country i in terms of country i 's currency ($i=1,2$)

(If $i=1$, then the index has been omitted)

Q_i = net national product of country i in physical units (quantity index)

p^a = price index of domestic absorption of country 1 in terms of its own currency

A = real absorption of country 1 in physical units (quantity index)

r = price (index) in country 1 of country 2's currency (index of the exchange rate)

p^m = price index of imports of country 1 in terms of country 2's currency

p^x = price index of exports of country 1 in terms of its own currency

X = real imports of country 2, real exports of country 1 (physical units, quantity index)

M = real imports of country 1 (physical units, quantity index)

In equations (1) - (5) all numerical indices referring to country 1 have been omitted from symbols of variables.

Starting with equation (6) all numerical subscripts of variables refer to time periods instead of countries.

Real absorption and real imports are stated as functions of nominal income divided by a price index of domestic absorption. This formulation allows the introduction of the effects on real absorption of changes in real purchasing power as measured by national income deflated by a price index of domestic absorption.

Absence of capital movements and simultaneous equilibrium of the balance of payments reduces the equilibrium condition (1) to equation (2):

$$(2a) \quad p Q = p^a A\left(\frac{p Q}{p^a}\right)$$

$$(2b) \quad \frac{p Q}{p^a} = A\left(\frac{p Q}{p^a}\right)$$

Equation (2b) is structured like equation (3):

$$(3) \quad x = A(x).$$

Therefore, real absorption behaviour and the conditions of simultaneous equilibrium for national income and the balance of payments determine a fix-point x^0 , which is the solution of equation (3). In the following we assume uniqueness of the solution of equation (3) and, in particular, we assume stability of the equilibrium.

The fix-point x^0 is consistent with an infinity of values of p , p^a and Q , all combinations of values having the following property in common:

$$(4) \quad x^0 = \frac{p Q}{p^a}$$

Thus, we have a proportionality relation between equilibrium values of (net) national product in physical units, its price index and the price index of domestic absorption:

$$(5) \quad Q = \frac{x^0 p^a}{p}$$

the fix-point of simultaneous equilibrium, x^0 , being the factor of proportionality. This factor represents in compact form elements of absorption behaviour as represented by level and slope properties of the absorption function. According to equation (5), the price index of national product must fall by a larger percentage than the price index of domestic absorption in order to increase equilibrium national product in physical terms. Stated differently, with a constant price index for national product, the price index of domestic absorption must rise both absolutely and relatively to p , in order to obtain a higher (simultaneous) equilibrium value of national product in physical terms.

In order to prove or disprove the LAURSEN-METZLER effect in a framework that sufficiently takes account of price effects, apart from the effects of changes in terms of trade, it is necessary to state a relationship between the price index of national product, p , the price index of domestic absorption, p^a , and the exchange rate, r , and, possibly, other prices as well. For this purpose, let us introduce a definition of the price index for net national product.

$$(6) \quad p = p^a w^a + p^x w^x - r p^m w^m$$

The constant and positive weights, w , have the following property

$$(7) \quad w^a + w^x - w^m = 1.$$

Their meaning is

w^a = the ratio of the value of domestic absorption
to the value of net national product

w^x = the ratio of the value of exports to the value
of net national product

w^m = the ratio of the value of imports to the value
of net national product.

These ratios are formed at the initial equilibrium position where all indices (including r) are assumed to have numerical value 1. In an equilibrium position the value of exports equals the value of imports. Thus

$$(8) \quad w^x = w^m,$$

while (7) and (8) imply

$$(9) \quad w^a = 1.$$

By means of (6) and (9) we obtain the following expression for the price index of domestic absorption:

$$(10) \quad p^a = (p - p^x w^x + r p^m w^m).$$

Let us now come to the core of our analysis. At first we shall be Keynesian in the sense of assuming a given constant price index of national product in country 1 and a given constant index of import prices of country 1 (in terms of country 2's currency). With respect to the index of country 1's export prices, p^x , we shall first assume that it does not fall.

Now, for a fixed p , a nondecreasing p^x and a fixed p^m , any reduction in r will definitely lead to a decrease of p^a . Thus, under rather weak Keynesian assumptions, an appreciation of country 1's currency reduces the price index of domestic absorption in country 1 both absolutely and in relation to the price index of national product. But then it is obvious from (5), that an improvement in the terms of trade, caused by an appreciation of country 1's currency (a reduction in r), necessarily reduces (simultaneous) equilibrium real output, Q , of country 1. Therefore, we find that the result of LAURSEN-METZLER - a deflationary effect of foreign business expansion - is confirmed by our analysis, in spite of a difference in the line of reasoning followed. In particular, we have explicitly incorporated all relevant price effects.

We might further reduce our minimum of Keynesianism with respect to price behaviour. Dividing both sides of (10) by p , and using (5) we obtain

$$(11) \quad Q = x^0 \left(1 - \frac{p^x}{p} w^x + r \frac{p^m}{p} w^m \right)$$

From (11) we see that, for a deflationary effect to occur, it is sufficient that a decrease of the ratio rp^m/p is not dominated by a decrease of the ratio p^x/p . Obviously, in order to derive a deflationary effect, it is not necessary to assume constancy of prices. The price index of national product may fall or rise while export prices fall or rise. Temporarily, the price index of national product may even rise at a higher speed or fall at a lower speed than the price index of country 1's exports. It may do so even continuously, provided there is sufficient equally

continuous improvement in the terms of trade.

Further manipulation of (11) and application of (8) leads to

$$(12) \quad Q = x^0 \left[\underbrace{1 - \frac{r p^m}{p}}_{\text{SOHMEN's "mitigating" factor}} \underbrace{\left(\frac{p^x}{r p^m} - 1 \right)}_{\text{terms of trade factor}} w^m \right]$$

Starting from the initial equilibrium position we find: if the terms of trade are improved, then the term in the inner brackets is positive and the terms of trade factor by itself clearly tends to reduce equilibrium output (in physical terms). For SOHMEN's "mitigating" factor to overcompensate this reductive tendency, the ratio rp^m/p has to fall sufficiently. As we have already seen, in order to obtain such a result, it is necessary to have a rise of the price index for national product sufficiently larger than the rise in the price index for exports, p^x , or, alternatively, a sufficient rise in the price index of national product alone, if export prices remain constant, or a fall of the price index for national product sufficiently smaller than a fall in the export prices.

Thus, if the terms of trade are improved for country 1, then a reversal of LAURSEN-METZLER's finding of a deflationary effect of foreign business expansion on country 1's equilibrium real output requires the assumption of a sufficient rise of the price index of national product relative to the price index of exports, p^x , both in country 1. However, it is difficult to imagine such a fall in the export prices relative to the price index of net national product - in particular if we start out from an equilibrium position with unemployment.

In the meantime after completion of this comment a careful reader of it, Rolf Seifried, has developed a simple proof by which it becomes evident that in my framework it is not only difficult to imagine such a fall in the export prices relative to the price index of net national product but that it is even impossible to have such a fall. Seifried's proof implies: starting from an equilibrium position, if the terms of trade are improved for country 1, then we necesssarily have a deflationary effect (a reduction in equilibrium real output) in country 1.

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