NATIONAL INTEREST IN INTERNATIONAL BUFFER STOCKS

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Introduction

There seems to be wide agreement that international buffer stocks for certain commodities such as wheat may help to increase world welfare. However, it is not possible to establish buffer stock schemes for all of those commodities where buffer stocks might have a favourable effect. This may be partly due to conflicts between broad national interests and economic benefits. It therefore seems worthwhile to examine the determinants of national interest, which is done in this paper. The analysis is restricted to some special aspects. Since for the world as a whole total export earnings must be equal to total import expenditures, the analysis can be restricted to analyzing the effects on total export earnings. In the following formulation, we assume that an international buffer stock can achieve stabilization of an equilibrium price. Without the buffer stock, prices are assumed to fluctuate only due to supply fluctuations. Given this set of assumptions, it follows that export earnings can only fluctuate due to changes in supply if the buffer is in operation. We get:

(1) $dR/R = dq^S/q^S$,

where:

R = world export earnings for the commodity exported; and

q^S = total world market supply.

According to (1), the percentage change in revenue is equal to the percentage change in world market supply. This fluctuation of export earnings under the buffer stock has to be compared with a situation without a buffer stock. To work out this effect, we start with the following set of equations:

(2) $R = pq^S$,

(3) $q^S = q^S(p, a)$,

(4) $q^D = q^D(p)$,

(5) $q^S = q^D$,

where:

p = world market price,

a = shift parameter due to weather conditions, and

q^D = total world market demand.

From (2) to (5) it follows that:

(6) $dR/R = [(\varepsilon^D + 1)/(\varepsilon^S - \varepsilon^D)1(- da/a)$,

where:

ε^D = price elasticity of world market demand, and

ε^S = price elasticity of world market supply.

A comparison of equations (1) and (6) shows that price stabilization can only stabilize export earnings if $|(\varepsilon^D + 1)/(\varepsilon^S - \varepsilon^D)| > 1$. Hence, two necessary conditions for a stabilization effect can be given: the absolute value of the demand elasticity must be less than 0.5 and the value of the supply elasticity must be less than 1. The elasticity of demand has to be smaller (in absolute terms) the higher the supply elasticity. If, for example, the supply elasticity were 0.8, the price elasticity of demand has to be smaller than 0.1 to get a positive stabilization effect on export earnings via price stabilization. Taking into account that the supply elasticity on the world market may be much higher than short term domestic production elasticities due to domestic storage policies, and the fact that domestic export elasticities are determined by domestic supply and demand elasticities as well as by the degree of self-sufficiency, it could be questioned if the necessary conditions are met for many commodity markets. However, even if total world export earnings cannot be stabilized via price stabilization, it may, nevertheless, be possible to stabilize an individual country's export earnings.

In working out the effects on an individual country, the general set of assumptions stated above is applied again. The only modification of the above model is given by the following equations:

(7) $q^S = q^S(p, a_i)$,

(8) $R_i = pq^S$,

where:

q_i^S = world market supply country i,

R_i = export earnings of country i, and

a_i = shift parameter of country i's world market supply curve.

Solving the set of equations (2) to (5) and (7) to (8) with respect to R_i results in:

(9) $dR_i/R_i = (-da/a)[(1 + \varepsilon_i^S)/(\varepsilon^S - \varepsilon^D)] + da_i/a$,

where:

ε_i^S = price elasticity of world market supply of country i.

Equation (9) gives the magnitude of revenue fluctuations under free market conditions for country i. Hence, these fluctuations have to be compared with those under a buffer stock which are:

(10) $dR_i/R_i = da_i/a_i$.

A comparision of (9) and (10) highlights the following results:

1. If domestic fluctuations in supply are negatively correlated with world market supply fluctuations, domestic export earnings will always be stabilized via a buffer stock.

2. If domestic and world market fluctuations are positively correlated, the likelihood of a stabilization effect with given elasticities is higher the

smaller the magnitude of domestic supply fluctuations are relative to world market supply fluctuations. According to this result, exporting countries with far above average fluctuations in domestic supply may not be at all interested in an international buffer stock. Their export revenue may be more stable under free market conditions.

3. Given domestic and world market supply fluctuations, a stabilization effect will more likely arise if all elasticities under consideration are small (in absolute terms). However, it does not hold any longer that the above are necessary conditions for a stabilization effect. This means that an individual country's export earnings may be stabilized even if total world market export earnings are destabilized.

To work out the effects of an international buffer stock on fluctuations of an individual country's import expenditure, the same model is applied. The following equations are postulated:

(11) $Ex = pq^I$,

(12) $q_i^I = q_i^D - q_i^S$,

(13) $q_i^S = q_i^D(p)$,

(14) $q_i^S = q_i^S(p, a_i)$,

(15) $q_o^D = q_o^D(p)$,

(16) $q_o^S = q_o^S(p, a_o)$, and

(17) $q_i^I = q_o^S - q_o^D$,

where:

Ex = expenditure on imports of the product under consideration,

q_i^I = import quantity of country i,

q_i^D = domestic demand for the product under consideration in country i,

a_o = shift parameter of world market supply curve,

q_o^S = international supply of all other countries, and

q_o^D = international demand of all other countries.

Solving this set of equations with respect to Ex results in:

(18) $dEx/Ex = (-da/a)[(1 + \varepsilon_i^{ID})/(\varepsilon^{ES} - \varepsilon_i^{ID})] - [S/(1 - S)](da_i/a_i)$,

where:

S = q_i/q_i^D = degree of self-sufficiency of country i,

ε_i^{ID} = import elasticity of country i, and

ε^{ES} = export elasticity of all other countries.

Equation (18) stands for fluctuations in import expenditures under free market conditions. Hence, this equation has to be compared with an equation which indicates fluctuations on expenditures in the case of a buffer stock in operation. This is:

$$(19) \quad dEx/Ex = - [S/(1 - S)](da_i/a_i).$$

A comparison of (18) and (19) highlights the following results:

1. When there is positive correlation between domestic and world market supply, and the value of the import elasticity is less than 1, price stabilization will lead to reduced fluctuations in import expenditures. Such a situation will very likely prevail for countries with a small degree of self-sufficiency.

2. If the absolute value of the import elasticity is greater than 1, and if fluctuations are negatively correlated, price stabilization will lead to reduced fluctuations in import expenditures. Such a situation may prevail for importing nations with a high degree of self-sufficiency.

3. If fluctuations are positively correlated and the absolute value of the import elasticity is greater than 1, detailed information is needed to check the stabilization effect. It depends on the magnitude of domestic and world market fluctuations and on all parameters given in the above formula.

4. If fluctuations are negatively correlated and the absolute value of the import elasticity is less than 1, the same statement as above (3) is valid.

National Versus International Stabilization Schemes

An individual country's decision concerning whether to join an international stabilization scheme does not depend only on expected net benefits, but also on a comparison with the possible costs and benefits of a national stabilization scheme. This may be a further source of national interest in international programmes. This consideration is explored here in some detail.

If exporting as well as importing nations were to aim at stabilizing export earnings or import expenditures by national stabilization schemes, a crucial difference of interests would appear: it would be very costly for exporting nations to stabilize export earnings via a national stabilization scheme because the individual countries would have to accommodate all potential world market fluctuations with a national storage programme. The costs of such a programme would very likely be higher than the possible benefits, and the national costs would be the same as total costs for an international buffer stock with the same benefit.

For an importing nation, however, the result of such calculations may turn out to be quite different. Storage capacity has to be larger in the case of positively correlated national and world market supply fluctuations. Domestic storage capacity should be great enough to accommodate domestic supply fluctuations and the effects of world market price changes on import expenditures. With increasing world market prices, some of the stocks should be released to stabilize the level of import expenditures. The necessary condition for stabilizing import expenditures via a national stabilization scheme is, therefore, a negative import demand elasticity. Such a situation may be assumed as realistic in most cases.

The necessary storage capacity is expressed in the following equation:

(20) $C = dq^S + (dP/P)(q_i^D - q_i^S)$,

where:

C = storage capacity,

dq_i^S = change in domestic supply,

q_i^S = domestic supply,

q_i^D = domestic demand, and

dP/P = percentage change in the world market price.

The second term on the right side of equation (20) indicates that a 1 percent change in world market prices has to be compensated for by a 1 percent change in the quantity imported. It is very simple to calculate from (20) the necessary storage capacity as a percentage of total domestic production. We get:

(21) $C/q^S = dq_i^S/q_i^S + [(q_i^D - q_i^S)/q^S](dP/P)$, and

(22) $C/q_i^S = dq_i^S/q_i^S + [(1 - S_i)/S_i](dP/P)$.

Even with an international stabilization scheme, some national storage capacity up to the percentage change in domestic supply is needed. The storage capacity saved by an individual country through an international stabilization scheme comes to:

(23) $C_S/q_i^S = [(1 - S_i)/S_i](dP/P)$,

where:

C_S = storage capacity saved.

Equation (23) shows that the national storage capacity which is needed to compensate for world market price fluctuations is determined entirely by the degree of self-sufficiency and the expected fluctuations in world market prices. For a S_i of 0.9 and a 10 percent change in world market prices, the storage capacity has to be 1.1 percent of national production, and for a S_i of 0.4 it should be 15 percent. This shows that the storage capacity necessary to compensate for world market price fluctuations increases progressively with decreasing self-sufficiency.

This finding has important political relevance. Because the comparative disadvantage of national stabilization schemes versus international schemes is much smaller for importing countries with a degree of self-sufficiency of nearly 100 percent than for highly deficient regions or exporting countries, the bargaining power may be quite unequal. The unequal benefits derived by individual countries from an international stabilization scheme should be taken into account when setting the level of national contributions, so that those who benefit most are required to pay most. If countries which only benefit marginally from a stabilization scheme are asked to make large contributions, they may refuse to cooperate, thus endangering the stability of the entire scheme.

RAPPORTEUR'S REPORT--Graham E. Dalton

The proposed models are elegant and of considerable conceptual value in dealing with a relevant set of problems. Some suggestions for improvement included expanding the models to deal with the cumulative aspects of storage and abnormal behaviour of demand and supply schedules caused by cross price elasticity and joint product effects.

The approach might be adapted for the purposes of decisionmakers in individual countries to include the effects of incomplete cooperation in an international buffer stock. There could also be complementary relationships between national and international objectives in controlling commodity markets which might be explored.

The conclusions in the paper would be more convincing if support could be found in the extensive literature on this subject, and if the assumptions made and the results of the models could be tested empirically.