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EEC VARIABLE IMPORT LEVIES AND THE STABILITY OF INTERNATIONAL GRAIN MARKETS*

Peter Svedberg†

During 1972-75, prices in the international grain markets sky-rocketed in response to what were *not* unusually large deviations of annual global production from the long run trend. The main reason for this seems to have been insufficient world grain reserves following the disentanglement of U.S. government-owned stocks, which began in the mid 1960s.[1] It has also been recognized that the existence of variable import levies in many net-importing developed countries tends to induce further price increases in the world market when supply is tight and prices rise.[2]

The objectives of this paper are threefold. The first is to provide a diagrammatically expounded model, illustrating how *variable* import levies tend to destabilise world market prices and shift the burden of adjustment onto other countries as compared to situations with either free trade or other types of import levies (section I). The second objective is to derive estimates on the basis of this model of the order of magnitude of the destabilising effects of the EEC countries' variable levies on world market grain prices and on the LDCs' real income in recent years (section II). The third aim is to assess the impact of the price instability induced by the EEC countries on other countries' grain trade policies in the long run and thus, indirectly, the further stability of the world market (section III).

I

THE MODEL

We assume a one-commodity (grain) world with three countries. Two are net importers: one (developed), d, using variable import levies to ensure a stable domestic grain price, and one (under-developed), u, which does not. Export supply is assumed to come from the third

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† Research Fellow, Institute for International Economic Studies, University of Stockholm, Stockholm, Sweden.

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1. *cf.* A. B. Mackie, "International Dimensions of Agricultural Price", *Southern Journal of Agricultural Economics*, Vol. XX, July 1974.

2. L. P. Schertz, "World Food: Prices and the Poor", *Foreign Affairs*, Vol. 52, No. 3, 1974; Peter Svedberg, "World Food Sufficiency and Meat Consumption," *American Journal of Agricultural Economics*, Vol. 60, No. 4, November 1978; and D. G. Johnson, "World Agriculture, Commodity Policy and Price Variability", *American Journal of Agricultural Economics*, Vol. 57, No. 5, December 1975.

country. The model is depicted in Figure 1. In the short run, supply is completely inelastic (S); further, there are no grain reserves. D_d and D_u are the 'free trade' demand schedules representing the developed and under-developed net-importing countries, respectively. (In order not to clutter the figure, demand in the third, exporting country is disregarded.) D_u is assumed to be more elastic than D_d. The aggregate demand is D_w. Long run supply, denoted S^+ in the figure, is for simplicity assumed to be perfectly elastic.

Introducing a variable import levy in the developed country and a domestic target price equal to P*, consumption will be Q_d^0, irrespective of world supply and the prevailing world market price, *i.e.*, demand in this country will become a vertical line, D'_d. In order to derive the new aggregate demand schedule for the two countries (D'_w), the horizontal distance between D_d and D'_d is subtracted from (below P*) and added to (above P*) the schedule D_w respectively. When short run supply is 'normal' (S in the figure), the equilibrium price in the world market will be P^0.

Assume now that there is a crop failure so that supply drops to S'. With the variable levy in force, the world market price will increase to P^1. In order to answer the question what would have been the price effect of this supply shortfall had there been no variable levy in the developed country, the alternative must be specified. In principle, there are three possible alternatives.

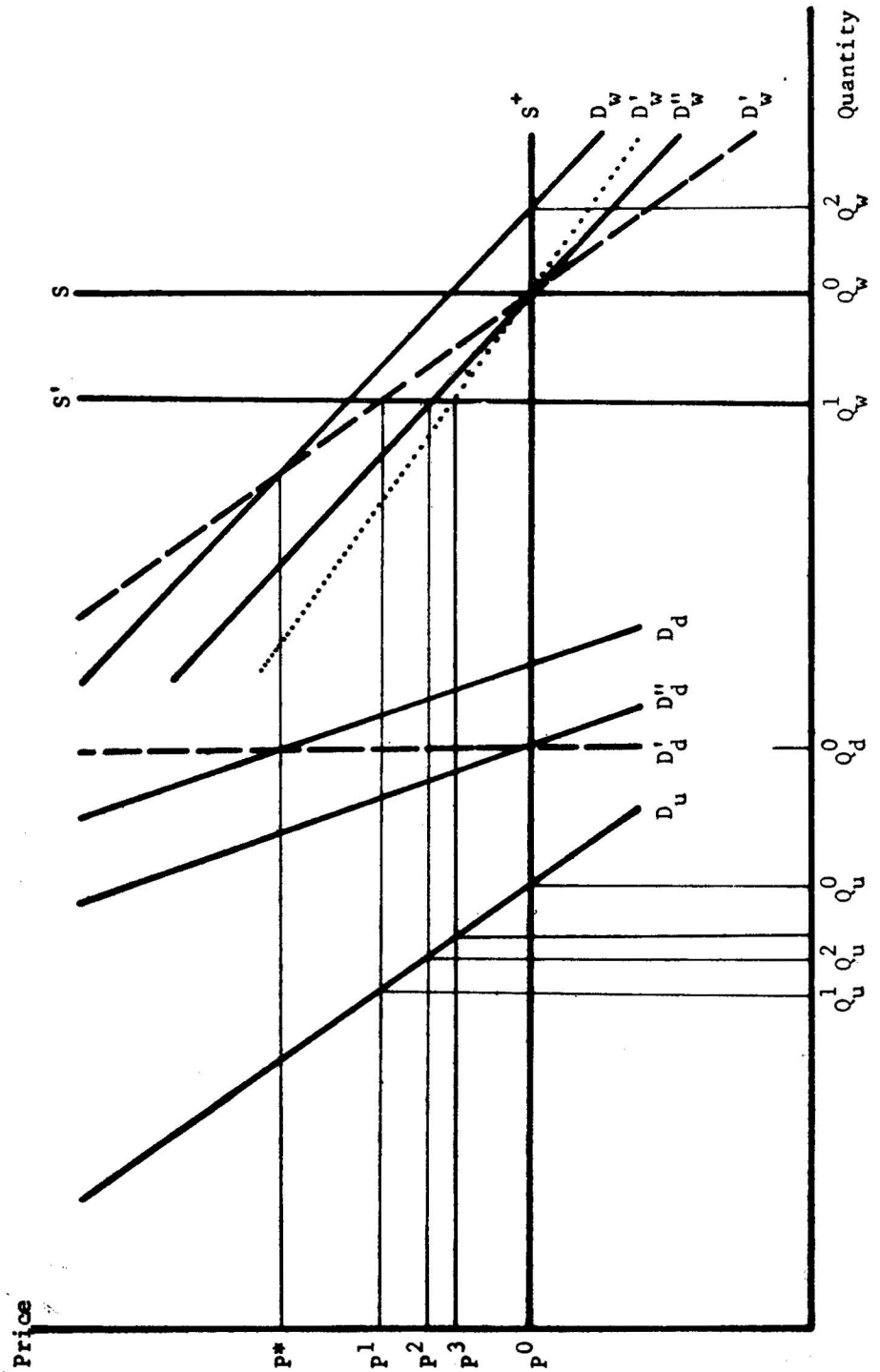
1. *A Fixed Levy (or Specific Tariff)*

To make a comparison of the *destabilising* impact of different types of levies meaningful, one has to assume that the *average* size of these levies is equal. In the present case, this means that the fixed levy is equal to the *average* (over a specified number of years) of the variable levy (P^*-P^0 in Figure 1). Subtracting the fixed levy from D_d, we get D''_d, which is parallel to D_d and depicts the net-of-levy demand in the developed country at different world market prices. The fixed levy also reduces demand in the world market by an equal amount, D_w shifts to D''_w. The world market price will be P^0 when the short run supply is normal whether there is a fixed or a variable levy. With the variable levy, however, the price will rise to P following the given production shortfall; with a fixed levy, the price will only rise to P^2. In this comparison, the effect of the *variability* of the levy is thus $P^1 - P^2$.

2. *Free Trade*

If free trade prevails, a production shortfall equal to S—S' raises the price from a level corresponding to the inter-section of D_w and S to that of D_w and S'. (In order not to clutter the figure these price lines have been omitted.) Since D''_w is parallel to D_w, however, this price increase is equal to P^2-P^0. That is, in absolute terms, the effect of a

FIGURE 1


Price
Quantity
S
S'
S+
Dw
D'w
D''w
D'w
Dd
D''d
D'd
Du
P*
P1
P2
P3
P0
Q1w
Q0w
Q2w
Q0d
Q0u
Q2u
Q1u

given production shortfall on the world market price is the same when we have free trade and when we have a fixed levy in the developed country.[3]

3. *A Proportional Levy (Ad Valorem Tariff)*

With a proportional levy in the developed country of the size $(P^* - P^0)/P^0$ to achieve comparability, the world demand schedule is D_w. In this case, a production shortfall of S — S′ will increase the world market price to P^3. With a proportional levy in the developed country as the norm of comparison, the price-destabilising impact of the *variability* of the levy is thus $P^1 - P^3$, which is larger than when the alternative is free trade or a fixed levy $(P^1 - P^2)$. The economic explanation for this result is, of course, that a proportional levy increases when the price goes up, reducing demand further, whereas a fixed levy does not. Proportional levies thus function as automatic, built-in stabilisers in world markets, as compared to free trade or a regime with fixed or variable levies.

When supply shifts from S to S′, the *variability* of the developed country's import levy means a loss of consumer surplus to the under-developed country (mainly a transfer of income to the exporting country). When free trade, or a fixed levy, in the developed country is the norm of comparison, the size of this loss is equal to $m.(P^1 - P^2)(Q_u^1 + Q_u^2).0.5$, where m is the share of grains imported. In this case, grain consumption in the under-developed country is reduced by $Q_u^2 - Q_u^1$. If a proportional levy is the alternative against which we compare, the loss of consumer surplus is larger (the equivalent area between P^1 and P^3), and so is the reduction of grain consumption.

There is, of course, a symmetrical consumer surplus *gain* when supply is above 'normal'. In the simple case depicted in Figure 1, with a linear demand curve, the consumer surplus gain occurring when supply is above normal is larger than the consumer surplus loss occurring when supply falls short (by an equal amount). The 'net consumer surplus' effect over several periods of the variability of the developed country's import levy is thus positive for the under-developed country. If the demand curve becomes more inelastic with rising price, which is probably a more realistic case (*cf.* below), the net consumer surplus gain *may* be negative.

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3. It should be noted, however, that had free trade prevailed for a long time, Q_w^2 would have been the initial equilibrium output. The initial world market price would then have been P^0, and a production shortfall by S — S′ would induce a price increase equal to $P^2 - P^0$. In this case, the price increase would thus be identical to the one experienced in the case with a fixed levy in both relative and absolute terms.

II

EMPIRICAL ILLUSTRATIONS

In this section, estimates of the effect on world market price fluctuations of the variable levies imposed by the EEC countries on grain imports will be presented. The estimates are derived by calculating the difference between the world market price effect of a given production shortfall when EEC's price elasticity is zero and when it assumes some other value, given the share of world use of grains accounted for by the EEC. Different sets of assumed values of other elasticities involved are used: (1) the 'free trade' demand elasticity in the EEC countries, (2) the demand elasticity in the under-developed countries and in (3) the rest of the world. As before, the short run supply is assumed to be completely inelastic (this assumption is discussed below).

The estimates are presented in columns 3 and 6 in Table I. They suggest that had the EEC countries adhered to free trade, or used a fixed instead of a variable levy, a global production shortfall of five per cent would have been followed by a 5-10 per cent lower price increase in the world market. Had the alternative been a proportional levy *ad valorem* tariff) of 50 per cent,[4] the estimated percentage shares of the increase of the world market price would have ranged between 7 to 15 per cent (columns 4 and 7).

The estimates presented in Table I are, of course, only indicative of orders of magnitudes; the model used is very simple and aggregated, and the size of the various *demand* elasticities involved is subject to

TABLE I—THE ESTIMATED WORLD MARKET PRICE INCREASE FOLLOWING A FIVE PER CENT GLOBAL GRAIN PRODUCTION SHORTFALL: TOTAL AND SHARE DUE TO EEC VARIABLE LEVIES ASSUMING (1) FREE TRADE AND (2) PROPORTIONAL TARIFF ALTERNATIVE*

	Assumed demand elasticity in the (free trade) EEC and the rest of the world					
	—0.05			—0.10		
Assumed demand elasticity in the poor underdeveloped countries	Total world market price increase (per cent)	Percentage share due to EEC variable levies		Total world market price increase (per cent)	Percentage share due to EEC variable levies	
		Free trade alternative (per cent)	Proportional levy alternative (per cent)		Free trade alternative (per cent)	Proportional levy alternative (per cent)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
—0.10	87	8	12	56	10	15
—0.20	61	6	9	44	8	12
—0.30	47	5	7	36	7	10

Note:—*Proportional levy assumed to be 50 per cent.

4. The *ad valorem* nominal tariff equivalent of the variable levies on grain imports in the EEC in the late 1960s and early 1970s has been estimated at 34-84 per cent for five cereals, the effective protection being much higher. G. P. Sampson and A. J. Yeats, "An Evaluation of the Common Agricultural Policy as a Barrier Facing Agricultural Exports to the European Economic Community", *American Journal of Agricultural Economics*, Vol. 55, No. 1, February 1977.

great uncertainty.[5] It should also be recalled that we have used the simplifying assumption that short run *supply* is completely inelastic. This may not be quite realistic for two reasons. First, there may be speculative grain stocks which are depleted gradually when the price rises. There is reason to think, however, that the holding of extensive private grain stocks would not be undertaken. Storing grains involves high costs because grains are perishable and have low value/volume and value/weight ratios. It is thus no surprise that several simulations of buffer stock schemes for grains have shown negative private profits even at very small holdings of reserves.[6] Second, higher prices may provide an incentive for reducing waste and spoilage of grains so that the 'net' supply in the market increases. Most econometric studies suggest, however, that short run supply elasticities in agricultural activities are very low,[7] even when the short run is taken to be two years or more. The supply elasticity for one production period, a year or less, is of course even smaller, suggesting that the over-estimation induced through the use of a completely inelastic supply curve is not very important.

As indicated in the theoretical section above, the additional increase in world market prices in poor global crop years brought about by the EEC countries' variable levies on grains affects the under-developed countries' real income and consumer surplus. In 1973-74, the price of wheat in the world market went up by 165 per cent as compared to the average for 1967-1972. With an import volume of 40 million tons of grain on commercial terms, chiefly wheat, this price increase did cost the under-developed countries about $ 3 billion in 1973.[8] Using the figures presented in Table I as the point of departure, an estimated 5-15 per cent of this excess cost, or $150-$450 million, was caused by the *variability* of the EEC countries' import levies.[9] Had the aggre-

5. Here we have used the set of values of the demand elasticities which most analysts of the functioning of the world grain market seem to consider the proper ones, although many qualifications are made. *cf.* D. G. Johnson, "Increased Stability of Grain Supplies in Developing Countries: Optimal Carryovers and Insurance", *World Development*, Vol. 4, December 1976; A. H. Sarris, P. C. Abbot, and L. Taylor : Grain Reserves, Emergency Relief, and Food Aid, Overseas Development Council Report, March 1977; and S. Reutlinger, "A Simulation Model for Evaluating Worldwide Buffer Stocks of Wheat," *American Journal of Agricultural Economics*, Vol. 58, No. 1, February 1976.

6. Reutlinger, *op. cit.*; Johnson, *World Development*, December 1976, *op. cit.*; and Sarris *et al.*: *op. cit.*

7. United Nations Conference on Trade and Development (UNCTAD) : Survey of Commodity Demand and Supply Elasticities, Research Memorandum No. 48, 1978; and Hossein Askari and John Thomas Cummings, " Estimating Agricultural Supply Response with the Nerlove Model : A Survey", *International Economic Review*, Vol. 18, No. 2, June 1977.

8. A further cause of instability is due to the fact that food aid, principally grains, decreased substantially in years of high grain prices, creating a need for further commercial grain imports. In 1973, grain aid was reduced by an estimated 50 per cent, or 6.6 million metric tons, as compared to the two previous years [Organisation for Economic Co-operation and Development (OECD): Development Co-operation Review 1974, Paris 1974, Table V-2], worth close to $ 1 billion at the time. The chief reason for this cut in food aid is probably that the opportunity cost for the donors increases with increased prices in the world market.

9. The EEC countries have variable import levies on a host of agricultural *exports* from the LDCs. These levies tend to destabilise both price and revenues received by the exporters when their supply fluctuates—as is usually the case in agricultural activities.

gate demand curve been linear, as assumed in the above model for simplicity, there would have been a larger symmetrical real income gain in globally good crop years.

However, the data on world grain production and prices do not corroborate such a symmetry. In the post-war era, world market prices have risen substantially in years when the total availability (current production plus stocks) of grains has been scant—as during the first half of the 1970s—but there have *not* been equally *drastic* price falls when total availability has been abundant. This may be because demand curves are non-linear and tend to become more inelastic as price rises; there are both theoretical reason and empirical evidence to support this notion.[10] If non-linearity is *the* main reason, one may thus tentatively conclude that the effect of the *variability* of the EEC countries' import levies on the under-developed countries' real income is likely to be negative.[11]

The lack of symmetry in the price picture may also be due to government policy, however. World market prices of grains are to a large extent dependent on the policies pursued by the U.S., the world's largest grain exporter. The U.S. has traditionally supported grain prices in glut years by subsidising the withdrawal of grains from the market through government financed stock building. This means that the negative price effect of the variability of the EEC levies may be fully neutralised by price supporting policies in the net exporting countries. In this case, the *de facto* net effect of the 'variability' on the under-developed countries' real income would be unambiguously negative. If, on the other hand, the negative price pressure of these levies in glut years is not *fully* neutralised by compensatory policies, the net real income effect *may* be positive. To assess the sign of the real income effect, empirical research is thus needed on both the reason for the non-symmetrical price response to production fluctuations and on the net exporting countries' price policies.[12]

III

THE EFFECT ON OTHER COUNTRIES' LONG RUN TRADE POLICIES

It may seem from the above calculations that the instability induced directly into the world grain markets by the EEC variable levies is rather small. These estimates, however, do not take into account the impact the EEC variable levies may exert on the other countries'

10. Sarris *et al.*: *op. cit.*, pp. 4-6.

11. The average protective effect of the EEC levies tends to exert a downward presssure on world market prices of grains because demand is reduced.

12. There may, of course, be other unwarranted effects on the under-developed countries of fluctuating import prices, some of which could be remedied by holding foreign exchange reserves—which signifies a real cost. There could also be macro economic cost in the form of inflationary pressure through so-called ratchet effects, and micro economic costs through hampering influences on investment in import-competing sectors.

grain trade policies, and thus the further stability of the world market.

In a world with no major government-owned grain stocks assuring stability, there is an innate tendency that stabilisation of the domestic supply of grains through trade interventions will spread to the countries, *prima facie* the U.S., who yet abstain from such practices. This is because, for each additional percentage point of the world grain use that is insulated, the unstabilising impact on world market prices of a given global production shortfall will grow exponentially. The incentive for the countries refraining from domestic stabilisation schemes to follow suit and insulate themselves from the world market will thus be growing exponentially too; and when additional countries pursue domestic price stabilisation policies, further price instability will be induced into the world market, etc.

The above reasoning could be presented a little more formally with the help of Figure 2. The line in the right-hand quadrant depicts the (linear) relationship between the *de facto* demand elasticity (η) and the share a of world grain consumption which is de-linked to world market prices, for a given assumed value of the size of the free trade aggregate demand elasticity (η^*).[13] The curve in the left-hand quadrant represents the relationship between the size of the *de facto* demand elasticity in the world market and the price response here to a given global production shortfall[14] as measured by the percentage deviation from the long run exponential trend.

As an illustration, let us now assume a given value of the *free trade* elasticity, say —0.20, and that the production shortfall in one year is —0.03. Initially, the share of total consumption which is insulated from the world market is 0.20. This means that the *de facto* demand elasticity is —0.16 and a production shortfall of three per cent pushes prices up by 19 per cent. If some additional countries, accounting for another 0.20 share of world grain consumption, insulate their domestic markets, a rises to 0.40 and η falls to —0.12. The price increase in the world market in response to a three per cent production shortfall will then be 25 per cent. The curvilinear relationship on the left-hand side of the figure means that the price effect will be *relatively* larger than the increase of a, as the latter grows. When a gets close to 1, the price increase will approach infinity.

Whatever the precise rationale—several have been suggested—governments seem to place a very high priority on stable *domestic*

13. The *de facto* aggregate demand elasticity η is derived through a weighted summation of the elasticity in the set of countries where consumption is de-linked to world market prices (η^0) and the elasticity in the set of 'free trade' countries (η^*). That is $\eta = a\eta^0 + (1-a)\eta^*$, where a is the share of total demand that is de-linked. Since η^0 is zero, the expression reduces to: $\eta = (1-a)\eta^*$, which is the linear relationship shown in the right-hand quadrant of the figure.

14. From the definition of the price elasticity we have: $\dot{p} = \dot{q}/\eta$. Differentiating this expression with respect to η and holding $\dot{q}$ constant, we get $d\dot{q}/d\eta = \dot{q}/\eta^2$, which shows that as η increases $\dot{p}$ grows exponentially.

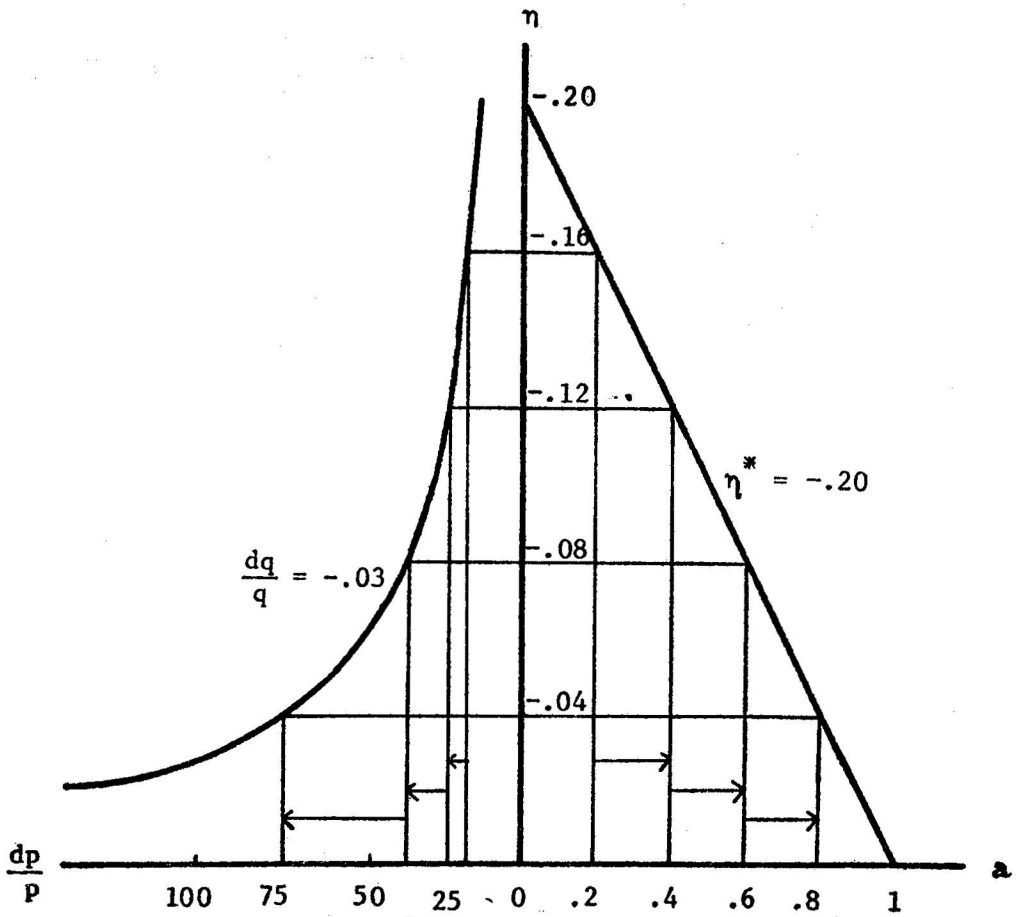

Figure 2

prices and supply of basic food items. Automatic (variable levies), or *ad hoc,* interventions in the world market may be the cheapest way for the individual country to achieve these ends as long as most other countries refrain from doing the same. Eventually, however, when more and more countries use these measures—and there is evidence to support such a development[15]—there is the possibility that the world market will become too unstable to function properly. At that point, or probably well before that, a collective first-best solution may be the build-up of internationally held and financed grain stocks, agreement on free trade, or the introduction of bilateral/multilateral trade arrangements of some kind.[16]

15. Johnson, *American Journal of Agricultural Economics*, December 1975, *op. cit.*, and Peter Svedberg, "Instability in International Grain Markets : Causes, Consequences and Policy Options", Institute for International Economic Studies, Stockholm, 1977 (mimeo.).

16. The following two studies may also be referred : A. I. MacBean : Export Instability and Economic Development, Allen and Unwin, London, 1966; B. F. Massell, "Export Instability and Economic Structure", *The American Economic Review*, Vol. LX, No. 4. September 1970.