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ON THE NEGLECT OF DYNAMICS, RISK AND MARKET INSULATION IN THE ANALYSIS OF URUGUAY ROUND FOOD TRADE REFORMS*

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The substantial investment in models of international food markets prior to and during the Uruguay Round of international trade negotiations has been a mixed blessing so far as the prospects for reform are concerned. At worst, results from these models have misled the negotiations because they have most often ignored a primary concern lending domestic political support to food market interventions, namely the avoidance of risks borne of dependence on international markets. In this paper the reasons for market insulating policies are reviewed and their links with protection elucidated. Some errors that have stemmed from the application of 'standard' but inappropriate models are noted. Finally, the implications of extending the standard method to include dynamic behaviour and market insulating policies are examined.

In global studies informing the Uruguay Round of trade negotiations, the models used to characterise market and government behaviour have tended to employ standard, rather than frontier methods, the scope of which seriously limits the power of the models to address the policy issues at hand. This can be particularly problematic in the area of economic policy since early results from 'standard' models can mislead the processes of policy formation and institution building. The resulting mistakes can result in new policy regimes and institutions, the lives of which are not simply terminated when new research suggests a change of direction.

Global models covering multiple interacting commodity markets and incorporating endogenous policy formation have recently become standard practice in the analysis of agricultural trade policy, as in Roningen (1986), OECD (1987, 1990) and Tyers and Anderson (1988).

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But the improvements they offer still leave important deficiencies which must be addressed before the analysis of food trade distortions properly considers the motivations which gave rise to the distortions in the first place. In particular, most continue to ignore the role of intertemporal changes and uncertainty which are critical to both policy formation and the behaviour of private agents. Indeed, it is often a widespread sympathy for farmers as agents subjected to extraordinary risks which reduces non-farm opposition to government intervention in agriculture.

The failure to represent the dynamics of food markets and of policy regimes which affect them causes confusion between the consequences of policy, as measured in comparative static terms, with the motivation for policy formation. The emphasis in early work has been on questions such as: 'Who benefits from the existing market distortions, by how much and at whose expense?' (see, for example, Tyers and Anderson 1988, Roningen and Dixit 1989). Although political pressure exerted by immediate beneficiaries might be influenced by this, wider support for some distortionary policies need not depend on static measures of economic surplus gained and lost. The broad political agenda behind most distortionary agricultural policies is risk-reducing insulation against changes abroad, rather than an activist redistribution of pre-existing domestic wealth, yet insulation as an aspect of agricultural policy has thus far been only weakly addressed by research on agricultural trade.

First, the recent evolution of models for food trade policy analysis is briefly reviewed, highlighting the emphasis on comparative static analysis. The reasons why insulation is popular and why it so often progresses to (less popular) protection are examined under the heading 'Market Insulation and Protection', while in 'Some Implications of Market Insulation for Agricultural Trade Policy Analysis', three important consequences of making market insulation explicit in policy models are demonstrated. In the final part, some conclusions are offered.

The Evolution of Food Trade Modelling Method

Since the commodity boom years of the 1970s there have been substantial investments in research on food trade policy. Interest in the subject has since been further enhanced by the Uruguay Round of international trade negotiations and the important role assigned to agricultural reform therein. The bulk of the policy analysis thus stimulated has employed readily available and easily interpreted partial equilibrium analysis in comparative static mode. The early work of this type examined the effects of distortionary policies in single countries and single markets for homogeneous commodities, assuming that either the quantity traded or the border price is exogenous (see Thompson 1981 for a review of these and some more advanced approaches).

Later, still in comparative static mode, new approaches emphasised international interactions, most popularly in non-spatial partial equilibrium models of individual world commodity markets (in the manner of Zwart and Meilke 1976, Linnemann and others 1979, Valdes and Zeitz 1980 and Bale and Lutz 1981). Interactions between separate commodity markets were incorporated in some single models which retained the comparative static approach and the partial equilibrium assumption (that the totality of the markets represented is small compared with the economy as a whole). These included the U.S. Department of Agriculture's GOL model (Rojko and others 1978).

Results from these partial equilibrium comparative static models came to dominate the analysis available to the trade policy process. Nevertheless, important deficiencies were recognised by some, including that policy is exogenous in each case. In such models, disturbances transmitted internationally as price changes are assumed to affect only the behaviour of private agents. New models were built to experiment with endogenous policy formation, as reviewed by Rausser et al. (1982) and, more recently by Rausser and de Gorter (1989). This is particularly important for multicountry models, since, while the objective might be to analyze a set of exogenous policy options for one country, the response abroad often embodies changes in both private and public behaviour (Tyers 1990a).

But, in the models which are now standard the role of intertemporal changes and uncertainty, both of which are critical to food market behaviour and policy formation, are still ignored. This is not to say that there is no work on models which focus on these problems. Dynamics and risk are the subjects of a very large literature in agricultural and general economics. Key results from this literature have thus far tended not to be used in the global models influencing current policy formation. Early papers in which the effects of policy on price stability are examined include those by Sampson and Snape (1980) and Blandford (1983). Closer to home, the efforts of Tyers and Anderson have crudely investigated food market dynamics (Tyers 1985, Anderson and Tyers 1991, and Tyers and Anderson 1992), while work proceeds on more sophisticated representations (which simulate dynamic games) none of which can be expected to generate useful results in time to influence the current round of trade negotiations (see, for example, Vanzetti and Kennedy 1988).

Market Insulation and Protection

In what follows, it is argued that the prevalence of distortionary policies affecting agriculture depends on the perception in both farm and non-farm households that agriculture is extraordinarily risky and that risk-reducing insulation against changes abroad is desirable in this sector. If this is true, comparative static trade policy analysis fails to focus on the fundamental motivation for the original interventions.

Results emphasising the static redistributions due to distortions measured in any one year are therefore not constructive, serving to inform the comparatively well-organised likely losers from reform and hence to galvanise the forces against it.[1]

Why should domestic market insulation be a primary motivation for food market distortions? And how does the well-meaning implementation by governments of risk-reducing insulation beget the high levels of agricultural protection observed in some economies? The argument, to be elaborated, runs as follows. First, imperfections in capital and insurance markets leave scope for net welfare enhancement by insulating trade distortions which reduce domestic price risk. Second, while most countries which do this are small, when all do it their insulating distortions congest the risk-spreading capacity of global food markets, exacerbating international price risk and ensuring that insulating policies become entrenched. Third, such policies sever the link between international and domestic prices, leaving the latter to be set by some administrative process. This process invariably uses pricing rules which bias home prices above those on world markets, in part because it is particularly vulnerable to being captured by farm interests seeking protection.

To take the first premise, revealed preference appears to confirm the popularity of market-insulating trade policies. The estimates of levels of market insulation listed in Table 1 are evidence that it proliferates in both industrial and developing countries. In their discussion of direct foreign investment, under the subheading 'Instinctive Reactions', Lindert and Kindleberger (1982) suggest the following:

> Social man tends to some considerable degree to be a peasant with a territorial instinct which leads him to object to foreign ownership of national natural resources; a Populist, which makes him suspicious of banks; a mercantilist, which makes him favour exports over imports; a xenophobe, which leads him to fear those from outside the tribe; a monopolist, who reacts strongly against competition; and an infant, to the extent that he wants to eat his cake and have it too.

Should there be any truth to this polemic, it is not difficult to explain a widely-held preference for the insulation of domestic markets against disturbances originating in the rest of the world. But very much more can be said by resort to the substantial literature on price stabilisation. It is sufficient to establish either that insulating policies, which use trade flows to stabilise home prices, yield a net improvement in the aggregate welfare of all domestic agents when border prices are risky, or that insulating policies benefit those groups with the greatest political influence and that governments therefore perceive political

[1] The way in which the standard comparative static analysis has helped to galvanise groups likely to lose from trade liberalisation is suggested by the report on Roningen and Dixit by the Center for Rural Affairs 1990.

benefits from their implementation. In one sense it is surprising that such a premise should be accurate. Insulation is distortionary, creating efficiency losses in every year in which border prices depart from desired domestic levels. To make insulation worthwhile, domestic agents must be sufficiently averse to price risk to offset the efficiency losses.[2]

In all countries some agents can be expected to have stronger preferences for price stability than others. Since market insulation occurs in both developing and industrialised countries, it is probable that this preference is strongest among the groups with most apparent influence over agricultural policy in each case; broadly, consumers and industrial capital owners in developing countries and farmers in industrial countries (Anderson and Hayami 1986). What, then, are the directions of the welfare impacts of price stabilisation on these groups?

The simple Marshallian analysis of Waugh suggests that, in the dominant case where the source of the price fluctuations is not shifts in demand, consumers lose from the stabilisation of the prices they face. This result stems simply from the downward-sloping nature of demand curves. A price decline increases welfare by more than a price rise of equivalent magnitude decreases it. Symmetrical fluctuations in price therefore raise average consumer welfare. This tendency of consumers to prefer price fluctuations persists in the more comprehensive analyses of Turnovsky et al. and of Newbery and Stiglitz (Chapter 9). Their results suggest that consumers prefer price stability only when they are substantially averse to income risk and when their demand is relatively inelastic.

To complement the early Marshallian analysis of Waugh (1944), the effects of price stabilisation on producers were examined by Oi (1961) and Massell (1969). The principal result of these studies, that producers lose from stabilisation where the source of disturbances is not the supply side and gain from it otherwise, does not survive more comprehensive analyses such as those of Wright (1979) and Newbery and Stiglitz (1981, chapters 5, 6, 11). These latter studies take account of some important special characteristics of primary (and particularly crop) production, including lags in supply response which necessitate that production decisions be made based on expected future prices. The way in which these expectations are formed and the extent of farmer aversion to risk are key determinants of production behaviour and of farmer preferences for price stability. When they are taken into account, the direction of these preferences is also ambiguous.

[2] Even then, the gains thus obtained must be larger than those from alternative reforms which address failures in capital and insurance markets whence is derived the aversion to price risk. These failures are here taken as given and the ensuing analysis of price risk is in the tradition of the second best. A good example of theoretical work which avoids this short-coming is Dixit (1987).

Other agents also have a stake in price stabilisation. In many poor countries industrial wages are effectively indexed, through payments in kind and by other means, to the price of a key staple food, such as rice. Food price fluctuations therefore increase the profit risk of industrial capital owners and the expenditure risk of governments as employers. But governments and parastatal agencies which monopolise imports of particular commodities can also gain from reductions in domestic price instability through partial insulation of domestic markets. This is because, under certain conditions, the revenue gained when imports are drawn from a depressed international market and sold at higher prices domestically exceeds that lost when world prices are high and imports must be resold at a loss.

TABLE 1
Degree of Food Market Insulation (per cent) [a]

	Short Run	Long Run
EC-10	83	62
Spain and Portugal	70	67
EFTA-5	91	60
Japan	76	53
United States	30	22
Canada	49	28
Australia	39	22
Argentina	39	30
Brazil	55	33
Mexico	78	63
Egypt	92	78
Nigeria	74	50
Korea, Rep.	89	72
Taiwan	63	31
China	81	52
Indonesia	87	50
Philippines	85	75
Thailand	68	41
Bangladesh	63	53
India	85	58
Pakistan	84	69

[a] The degree of insulation here refers to the complement of the average elasticity of price transmission (one minus that elasticity). The average price transmission elasticity is weighted by the values at border prices of the production and consumption of rice, wheat, coarse grains, sugar, dairy products, and meats of ruminants and non-ruminants.

Source: Time series analysis of consumer and producer prices for the interval 1962–83, as reported in Tyers and Anderson (1992: Appendix 2).

The ambiguous nature of the consumer and producer welfare effects of price stabilisation means that the preferences for price stability of these predominant groups remain matters for empirical analysis. It is therefore useful to examine these effects in some illustrative cases. Two studies which do this are those by Tyers and Anderson (1992, Chapter 3 and Appendix 4) and by Gibbard and Tyers (1990). The former uses a model of a single open commodity market which is subject to random fluctuations in international prices and home production. Agents are risk averse and the government chooses a price-setting rule to achieve some optimal level of partial domestic market insulation. It is applied to two archetypical economies, one a developing food importer and the other an industrialised food exporter. The latter improves the original model by separately considering producer and consumer price policies and permitting the country to be large in the international commodity market concerned.

The results suggest farmers are comparatively indifferent to market insulation in the developing country but could be expected to favour it in the industrial country. This is primarily because farmers in developing countries commit a relatively large share of their income to the purchase of farm products. Their gain from revenue stabilisation is largely offset by losses which stem from their relatively elastic consumer behaviour. In the industrial country on the other hand, farmers commit little of their income to farm products and the revenue (and hence income) stabilisation effects are dominant. Non-agricultural workers in both the developing and the industrial country are roughly indifferent to market insulation. In developing countries this is because, given high expenditure shares on food, food price fluctuations necessitate either partly offsetting wage fluctuations or payments in kind or both. In industrial countries it is because the expenditure share on basic foods is small.

Insulation is favoured by industrial capital owners in developing countries, however. This is because payments to labour dominate the value added in the non-agricultural sector. Fluctuations in these payments therefore result in substantial profit risk. On the other hand, in industrial countries non-agricultural income is not significantly affected by food price fluctuations and capital owners there are indifferent. The corresponding government revenue effects are dominated by shifts in mean revenue due to the partial insulation policy. These revenue gains depend primarily on the elasticity of domestic consumer demand in the short run. Since this elasticity is comparatively high in developing countries, the revenue effects of partial stabilisation are significant there.

In both cases there are net welfare gains to the home economy, supporting the public interest explanation for insulating policies. The results do, however, bear out the hypothesis that the most influential group has the most to gain from market insulation in each case. The gains to industrial capital owners and to government revenue are

dominant in the developing country, where industry tends to be protected at the expense of agriculture and where the cost of collecting revenue by other means is especially high. In the industrial country on the other hand, where agriculture tends to the protected at the expense of other sectors, farmers have the dominant interest in price stabilisation. In addition, since no group of agents in the domestic economy would appear to lose significantly, governments tend not to find market-insulating policies costly to sell to non-beneficiaries.

Thus, the literature tends to support the first premise. For given international price risk, governments find trade policies which insulate home markets attractive. The second, that this behaviour is reinforced by the resulting congestion on the risk-spreading capacity of international markets, requires that this capacity be seen as an international public good. Another contribution from Kindleberger (1986) has been to classify efficient international markets as public goods. This general idea has been further explored by Runge *et al.* (1989) who assert that

> When countries retain the general benefits of open trade while attempting to protect certain sectors from competition, they are engaged in a form of 'free riding', drawing down the global benefits which trade provides.

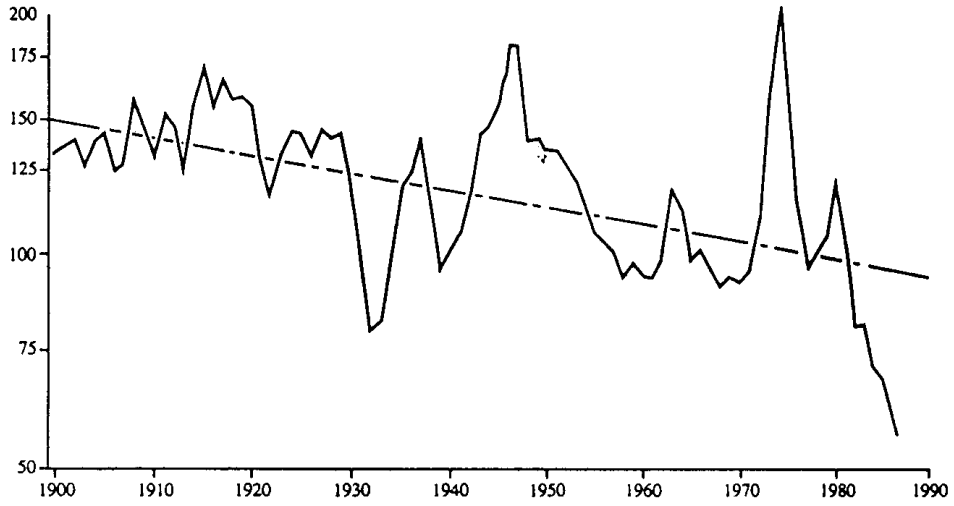
The risk-spreading role of world food markets is readily characterised this way. Its use is not restricted to those countries who share risk by exposing their domestic agents to price fluctuations, neither is it characterised by direct rivalry. Countries which insulate their domestic markets, using trade to eliminate residual excess demands or supplies and thereby stabilising domestic prices, might then be portrayed as free riders even if their levels of protection, averaged through time, are comparatively small. By exposing domestic agents to international price instability, countries help to spread risk and thereby contribute to the supply of the international public good. Typically, as with all public goods, the inability to exclude non-contributors leads to undersupply and to excessively risky world food markets.

Thus, since the insulation of domestic markets is perceived by most governments to be in the national interest and since they therefore exploit the risk-spreading capacity of world markets, they collectively enhance international price risk, thereby reinforcing the prior perception. If enough countries choose to insulate less, better-spread price risk would reduce the need for insulation by others. Quantitative evidence in support of this proposition is presented in Tyers (1990b) and in Tyers and Anderson (1992). To summarise that evidence, the removal of policy-induced insulation in all countries would reduce the coefficient of variation of key international food commodity prices by two thirds. Except in a few countries, domestic prices would be less volatile than they are at present.

As for the third premise, that insulation policies beget protection, it is reasonable to suppose that insulation need not be directed solely at

short-run price fluctuations. As illustrated in Figure 1, while the volatility of real international food prices has increased, their trend has been declining throughout this century, most steeply since the early 1970s (Grilli and Yang 1988). Simply by retarding the transmission of this decline to domestic markets, many governments have caused the trend of home prices to be above that of international prices and hence rates of protection to rise through time. Others have fully transmitted declines but with a lag, leading to continuous, though lower, levels of protection.

FIGURE 1
Real International Food Price Index, 1900–1987
(1977–79 = 100)[a]



[a] An index of export prices in US dollars for cereals, meats, dairy products and sugar, deflated by the US producer price index (primarily of industrial product prices), with weights based on the importance of each product in global exports in 1977–79.

Source: Time series provided by the World Bank, as reported in Tyers and Anderson (1992).

Two general characteristics of market-insulation policies are important in this link with protection. First, such policies always separate domestic from border prices and hence distort domestic incentives, at least in the short run. And second, because the current and future trend of international market prices is uncertain, there is no obvious and undisputed level at which domestic prices should be set in order to achieve the objective of comparatively stable domestic prices (Walters 1987). The process by which the domestic price is set is therefore subject to lobbying by vested interests. The cost of substantial distortion of domestic prices away from border prices is reduced because governments can claim that the distortion is temporary, pending the return of border prices to 'trend' levels. Since the lobbying and

propagandising effort of farmers in industrial countries is stronger than that of groups which lose from high food prices, this process tends to be captured there by farm interests (Anderson and Hayami 1986). Similarly, in developing countries, the initially well-intentioned separation of domestic from international markets by governments averse to food price and wage risk reduces the political costs of policies which ensure that the trend of domestic prices is below that at the border.

Some Implications of Market Insulation for Agricultural Trade Policy Analysis

The presence of market insulating policies makes more difficult the analysis of policy reform and its interpretation. Moreover, commonly used comparative static analysis can be badly misleading. To demonstrate this, three key implications of market insulating behaviour are examined. These are first, that magnitudes of price distortions vary from year to year as international prices fluctuate. The results from any comparative static analysis therefore depend on which year is chosen for analysis. Second, when price distortions are measured in a single year, it is impossible to tell what part of these is due, on the one hand, to governments' commitments to keeping domestic prices above the trend of world prices (pure protection) and, on the other, to risk-avoiding market insulation. And third, where policy analysis is carried out prospectively, the results can depend critically on whether international prices are predicted to rise or fall.

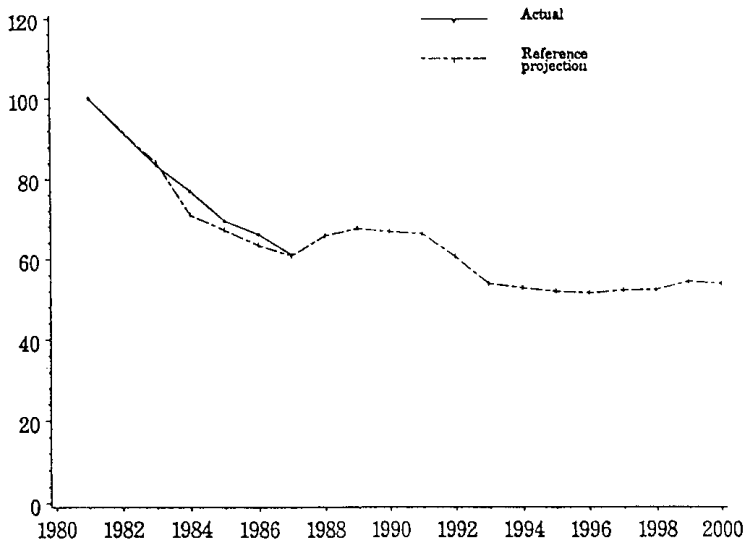
To illustrate these three implications for policy analysis, the Tyers-Anderson model of world trade in grains, livestock products and sugar is used once again. This dynamic model is equipped for the purpose with endogenous policy formation and stock-holding behaviour (Tyers and Anderson 1992, Chapter 5).[3] Its base period is 1980–82 which, by inspection of Figure 1, has average international food prices roughly on the long run trend. Simulations run from 1983 through the year 2000. Disturbances to food production provide the main source of uncertainty in the model and these are introduced stochastically beyond 1989, the last year for which comprehensive quantity and price data were available at the time of writing.

The analysis begins with a reference simulation which projects the trend in mean food prices illustrated in Figure 2. Since the dramatic decline in prices of the early 1980s is not followed by any substantial resurgence, protection rates in countries with insulating policies might be expected to be higher than in the base period. Indeed they might be

[3] Although the model does include endogenous policy formation and stock-holding, it relies on some simple behavioural assumptions, including that all agents have backward-looking expectations. Clearly, some agents in industrial countries would be better characterised as having model-consistent expectations. Methodologies are now available which make this possible, though none are yet in use in global agricultural trade models.

expected to be at their highest in 1986 and 1987, thereafter declining as the dip in world prices is gradually passed through to domestic agents by those countries which do not insulate their markets totally. This expectation is borne out by the projected trends in protection rates listed in Table 2. Price distortions, and their associated efficiency losses, peak in 1987 and their projected mean declines thereafter.[4]

FIGURE 2
Projections of an Index of International Food Prices[a]



a For the composition of the index, see Figure 1.

These results illustrate the first of the above implications of insulating policies. Comparative static analysis would yield conclusions about price distortions and their economic cost which would vary enormously, depending on the year chosen. In particular, studies based on statistics for 1986 or 1987 would yield global efficiency losses twice as large as for subsequent years and five times larger than they were in 1980-82. This is a major difficulty with studies such as that by Horridge and Pearce (1988) and Horridge *et al.* (1990). They address distortions which appear high because of the year chosen (1986), but which are mere symptoms of more complex policies not intended to distort prices to that extent in all years. One way in which such studies have misguided the negotiation process is that they have made it

[4] Of course, the projection beyond 1987 employs stochastic simulation. The mean projections therefore disguise an infinite number of alternative combinations of projected prices, rates of protection and efficiency losses.

possible for the EC, in its mid-1990 proposal to the Uruguay Round, to appear to offer a substantial reform by suggesting phased reductions in price distortions of 30 per cent, with 1986 as the base. The following is a quote from that proposal.

> As foreseen by the decision in Geneva in April 1989, reductions would be measured against the reference of 1986, in order to give credit for the measures which have been adopted since the Declaration at Punta del Este.

To the extent that international prices have risen since then, the insulating policies of the EC have ensured that most of that reduction has already occurred. Such a proposal will yield true reform only if real international food prices fall still lower in the 1990s than they did in 1986-87, as Figure 1 suggests they might.

To examine the second implication, that the effects of the pure protection and the market insulating components of trade policy are difficult to separate, an additional simulation is used in which the insulating component of component of policy is removed in all countries from the base period, 1980-82 onwards. In the Tyers-Anderson model this is the equivalent of the conversion of all policies into *ad valorem* taxes or subsidies at the border as of 1982 and to the binding of their rates in that year. Thereafter, while the level of pure protection is held constant, all proportional fluctuations in international prices are fully transmitted to all domestic markets. The resulting counterfactual price projection is illustrated in Figure 3.

TABLE 2
The Effects of Insulation on Changes through time in Agricultural Protection

	Average OECD Nominal Protection Coefficient	Global Net Welfare Cost of OECD Protection [c], billion 1985 US$
1980–82[a]	1.40	16
1987[b]	1.96	83
1990[b]	1.81	45
1995[b]	1.91	46
2000[b]	1.85	50

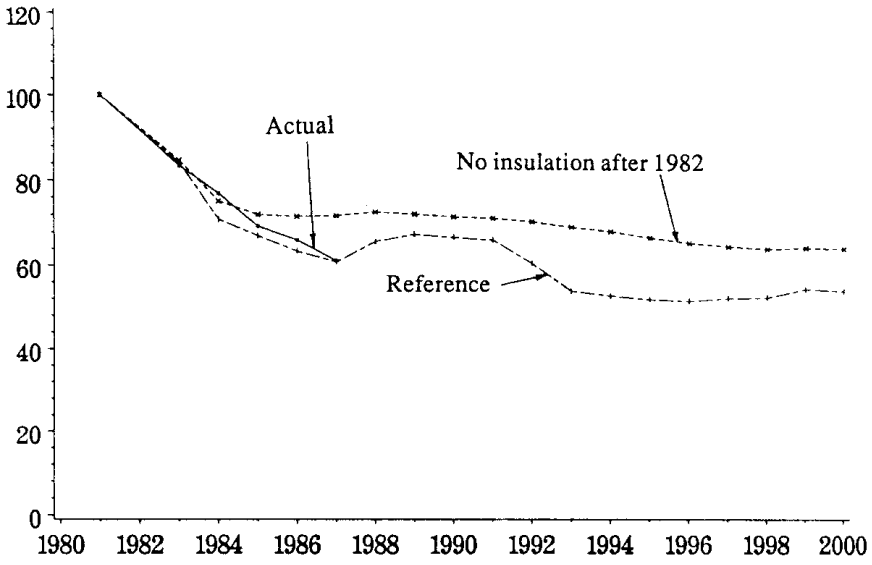
[a] Base period estimates.

[b] Reference dynamic simulation.

[c] The welfare measures used here are equivalent variations in income. They ignore risk benefits. Agents are assumed to be risk neutral.

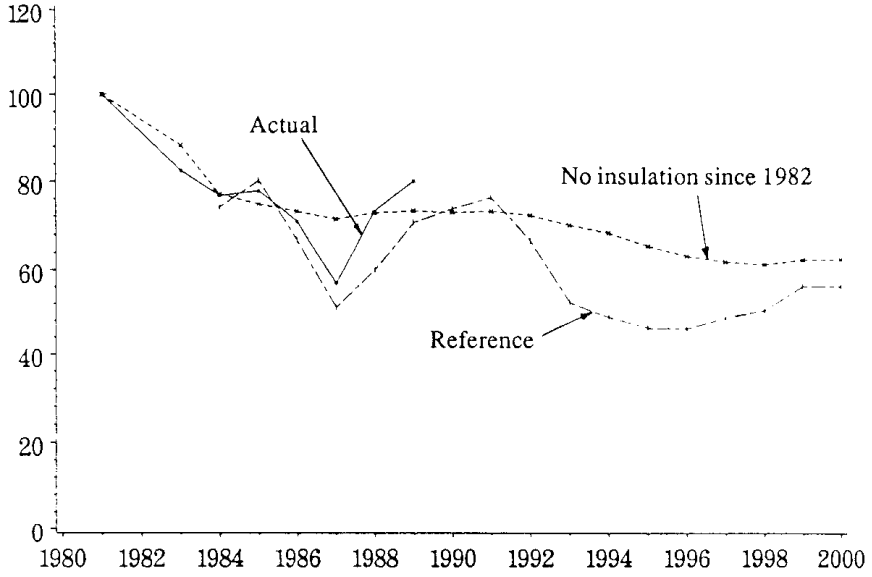
Source: Simulation results from the Tyers-Anderson food trade model.

FIGURE 3
Projections of an Index of International Food Prices[a]



[a] For the composition of the index, see Figure 1.

FIGURE 4
Projections of International Wheat Prices



Not surprisingly, the projected path of international prices is made more smooth by the wider spreading of price risk. This tendency is even clearer in the projections for individual commodity prices, such as that of wheat (Figure 4). More importantly, however, the decline in prices beyond the base period is substantially reduced. This is because, when domestic markets are not insulated, the increases in *ad valorem* protection rates in Table 2 no longer occur. The differences between the retained protection rates of the base period and those which occur when markets are insulated is then that part of price distortions due to the insulating component of policies. Obviously, this also depends on which base period is selected. The period 1980-82 is sensible in that its average prices lie on an estimated long run trend (Figure 1). In Table 3 the two components of policy are separated in this way and their global efficiency losses compared.

These results suggest that the effects of insulation since 1982 are substantial. More than half of the average price distortion in the OECD is due to insulation. Note that the average rate of protection varies slightly from year to year even when there is no insulation. This is due to changes in the volume mix of food commodities in production and trade. The efficiency losses due to insulation since 1982 are also the major part of the net global cost of price distortions both in the OECD countries and in all countries. Had the GATT Round discussions concluded in 1982 with agreement to cease market insulation but to retain existing pure protection (which retained very high levels in some countries, particularly in Europe and Japan) the majority of the distortions, and of the costs now being borne by the world economy would not have arisen. These are good reasons why market-insulating policies should have been given a higher profile earlier in the current Round. They were not, at least in part, because of a reliance on 'standard' models.

Once a trade policy analyst decides, for the above or other reasons, to incorporate insulating policies explicitly in their model, they must then confront the third of the implications listed above. If they choose, to conduct the analysis of prospective policy alternatives prospectively, by modifying a forward reference projection, then their results will not be independent of the forecast content of that reference projection.

It is not possible to use the old disclaimer that the exercise of prospective policy analysis is not aimed at forecasting and therefore that projected price levels are of little significance. If the reference projection shows rising real international prices, insulating policies will cause protection rates to decline and, liberalisation will yield comparatively small efficiency gains.[5] If, on the other hand, they are

[5] This is provided that most food production in the liberalising countries is protected. Of course, if international prices are high and negative protection is most common, then insulation would yield larger price distortions.

falling, then projected protection rates will be comparatively high as will the efficiency gains from liberalisation.

TABLE 3
Changes in Protection and Efficiency Losses Due to Insulation since 1982

	1980–82	1987	1990	1995	2000
OECD nominal protection coefficient					
Reference	1.40	1.96	1.81	1.91	1.85
No insulation		1.43	1.39	1.38	1.37
% of distortion due to insulation since 1982		55	51	58	56
Annual global net welfare cost of OECD protection[a], 1985 US$ billions					
Reference	16	83	45	46	50
No insulation		20	18	13	12
% of cost due to insulation since 1982		76	60	72	76

[a] The welfare measures used here are equivalent variations in income. They ignore risk benefits, assuming agents are risk neutral.

Source: Simulations of the Tyers-Anderson food trade model.

To examine the sensitivity of model results to projected price levels, two additional reference simulations were made, each retaining the same (constant) policy parameters. From 1989, global income grows one third faster than the original reference simulation in one and one third slower in the other. The results, summarised in Table 4, have projected international prices in the year 2000 departing from the original reference by between 20 and 40 per cent. Insulation policies yield corresponding variation in protection rates which is between 20 and 30 per cent. Thus, projected distortions can vary considerably, depending on the analyst's optimism or pessimism about future trends in world food prices.

One important message in the foregoing is as follows. Given the adaptive nature of domestic policies affecting food trade, any truly useful analysis of one country's policies affecting food production and trade must take into account the extent to which the policies of others will adapt in response. The appropriate model should therefore make those policies endogenous. Furthermore, that model had better be more

than just a vehicle for comparative analysis; its performance will also depend importantly on its forecasting strength.

An example of the practical importance of the latter point is the 1980 United States Farm Bill. Policy was formulated in that year in a climate of optimism about future export markets for staple food products, influenced in part by the Carter Administration's 'Global 2000 Report' (see Council on Environmental Quality 1981). No need was perceived to address the means by which farmers might be assisted if international prices collapsed. Floor prices would continue to be set at levels it was expected could be defended with additions to public stocks. When international prices did indeed collapse, United States public cereal stocks rose to unprecedented levels, effectively defending the floor price for the world as a whole. From the viewpoint of the United States, this was a particularly expensive approach to the assistance of its farmers, one which was subsequently changed following the 1985 Farm Bill.

TABLE 4
Dependency of Estimated Price and Welfare Effects of Reform on the Reference Projection to 2000

	High	Medium	Low
Index of international food prices (1980–82=100)	70	54	41
Average OECD nominal protection coefficient	1.61	1.85	2.15

Source: Simulations of the Tyers-Anderson food trade model.

Conclusion

Numerous models of domestic and international food markets have been used in support of the Uruguay Round of international trade negotiations. Almost all these models adopt a comparative static approach and many also rely on the partial equilibrium assumption to simulate sectorally disconnected markets for homogeneous commodities. The omission from virtually all of dynamic behaviour and risk has tended to misdirect those negotiations and, at best, to retard the process of reform. Applications of these models have examined the price and trade effects of reform, but emphasis has been given to implicit transfers among interest groups and across countries in years which may not be representative. A particular problem arises when these calculations focus attention on distortions which are temporary and indirect consequences of the insulation of domestic markets against external disturbances. Where market insulation is the primary motivation there is usually a broad base of political support for the exclusion of shocks presumed to be initiated by foreigners. This issue

might better have been dealt with had the research emphasised the risk-spreading capacity of international food markets and the extent to which the reform of market insulating policies in all countries could eliminate the need for it in any countries.

It is of particular importance that new models for food trade policy analysis incorporate dynamic behaviour and price risk. This will ensure that they reflect a fundamental motivation for food trade distortions and that they are useful in addressing the collective mismanagement of the global commons suggested by unnecessarily risky markets. Such models must necessarily be more difficult to interpret, however. The effects of the pure protection and market-insulating components of food policies are then difficult to separate and the implications for welfare difficult to measure. Furthermore, no longer is it appropriate for models to be designed to specialise in either policy analysis or forecasting. To do the former well requires that the latter also be done well.

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