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STABILITY ISSUES IN POLICY ANALYSIS

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INTRODUCTION

The instability and riskiness of agriculture has long been recognized. In his seminal piece on U. S. agriculture, Schultz (1945) argued:

> "Farm prices change more frequently and fluctuate more widely than any other set of producer prices. Constantly changing prices have their cost, usually resulting in waste and costly maladjustments. . . . Farm prices in the past, altogether too erratic, have not only burdened agriculture with much unnecessary price uncertainty, but their instability has impaired appreciably the positive functioning of prices, namely, to guide and direct production" (p. 42).

Acceptance of this view is reflected in many of our current institutions. For example, the exemptions allowed agriculture under the General Agreement on Tariffs and Trade (GATT) originally were justified by the risk and instability within agriculture as compared to that in manufacturing sectors. The United States can claim responsibility for the initial exemptions in Article 11 of GATT. Because of these exemptions, multilateral trade negotiations have failed, time and again, to bring agricultural trade under any set of consistent rules. As a result, the original justification for agricultural exemptions ironically has led to the current disorder and instability in international agricultural markets.

In addition to internal sources of instability outlined by Schultz (1945) and others (see Blandford and Currie, 1975), evidence has begun to accumulate on external market sources of instability (Andrews and Rausser, 1986; Rausser et al., 1986). Macroeconomic phenomena, especially interest rates and

exchange rates, have been hypothesized to be a major source of instability within the agricultural sector. To the extent that this instability is explained by the fixed-price/flex-price disequilibrium specification, another potential market failure justification is offered for governmental intervention.

Market failures, internal or external, do not explain (normatively or positively) governmental intervention. Gardner (1983 and 1987) has argued that U. S. government commodity programs essentially are income redistribution mechanisms. In the Gardner analysis, however, no market failures exist and thus the competitive equilibrium is a Pareto optimum. In this setting governmental intervention plays no role in correcting market failures or lowering transactions costs [a political economic resource transaction (PERT) governmental intervention] and thus indirectly increasing societal welfare. This perspective presumes that governmental intervention comes in the form of political economic-seeking transfers (PESTs) (Rausser, 1982). PESTs are all those rent-seeking activities by individual groups which distort public policies and lead to government or political failure. The literature on government failure has made it clear that public policy not only absorbs some risks within the private sector but also can become another source of instability and uncertainty. Political-economic markets, with their role in endogenous government behavior, require policy instabilities and risks to be assessed along with market instabilities and risk.

Focusing on issues of stability in terms of what is rather than what ought to be, the themes of this paper are basically three. Each theme relates to a different source of instability within the agricultural sector; all of these

sources beg for additional conceptual and empirical work. The first source of instability will be defined as internal, the second source as external or multimarket, and the third and final source of instability as public policies. It is argued that a comprehensive view of instability and uncertainty within the agricultural sector of the United States or other countries cannot be achieved without acknowledging the contribution of all three major sources of instability.

INTERNAL INSTABILITY AND INCOMPLETE MARKETS

Prior to the early 1970s, the common explanations for internal instability within U. S. agriculture were (1) on the demand side, the inelastic nature of aggregate food demand and the low-income elasticity of demand; and (2) on the supply side, weather patterns, rapid technological change, atomistic behavior, and asset fixity (Hathaway, 1963). The inherent instability resulting from these characteristics--without governmental intervention--was regarded as undesirable by many of those involved in the food and agricultural system (from input suppliers to producers, assemblers, processors, distributors, and consumers). The same stance is taken in the recent papers prepared by the Organization for Economic Cooperation and Development (OECD) Working Party I. Even though this working party argues strongly for liberalization and major reforms of agricultural policies through the developed world of OECD, they, nevertheless, accept the view that internal instability within agricultural sectors is undesirable to society as a whole.

The inherent instability and uncertainty within the agricultural sector by itself is not sufficient justification for governmental intervention. Only if

instability and excessive uncertainty are combined with an incomplete set of risk markets does a market failure justification for governmental intervention in U. S. agriculture exist. The inflexibiliity of some assets employed within the sector is another potential justification for governmental intervention. Still another potential explanation is noncompetitive behavior within the vertical marketing chain for agricultural products.

Incomplete Markets

Incomplete markets arise because of high transaction costs and various types of imperfect information. These include asymmetric information, moral hazard, adverse selection, and principal/agent problems (Ross, 1973). Both static and dynamic models have been designed to represent these problems. In adverse selection models, information may be conveyed either by examination or by self-selection. The action which conveys information may be quantity related or price related; in some cases, it is not the action of a single individual which conveys information but the action of groups of individuals. In these models, it makes a difference whether the uninformed individual moves first or whether the informed individual moves first (for example, individuals must purchase a level of education before employers will make job offers).

Private insurance markets face serious obstacles in agriculture, for both reasons of adverse selection and moral hazard. A farmer is likely to be better informed about the hazards he faces than the insurer (adverse selection), and there are actions the farmer can take to affect output (moral hazard). In essence, although the farmer cannot affect whether there is a hailstorm, he can affect the losses he incurs by taking precautionary actions.

Most models to date have been characterized by one-sided imperfect information, e.g., the borrower knows the characteristics of the lender but the lender does not know the characteristics of the borrower (Bester, 1985). In some research, models with two-sided imperfect information have been specified. Though only a few general principles apply to all markets, some natural parameterizations and simplifications seem more appropriate in some markets while others seem more appropriate in other markets (Fama and Jensen, 1983; Innes, 1986).

Economists have been able to demonstrate that incomplete markets and asymmetric information are closely linked. With complete markets, a farmer can sell the set of state-contingent commodity bundles he produces, thereby internalizing the cost and benefits of any actions he takes. However, if other agents cannot distinguish the effects of states and actions, contracts can only be made contingent on an observable variable and markets cannot be state contingent--or, therefore, complete. Thus asymmetric information is associated with the incomplete market inefficiencies and with "incomplete" contract forms. These contract forms give rise to a second source of inefficiency: The action-choosing agent (e.g., the farmer) does not consider the costs/benefits to be incurred/enjoyed by other parties to a contract, and an externality is present (Greenwald and Stiglitz, 1986).

The lack of a complete set of contingency markets dramatically alters the implications of standard welfare economics (Rausser, 1982; Innes and Rausser, 1987). This is formally demonstrated in the appendix to this paper. It is shown in the appendix that it is possible to design a simple model of incomplete markets which reverse the outcome of standard welfare analysis. In

the model specified in the appendix, deficiency payments do not result in deadweight losses. Moreover, production controls are shown under certain conditions to be an optimal complementary policy to deficiency payments. In fact, for the incomplete-markets specification of the appendix, the optimal deficiency-payment/production-control program can lead to a full Pareto optimum.

Private Stockholding and Market Instability

Recently, a number of justifications have been advanced for public stockholding (Newberry and Stiglitz, 1981; Schmitz, 1982). Long ago, Keynes (1938) argued that the inherent instability in commodity markets would lead to insufficient private stockholding. Risks associated with price volatility, uncertainty about the ultimate "normal price," and the length of time that stocks would have to be held were viewed as the three major factors for this result. Keynes argued, as did Houthakker some years later (1967), that government intervention was needed because of divergence between social and private risk. Bosworth and Lawrence (1982) consider this perspective along with a number of other justifications for government interventions to stabilize the prices of volatile commodities. They come to the conclusion that the divergence between social and private benefits provides the best justification for intervention. In particular, as argued in the section below on public policy, private stockholders will not store for extreme contingencies because they do not expect to receive the true scarcity value of their stocks during such periods.

Internal Inflexibility

Although much has been written about the asset fixity in the U. S. agricultural sector, it is of concern not so much with regard to physical capital as to human capital. As argued by Schultz (1945), ". . . the labor market in the non-agricultural sector is quantity rationed and thus inhibits the migration of labor from agriculture to industry." Moreover, many farmers expend great amounts of effort and capital in the production of cash income in order to at least cover the cash expenditures necessary to remain in farming. This is especially true for those farmers participating in the mid-size category of the trifurcated agricultural production sector.

Small farms, whose major source of income is off-farm employment, have some means for effectively managing the inherent riskiness and instability of farming. Asset fixity for these particular farmers is not a serious concern because of the opportunities for off-farm employment and the low transaction cost of moving from one type of employment to another. For larger farms with off-farm income generated from other assets, a more balanced portfolio provides an effective means for managing the inherent riskiness and instability of agricultural markets. Moreover, the human-capital asset fixity for these larger operations is rather minimal. Human-capital asset fixity is most important for mid-sized farms. Hence, as the relative portion of the mid-size farming operations (which have limited off-farm income opportunities) has fallen, the importance of human-capital fixity has declined over time as a distinguishing characteristic of U. S. agriculture. Equivalently, this outcome has occurred as farms have become more integrated into the balance of the U. S. economy.

Noncompetitive Markets

Within the vertical marketing chain for agricultural products, many intermediaries (assemblers, processors, wholesalers, distributors, marketing boards, etc.) exist. As shown by Bieri and Schmitz (1974), for noncompetitive market structures, intermediaries or middlemen can benefit by "manufacturing" instability. They demonstrate that, for intermediaries who act as monopolists on the sell side and as monopsonists on the buy side, profits will be maximized by stabilizing prices to buyers but destabilizing procurement or grower prices. Even though an intermediary stores a portion of the good produced, there is a clear advantage to destabilized producer prices while stabilizing consumer prices. In this framework, if instability occurs as a natural phenomenon, the intermediary simply gains from storing, acting as a monopolist and acting as a monopsonist. However, if instability is not caused by natural forces, the framework suggests that it would actually pay an intermediary with monopoly and monopsony power to manufacture instability at the expense of the rest of society. In empirical analysis for a number of commodity systems, evidence has begun to accumulate that inventories held by intermediaries contribute to the stickiness of prices toward the consumer end of the chain while augmenting instability at lower levels of the marketing chain (see Wohlgenant's discussion comments in this volume).

MARKET LINKAGES AND EXTERNAL SOURCE OF INSTABILITY[2]

The path followed by agricultural commodity prices over much of the 1970s and 1980s is largely duplicated by other flexible price commodity markets, e.g., gold, silver, platinum, copper, lumber, etc. Stocks also accumulated

for these commodities during the 1970s and early 1980s. This suggests that internal market conditions within agriculture and governmental policies are only a part of the explanation for the behavior of agricultural commodity markets. The search for a complete explanation leads to a multimarket perspective, namely, an investigation of external linkages with other markets.

Since 1972, the conventional wisdom has placed increasingly less emphasis on the inherent instability in commodity markets and more emphasis on external linkages with other markets. During this period, the deregulation of the credit and banking system resulted in greater exposure of agriculture to conditions in the domestic money markets. Also, because of the shift from fixed exchange rates to flexible rates, commodity markets have become more exposed to international money markets and real trade among countries. Moreover, the emergence during this period of a well-integrated, international capital market meant that agriculture, through domestic money and exchange rate markets, has become increasingly more dependent on capital flows among countries.

The linkages of commodity markets with U. S. money markets is indeed pervasive. Since farming is extremely capital intensive and debt-to-asset ratios have risen dramatically over the last 10 years, movements in real interest rates have a significant effect on the cost structure facing agricultural production. Stock carrying in storable commodity systems is sensitive to changes in interest rates; for nonstorable commodities (for example, live cattle and live hogs), breeding stocks are interest-rate sensitive. These effects, combined with the influence of interest rates on the value of the dollar, press grain products from both the demand side (for

example, export demand, domestic livestock grain demand, and stockholding demand) and the cost side. The especially sensitive nature of agriculture to interest rates suggests that this sector is vulnerable to monetary and fiscal policy changes. It has been argued that since 1972, but particularly since 1980, the instability in monetary and fiscal policy has contributed greatly to the instability of commodity markets.

Overshooting

There is ample evidence that the U. S. agricultural sector has become more closely related to the rest of the domestic and international economies. The instability in monetary and fiscal policies is thought to have imposed sizable shocks on commodity markets. This is especially true if agricultural commodity markets behave as flex price while other markets behave as fixed price. This fixed/flex price specification is necessary but not sufficient for money nonneutrality to imply overshooting (Rausser, 1985). Overshooting combined with "myopic" expectations means that "macro externalities" will be imposed upon the agricultural sector (Rausser, et. al., 1986). Flex-price commodity markets and fixed-price nonagricultural output markets combined with "small" output responses mean that overshooting in agricultural sector markets will occur even if expectations are formed rationally. Such overshooting results from the spillover effects of monetary and fiscal policy on commodity markets.

Without governmental price supports, agricultural prices are generally more flexible than nonagricultural prices. This is true in part because contracts for agricultural commodities tend to be written for shorter duration

and because biological lags tend to cause agricultural supply to be unresponsive to price changes in the short run. However, if output can conceivably respond sufficiently to more than compensate for a short-run spike or fall in flexible prices, market overshooting will not necessarily be observed.[3]

Given a world of fixed- and flex-price markets, the driving force behind overshooting is the "real rate of interest" and arbitrage across markets. When real interest rates rise above (fall below) the long-run equilibrium rate of interest, pressure arises in the short-run to drive flexible commodity prices downward (upward). In much of the 1970s, real interest rates were below and, for some periods in the 1980s, real interest rates were above their long-run equilibrium levels. In the case of interest rates facing the U. S. agricultural sector, the degree of disequilibrium was even more pronounced. This is because of the organizational structure and the relative importance of the farm-credit system. This organizational structure amplifies the disequilibrium and generates more overshooting than would otherwise result. This is because of a farm credit system ownership structure in which the borrowers are, in fact, owners and no dividends are paid to stockholders. As a result, during favorable periods, the only way of extracting any surpluses that might be generated by the system is through owners increasing their level of borrowings at interest rates which are below prevailing interest rates for the rest of the economy. During unfavorable periods, the opposite situation exists. Because of this phenomenon, interest rates charged within the farm-credit system through much of the 1970s were dramatically below interest rates facing the rest of the economy while, during the 1980s, the opposite

result occurred. Hence, interest rate market disequilibriums are even more pronounced for the agricultural sector, and the associated overshooting and instability for the sector are amplified relative to the balance of the U. S. economy.

Empirical Evidence on Overshooting

Empirical evidence supports the view that output response is not sufficient to counter the tendency for prices to overshoot and that expectations are, at best, only "myopically" rational. Bordo (1980) has shown empirically that prices of raw goods respond more quickly to changes in money supply than do prices of manufactured goods. Andrews and Rausser (1986) have shown that, during the large cyclical downturns of the early 1930s and the early 1980s, prices fell more and quantities fell less in the agricultural sector than in any of nine other sectors of the U. S. economy. Numerous studies (e.g., Cumby and Obstfeld, 1984) have shown that real interest rates vary significantly across countries, refuting the old view that real interest rates are constant. These results also suggest that the purchasing power parity assumption does not hold, even approximately. In other words, exchange rate changes do not offset changes in relative price levels.

Frankel and Hardouvelis' (1985) study on monetary surprises rejects the flex/flex specification in favor of the fixed/flex specification. Their empirical results suggest that when money supply turns out to be greater than expected, nominal interest rates tend to rise and the prices of basic commodities tend to fall. If the flex/flex specification were correct, then interest rates and commodity markets would either both rise (if the

announcement were to cause the public to revise upward its expectation of future money growth) or both fall (if the public were to revise downward its expectation of future money growth). The only hypothesis that explains the reactions in both the interest rate and commodity markets is that the increase in nominal interest is also an increase in the real interest rate. This is presumably because the public anticipates that the Federal Reserve will reverse the recent fluctuations in money stock, thus increasing interest rates and depressing the real prices of commodities.

In some work that is underway at Berkeley, measured effects of money supply on raw agricultural product prices, retail prices of food products, and the nonfood Consumer Price Index (CPI) support overshooting. Consistent with the nonneutrality of money and raw agricultural prices being generated by flex-price markets, money supply was a more important determinant--and the associated lag endogenous variable a less important determinant--of short-run changes in raw product prices than the nonfood CPI or the index of retail food prices. We have also tested the proposition that there is a relationship between the degree of overshooting and the number of flex-price markets. To perform this test, the following three regimes were defined:

Regime 1: Fixed exchange rates and fixed nominal interest rates (pre-1973).

Regime 2: Flexible exchange rates and fixed nominal interest rates (1973 to 1979).

Regime 3: Flexible exchange rates and flexible nominal interest rates (from the fourth quarter, 1980, through 1984).

As expected, the coefficient on money in the raw-product agricultural price equation falls as we move from regime 1 to regime 2 to regime 3. In other words, for a given macroeconomic policy shock, agricultural commodity prices overshoot their eventual equilibriums more dramatically for the period 1967 through 1973 than for the later-specified periods.

Trade Effects of Unstable Macroeconomic Policies

Trade and internal agricultural policies do impinge upon the total value of trade and various degrees of competitive advantage across countries, but so do various countries' macroeconomic policies. The latter policies are reflected in three major macroeconomic variables: growth rates, real interest rates, and exchange rates. The rate of growth of income is perhaps the most important of these three variables. The growth rate of income among OECD countries is a crucial determinant of the growth rate of world trade in general and of less-developed country (LDC) exports in particular. The demand for the types of goods that LDCs produce is thought to be particularly procyclical. This is why the volumes of these exports, after the rapid growth in the 1970s, fell sharply from 1980 to 1982.

LDC export volumes responded well to the U. S. recovery that began in 1983 and spread weakly to other industrialized countries in 1984. But prices of LDC exports, which began to fall during the recession, continued a downward trend through 1985, whether measured in terms of dollars or in terms of LDC import prices. Prices of LDC exports, particularly of commodities, have remained depressed throughout the 1980s, in part because of high real-interest rates. The increase in world real-interest rates in the early 1980s, in part

a result of the shift in the U. S. mix of monetary and fiscal policy, has had three major effects on commodity-exporting LDCs. The first is a depressing effect on the price of commodity exports. The second (because much of LDC debt was either short term or floating rate) is the increase in interest rates that quickly resulted in an increase in the debt-service burden of the debtors. This was as important as the loss of export revenue during the early 1980s in the creation of increases in the current account deficit, the external debt, and the debt/export ratio. The third and final effect of higher world-interest rates is the direct effect on interest rates within each LDC because of arbitrage opportunities. For many LDCs, the magnitude of capital flows in response to interest rate differentials helps explain why local LDC interest rates eventually must adjust.

This third major macroeconomic variable, the exchange rate, is influenced not by the level of macroeconomic policies but by the differences between macroeconomic policies in the United States and other countries. The pattern of influence of movements in the exchange rate on agricultural trade is indeed complex. A number of direct effects have been captured empirically. These include price effects, cross-price effects associated with substitutable commodities, and policy-distortion effects (Nishiyama and Rausser, 1986).

If the value of the dollar were to increase by 10 percent, it would make very little difference to the importers of corn in Japan if the price of corn were to fall by an equivalent amount. In this instance, the net cost in Japanese yen to an importer of corn would remain the same. Throughout the early 1980s, however, with the rapid increase in the value of the dollar, the corresponding fall in the price of corn was not possible for U. S. origins

since support prices were at sufficiently high levels. Because of these high levels, the so-called policy distortion effect occurred. When the price of corn from other origins is not subjected to this downward rigidity and currency arbitrage conditions hold, the export demand facing the United States naturally falls.

There are a number of secondary or indirect effects of exchange rates that exert influence on agricultural trade. Combined indirect or secondary effects cause consequent changes in income and growth which, in turn, affect export demand in various countries throughout the world. First, one of these indirect effects emanates from foreign central banks' systematic intervention in exchange rate markets to influence the value of their currency. When such intervention is not sterilized, it changes money supplies of the intervening countries and, in the short run, also changes the rates of income growth. Second, a change in trade balance due to movements in the value of the exchange rate will increase growth, a part of which will be spent on imports. Third, one indirect effect focuses on wealth transfers associated with current account imbalances. Current flow payments are equivalent to wealth transfers, and such transfers require movement in interest rates to restore equilibrium in money markets. These new equilibria cause changes in investment income and (ultimately) in export demand for agricultural products.

In addition to all of the above effects of exchange rates, there can be additional effects on the debt/export ratio if the currency composition of the denomination of debt differs from the currency composition of the exports. For example, many debtor countries suffered from the sharp appreciation of the dollar when all of their debt was in dollars while a part of their exports was

in other currencies. This phenomenon occurred regardless of whether a severe shift occurred in a particular debtor country's terms of trade during the 1980s. Moreover, for this reason, the dollar appreciation has often been listed as one of the three macroeconomic shocks, along with the recession and the increase in real interest rates, that precipitated the debt crisis of 1982.

Because of inadequate domestic savings within the United States, the current and foreseeable budget deficits will continue to be a major force behind the huge trade imbalances that exist. The so-called twin-deficits problem will continue to plague the export performance of the U. S. agricultural sector. Few policymakers realize that the large budget outlays of the U. S. agricultural sector are partially responsible for the dismal trade performance of the sector. The causal flow moves from subsidization of agriculture to government budget deficits to the need of foreign countries to generate trade surpluses that will finance their capital flows into the United States. The latter flows provide the funds necessary to finance the huge credit demands within the United States that currently cannot be financed by internal savings.

Agriculture contributes to the trade imbalances not only through the current account but also through the taxpayer cost of agricultural programs. Since federal government deficits are partially responsible for current trade imbalances, the huge subsidization to the agricultural sector by the federal government has contributed to the U. S. trade deficit. This trade deficit has been the cause of some instability in nominal and real interest rates in this country as well as exchange rates. It has also contributed to political instability by providing a formal justification for protectionist trade

legislation that has been actively debated by both the House and Senate and opposed by the Reagan Administration. If this trade protection legislation is implemented, the U. S. agricultural sector will suffer immensely through further reductions in agricultural product exports. Hence, governmental expenditures in the short run may appear to support the U. S. agricultural sector but in the long run could prove to dramatically harm the sector.

PUBLIC POLICY

When the government guarantees farmers a certain price or a certain income level, it absorbs risk and eliminates some of the uncertainty faced by many in the agricultural sector. Over short periods, government policy can and has succeeded in this respect. But government behavior can also create risks by contributing to commodity market instability. After the Soviet grain deal of 1972, the absence of government-held stocks contributed to large price increases. The Food and Agriculture Act of 1977 changed commodity programs by permitting a wider fluctuation in prices. The export embargo of 1980, variations on the rules of the Farmer-Owned Reserve program since 1980 and the Payment-in-Kind (PIK) program of 1983, to name but a few major changes in government agricultural programs, make it clear that policy uncertainty can be a major contributor to private commodity market instability.

Very recently (postharvest, 1986), the major source of uncertainty in future and spot markets for nonmarketing loan-programmed commodities was the outcome of the confrontation between the Office of Management and Budget (OMB) and the U. S. Department of Agriculture (USDA). The conflict focused on the percentage of deficiency payments that could be made in the form of generic

certificates. The markets generally expected that, if 100 percent of all payments were made in generic commodity certificates, we would in effect have a marketing loan program for corn and almost a marketing loan program for wheat. Within the bowels of government, the debate between OMB and USDA revolved around the cost to the government of issuing generic certificates. Ultimately, a compromise was reached, and 50 percent of most payments were made in the form of generic commodities certificates.

The mere existence of governments is another reason why private stockholders may not store for extreme contingencies and, thus, provide needed price stabilization. History reveals that it is difficult for governments to resist taking actions that interfere with the market system during periods of shortage. This is true of all countries--even wealthy countries, formerly wealthy countries, and soon-to-be formerly wealthy countries. In effect, market failure is induced by the simple presence of government.

Market Failure Versus Government Failure

As implied by the earlier discussion in the section on internal instability, the existence of market failure is often thought to be sufficient for justifying government intervention to correct a problem. But, in addition to market failure, the effects of government failure must be considered. Government failure is the tendency of the legislative and policy implementation process to be influenced by self-interested private groups. To the extent that government intervention is captured by such groups, the public interest is not adequatey served. As a result, market failure is a necessary, but not sufficient, condition for government intervention. A sufficient

condition would be when the loss of economic efficiency in the case of the uncorrected market failure is greater than the loss under the government remedy, accounting for potential failures in the implementation of designed policies.

It must also be recognized that, over time, policies may be modified to serve political concerns. Government policy, while perhaps achieving its direct goal, may have side effects and consequences that are unintended, unanticipated, and often costly. Once it is known that the government intends to redistribute income from one group to another, specific economic groups may lobby the government in an attempt to gain these lucrative transfers for themselves. If, for instance, the government has reduced the downside risk in producing certain commodities in accordance with the model of the appendix (PERT), farmers will specialize in these commodities since they offer a less variable rate of return than was previously the case. They will then also have an economic incentive to push for the political maintenance and extension of that government program from which they benefit (PEST).

Policy outcomes may sometimes reflect the strength of lobbies behind certain proposals--lobbies which use economic resources only to obtain income transfers for themselves and not necessarily to work toward what is best for society. Once it is recognized that government is not a perfect instrument for correcting whatever market failure might exist, other corrective schemes must be considered. At a minimum, market failure considerations must be balanced with possible government failures. Replacing one uncertainty or source of instability with another does not necessarily lead to a net improvement.

Intra- Versus Intergovernmental Behavior

When one country pursues the seemingly innocent purpose of stabilizing its own agricultural markets, it inadvertently adds to the instability of international prices. Throughout the world, highly intrusive interventions exist with the express purpose of preventing the fluctuation of internal agricultural and food prices. When internal shortages or surpluses then develop, all of the necessary adjustments are made at the border through changes in international trade. By making adjustments through trade, rather than through changes in domestic production and consumption, countries are forcing their own burden of adjustment on producers and consumers abroad. They are "exporting instability" into the world's agricultural marketplace.

In essence, one country's government failure is another country's market failure. A PEST intervention in one country creates an externality affecting another country--whether through lost markets, a lower price, or greater price instability. Intervention in one country creates conditions justifying interventions in another country, thereby leading to a further retreat from any semblance of market-determined allocation.[4]

Empirical Evidence on the International Cost of Instability

One glaring example of the international cost of industrialized-country policies is the case of sugar. Neither the European Community (EC) nor the United States has been able to adjust its sugar policies to changing economic conditions. Both the EC and the United States have accepted increasing market distortions and dramatically growing economic cost. Moreover, because the United States has been dominant in the world sugar trade, the imposition of

import quotas has depressed world sugar prices. This policy and the EC sugar policy have placed a great burden of adjustment on many developing countries. One study, the World Bank's 1986 World Development Report, has estimated that sugar policies of industrialized countries cost the developing countries about $7.4 billion in lost export revenues during 1983, reduced their real income by about $2.1 billion, and increased price instability in the residual market for sugar by approximatley 25 percent.

It has been estimated that the variability of world wheat prices could be reduced by 48 percent if all countries were to end their ill-liberal wheat prices (Schiff, 1985). Tyers and Anderson (1986), using a computer model which simulates the effects of policy liberalization in more than a half-dozen different commodity markets, have calculated that the liberalization of agricultural policies of industrial countries would substantially reduce the international price variability of all major temperate zone commodities--wheat by 33 percent, coarse grains by 10 percent, rice by 19 percent, sugar by 15 percent, and dairy products by 56 percent.

Conceptually, of course, world prices could be stabilized even if most countries were to insulate their markets--as long as countries or private individuals operating in free markets had sufficiently large stocks. The size of stockpiles needed, however, increases with the number of countries which insulate their economies. One study of 14 regions found that stocks had to be eight times larger if the regions completely insulated their economies than if they instituted free trade (Johnson and Sumner, 1976). Clearly, the cost of extra stocks held indicates one source of potential grain from trade liberalization.

CONCLUDING REMARKS

The first major issue in agricultural sector stability analysis is how large the potential benefits would be from correcting whatever market failures exist. The second relates to the potential failures in the government's implementation of PERT strategies for correcting market failures. Are the costs associated with these failures sufficiently "small" to justify public policy correction of particular market failures in agriculture?

It must be explicitly recognized that sources of market incompleteness are not predetermined. Since information can be purchased and markets opened at a cost, the sources of market incompleteness must be isolated and the associated costs and benefits determined for alternative institutional designs, especially market-enhancing and nonmarket-coordinating mechanisms. Do other coordinating mechanisms or institutions exist which improve the ability to absorb risks by modifying the current risk-sharing across components of the food and agriculture system? Are private-sector coordinating mechanisms more cost effective and less prone to PEST-related activities than governmental policy intervention?

A major reason why a more comprehensive set of risk markets has not arisen within the private sector can be traced directly to heavy governmental intervention. So much of the risk is borne (or is potentially borne) by the public sector that private institutions have little incentive to manage inherent instabilities and risks.

A set of issues potentially far more important than those outlined above relates to the longer term unstable economic waves that have been observed for the U. S. agricultural sector. If the U. S. agricultural sector were only

faced with short-term instabilities, the recent crisis would not have arisen. It is far easier to design effective institutions for managing short-term instabilities. One to two years of unfavorable economic conditions can be weathered, but four or five years is quite a different matter.

History suggests that large downturns generally follow favorable economic waves. It is indeed difficult to design institutions and public policies to address both the economic upturn of the 1970s and the downturn of the 1980s. Similar waves have occurred throughout the history of the U. S. agricultural sector, e.g., the period from 1900 to 1915 versus the 1920s and 1930s. What role have each of the potential sources of instability--(1) internal, (2) external, and (3) government public policies--played in determining the form and length of the economic waves that have been experienced historically within the U. S. agricultural sector?

Appendix

INCOMPLETE MARKETS AND AGRICULTURAL POLICY

To demonstrate the implications of incomplete markets, two standard agricultural policies will be examined in this appendix. The first is the deficiency payment, or Brannan plan, which sets a target above the free-market equilibrium and pays farmers the difference between this target price (P*) and the market-clearing price (P), provided P* > P. Under this program, farmers will be presumed to choose output levels freely. The second program imposes production controls which set farmer output levels below free-market levels, thereby returning farmers a higher price for their output. The two instruments (deficiency payments and production controls) can be either combined or imposed separately. Here, we shall investigate deficiency payments both separately and in combination with production controls.[5]

Formally, consider a static, two-good economy in which the two goods are a food commodity (x) and a numeraire (y). Assume that there exists a representative (aggregate) farmer who can be characterized as follows:

1. Preferences are defined on profits and satisfy the rationality axioms of Von Neumann and Morgenstern (see Borch, 1968). The representative farmer's utility can then be represented by an expected utility function, $EU(\tilde{\pi})$, where E denotes the expectation operator over states of nature, $\tilde{\pi}$ denotes the state-dependent profit, and $U(\cdot)$ denotes the ex post utility function assumed state dependent and twice differentiable with $U' > 0$ and $U'' \leq 0$.

2. He has a production technology defined by a twice-differentiable cost function, C(z) (where cost is measured in units of the numeraire), and an output function, $x = \tilde{\theta}z$, $E(\tilde{\theta}) = 1$; z is the "expected output" choice which must be made before the state is revealed, and $\tilde{\theta}$ is a state-dependent output coefficient. Assume $C' > 0$ and $C'' > 0$. Note that the cost function, C, implicitly reflects the presence of some fixed factor of production in the agricultural sector, such as land.

3. The farmer is a pricetaker and has rational expectations in the sense that the price he expects in state σ is the equilibrium price in that state.

Assume that there exists a representative consumer whose indirect utility function is V(P, Y), where P is the price of food, Y is aggregate consumer income, and $V(\cdot)$ is a twice-differentiable, state-independent function. Assume $V_P < 0$, $V_Y > 0$, and $V_{YY} \leq 0$. Let this consumer also obey the standard rationality axioms of choice under uncertainty so that his utility can be represented by $EV(\tilde{P}, \tilde{Y})$. Further, suppose that, in the absence of taxes to pay for deficiency transfers, Y is constant across states. Finally, assume that consumers pay the full cost of the deficiency payments via a lump-sum (ex post) tax.

Suppose that there is perfectly symmetric information and that equilibrium is stable in a Walrasian sense. Further, for analytical tractability, assume that there are two equiprobable states of nature with $\theta_1 > \theta_2$; when practicable, the more general case will be examined--namely, that of states,

indexed by σ, continuous on an interval [a, b] with the production coefficient, $\theta(\sigma)$, decreasing in σ.

With this construction, farmer profits in state σ are

$$\pi_\sigma = \max(P_\sigma, P^*)\, \theta(\sigma)\, z - C(z) - s_f \tag{A-1}$$

where P_σ is the market price of food prevailing in state σ, P^* is the target price, and s_f is a fixed (nonstate-contingent) government tax. When the farmer is choosing "expected output," his utility-maximization problem can be written

$$\max_z EU[\max (P^*, P)\, \theta\, z - C(z) - s_f] \tag{A-2}$$

with first-order condition (assuming an interior solution)

$$EU\{U'[\max(P^*, P)\, \theta - C']\} = 0. \tag{A-3}$$

Clearly, the farmer's optimal z, z^*, is a function of received prices in all states, $[\max(P_\sigma, P^*)]$; the tax, s_f; and parameters of cost and utility functions. Given rational farmer expectations, market prices are determined by the equilibrium conditions (using Roy's identity and subsuming relevant parameters in the z^* function)

$$x^d(P_\sigma, Y_\sigma) \equiv -\left[\frac{V_P(P_\sigma, Y_\sigma)}{V_Y(P_\sigma, Y_\sigma)}\right] = \theta(\sigma)\, z^*\{[\max(P_\sigma, P^*)], s_f\} \tag{A-4}$$

where $x^d(\ )$ denotes consumer demand, assumed downward sloping in price,

$$Y_\sigma = Y - [P^* - \min(P_\sigma, P^*)]\, \theta(\sigma)\, z^*\{[\max(P_\sigma, P^*)], s_f\} - s_c$$

and s_c is a fixed (nonstate-contingent) government tax on consumers. Letting $[P_\sigma(P^*, s)]$, $s \equiv (s_f, s_c)$ denote the solutions to (A-4), the equilibrium producer input choice, $z^{**}(\ )$, can be represented as a function of P^* and s alone[6]

$$(A\text{-}5) \qquad z^{**}(P^*, s) \equiv z^*(\{\max[P_\sigma(P^*, s), P^*]\}, s).$$

Note that structural parameters are also subsumed in the z^{**} function.

Deficiency Payments

Define welfare in a conventional way as the sum of producer- and consumer-compensating variations (PS and CS, respectively). Essentially, government taxes are being selected to preserve agents' preprogram utilities, and the following welfare question is posed: Given P^* and the associated utility preserving taxes, is there a surplus in the government budget? To answer this question for the two-state setting, PS and CS are expressed implicitly in the following equations

$$(A\text{-}6a) \quad \sum_{\sigma=1}^{2} .5\left\{V\left[P_\sigma(P^*),\ Y - \{P^* - \min[P^*, P_\sigma(P^*)]\} \cdot \theta_\sigma\ z^{**}(P^*) - CS\right]\right\} = \bar{V}^{ce}$$

$$(A\text{-}6b) \quad \sum_{\sigma=1}^{2} .5\left(U\{\max[P^*, P_\sigma(P^*)]\ \theta_\sigma\ z^{**}(P^*) - C[z^{**}(P^*)] - PS\}\right) = \bar{U}^{ce}$$

where $\bar{V}^{ce}$ and $\bar{U}^{ce}$ denote no-program, competitive equilibrium utilities of the two agents and where prices and outputs represent compensated equilibrium outcomes. Differentiating and summing for the case of $P^* < P_2$

$$\frac{dW}{dP^*} = \frac{dCS}{dP^*} + \frac{dPS}{dP^*} = .5 \left\{ \theta_1 \; z^{**}(P^*) \left[\frac{U_1'}{E(U')} - \frac{V_{1Y}}{E(V_Y)} \right] \right.$$

(A-7)

$$\left. + \theta_2 \; z^{**}(P^*) \left[\frac{U_2'}{E(U')} - \frac{V_{2Y}}{E(V_Y)} \right] \left[\frac{dP_2}{dP^*} \right] - \left[\frac{V_{1Y}}{E(V_Y)} \; (P^* - P_1) \; \theta_1 \right] \left[\frac{dz^{**}}{dP^*} \right] \right\}.$$

This last equation gives rise to:

Proposition 1:

If $dP_2/dP^* \leq 0$ at $P^* = P_1^{ce}$, then a sufficient condition for the existence of a welfare-improving target price is that the following inequality be satisfied at the no-program competitive equilibrium.

(A-8) $$MRS_{consumer} = \frac{V_{1Y}}{V_{2Y}} < \frac{U_1'}{U_2'} = MRS_{farmer}$$

where MRS denotes the marginal rate of substitution.

Expanding and interpreting the prior condition to this proposition yields the following corollary.

Corollary 1:

If (a) demand is price inelastic for $P \in [P_1^{ce}, P_2^{ce}]$, (b) farmers are strictly risk averse with nonincreasing absolute risk aversion, and (c) η (the income elasticity of demand) is approximately zero for $P \in [P_1^{ce}, P_2^{ce}]$, $Y_\sigma = Y(\sigma = 1, 2)$, then a positive target price, $P^* > P_1^{ce}$, will be socially optimal.[7]

Production Controls with Deficiency Payments

When production controls and deficiency payments can be jointly employed (and we are, again, in a two-state setting), the Social Welfare Function can be written as follows:

$$W(s, P^*, z^c) = \sum_{\sigma=1}^{2} .5\Big[U\{\max[P^*, P_\sigma(s, P^*, z^c)] \cdot \theta_\sigma z^c - C(z^c) - s\} + \lambda V(P_\sigma(s, P^*, z^c), Y - \{P^* - \min[P^*, P_\sigma(s, P^*, z^c)]\}\theta_\sigma z^c + s)\Big] \tag{A-9}$$

where $P_\sigma(s, P^*, z^c)$ denotes the equilibrium price in state σ.

Note that choice of z^c will be constrained by the condition $z^c \leq z^{**}(P^*, s)$, the producer's optimal choice in the absence of controls. Assuming that a positive target price is optimal, will this constraint be binding as the optimum? To answer this question, the first-order necessary conditions for the unconstrained maximization problem may be derived and analyzed to determine whether the constraint is violated.

With $P^* < P_2$, the first-order necessary conditions for the unconstrained maximization of (A-9) are as follows (after some simplification)

$$\frac{\partial W}{\partial s} = [\lambda E(V_Y) - E(U')] + .5\left(\frac{\alpha_2 \eta_2}{\gamma_2}\right)(U_2' - \gamma V_{2Y}) = 0 \tag{A-10}$$

$$\frac{\partial W}{\partial P^*} = .5\,\theta_1 z^c(U_1' - \lambda V_{1Y}) = 0 \tag{A-11}$$

$$\frac{\partial W}{\partial z^c} = E\{U'[\max(P^*, P)\,\theta - C']\} + \left(\frac{\theta_2 P_2}{\gamma_2}\right)(\lambda V_{2Y} - U_2') - \lambda V_{1Y}(P^* - P_1)\,\theta_1 = 0. \tag{A-12}$$

Now consider (A-12). The first term is the partial derivative of farmer-expected utility with respect to ex ante output; if positive, production (z^C) is less than the farmer would choose in the absence of control and the constraint will not be binding. Hence, given that (A-12) is satisfied, a necessary and sufficient condition for production controls to be optimal is that the sum of the second and third terms be negative. A sufficient condition is that one term be negative and the other nonpositive. Since $P^* > P_1$ by the assumption that a positive target price is optimal, the third term is negative and, therefore, the sufficient condition reduces to the nonpositivity of the second term. A little manipulation of conditions (A-10) and (A-11) reveals that this term must be zero; specifically, solving of λ from (A-11), substituting into (A-10), and rewriting gives

$$.5\, U_1' \left[1 - \left(\frac{\alpha_2 \eta_2}{\gamma_2}\right)\right]\left[\left(\frac{V_{2Y}}{V_{1Y}}\right) - \left(\frac{U_2'}{U_1'}\right)\right] = 0, \tag{A-10'}$$

$$\lambda = \frac{U_1'}{V_{1Y}} = \frac{U_2'}{V_{2Y}}.$$

Equations (A-10') and (A-12) not only imply that $E\{U'[\max(P^*, P)\,\theta - C']\} > 0$, they are also equivalent to the conditions for a full Pareto optimum, namely, $E[U'(P\,\theta - C')] = 0$ and $(V_{1Y}/V_{2Y}) = (U_1'/U_2')$. It is easily verified that all of these conclusions carry over to the case of $P^* > P_2$ (and of unequal state probabilities), thus proving the following proposition.

Proof: If the participation constraint is not binding, a production control is optimal by supposition. Now, suppose that the constraint is binding and a production control is not optimal. Participation in the deficiency-payment/production-control program then costs farmers nothing and gives them the benefit of the target-price/deficiency payment; therefore, they will choose to participate, and the constraint will not be binding--a contradiction.

Proposition 2:

In a two-state world, production controls will be an optimal complementary policy to deficiency payments whenever deficiency payments are socially desirable. Further, in this setting, the optimal deficiency-payment/production-control program will yield a full Pareto optimum.

In the above analysis, production controls are treated without regard to the willingness of farmers to restrain their output. When these controls are not linked to any other policy, this is a necessary abstraction. However, when both deficiency payments and output control policies are pursued, entitlement to a target price can be linked to output constraints. In this case, assuming government cannot impose controls, an additional constraint is added to the welfare-maximization problem--namely, that, given prevailing market prices with full farmer participation in the deficiency-payments/production-control program, farmers prefer participation (i.e., receipt of the target price in low-price states in exchange for output control) to nonparticipation (i.e., receipt of market prices without control). Though this constraint may bind the government planner's choice of z^C, the following proposition demonstrates that it will not alter the implications of the above discussion with respect to the optimality of some production control.

Proposition 3:

If a joint deficiency-payment/production-control policy is socially optimal when the government planner does not face a voluntary participation constraint, some production control will also be an optimal complement to the deficiency payment when the planner does face a voluntary participation restraint.

Footnotes

[1]Robert Gordon Sproul Distinguished Chair Professor, Department of Agricultural and Resource Economics, University of California at Berkeley.

[2]The recognition of additional markets, portfolio analyses (more formally, capital asset-pricing models), the size of the agricultural sector relative to the total economy, and various market imperfections support the view that the risks within the agricultural sector are not totally diversifiable.

[3]If overshooting does occur, inefficiencies do not arise if all agents have formed their expectations rationally in terms of the long-run equilibrium. If money is neutral in the long run and agents form their expectations in accordance with this long-run equilibrium, then, even though overshooting can occur, it will not lead to any "externalities" which will generate misallocations of resouces.

[4]This strategic interdependence of policy creates a natural gravitation toward a prisoner's dilemma in the reform of agricultural trade. The rewards for unilateral reform are slight (as compared to the domestic political costs) when viewed beside the possible gains from multilateral reform. The incentive structure currently dictates the compounding of public policy interventions to retain markets in the face of distortions generated by other countries.

[5]A more comprehensive treatment, including other policy instruments, is available in Innes and Rausser (1987).

[6]The $[P_\sigma(P^*, s)]$ will be assumed existent, unique, continuous everywhere, and differentiable at all points other than where $P^* = P_2(P^*, s)$. (At the latter points, the functional relationship between P^* and farmer first-order conditions changes.) These assumptions imply that $z^{**}(P^*, s)$ is continuous everywhere and is differentiable at all points other than $\bar{P}_s^*$ which

satisfy $\bar{P}^*_s = P_2(\bar{P}^*_s, s)$. [Twice differentiability of U and C implies (from the implicit function theorem) that z* is a differentiable function of its arguments. Thus, the continuous and composite mapping theorems (Marsden, 1974, pp. 84 and 168) imply these properties of z**(P*, s).]

[7]Complete development and proofs of Proposition 1 and Corollary 1 may be found in Innes (1986).

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