RETHINKING GRAIN PRICE STABILIZATION:
THE PHILIPPINE CASE

by

James A. Roumasset

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ABSTRACT

The welfare effects of grain price stabilization depend on the stabilization instrument and the source of instability. If the source is international market price instability, then even an omniscient (perfect forecasting) and omnipotent (zero storage costs) government cannot increase welfare by price stabilization. Stabilization agencies should be downsized and converted to market integration and competitiveness enhancing agencies. In this way, international prices stabilize against domestic disturbances, and the remaining instability is welfare increasing.
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In light of the renewed controversy about the appropriate role of government in promoting economic development, the question of price stabilization warrants closer scrutiny. In particular, several governments of both developing and developed countries have empowered one or more government agencies to increase the stability of grain prices (e.g. the National Food Authority, NFA, of the Philippines). The typical stabilization objectives can be summarized as follows.

1. To increase prices received by producers when prevailing market prices are unacceptably low.

2. To decrease prices paid by consumers when prices are unacceptably high.

It is taken for granted that these objectives are best achieved by stabilizing grain prices. Three specific types of stabilization are pursued:

1. Insulate the domestic price from fluctuations in the world price.

2. Insulate producer and consumer prices from domestic shocks to supply and demand.

3. Protect the consumer and producer from speculative attacks by middlemen, unscrupulous or otherwise.
Welfare Effects of Stabilization

Research on the effects of stabilization policy, however, has established that attempts to stabilize prices are likely to make both consumers and producers worse off. Moreover, the economic and welfare effects of stabilization depend completely on the particular instrument of stabilization and the source of instability. Seemingly small changes in specification can lead to large differences in the consequences of stabilization policy (Williams and Wright, 1991, ch.12).

Consider the case of a buffer-stock designed to offset the effects of world price instability on the domestic price. Even if the scheme were completely successful in stabilizing the price at the mean value of world price, both consumers and producers would lose. Consumers lose less from high prices than they gain from low prices by adjusting their consumption accordingly (Waugh, 1944). Similarly producers gain more from high prices than they lose at low prices. Even allowing for risk aversion it is extremely unlikely that this form of stabilization would yield positive benefits. Moreover, operating a buffer stock program that must store grain for an entire year or more is extremely costly and in all cases in excess of the real rate of interest. Finally, the apparent symmetry of buffer stock programs is misleading. Even if the stabilizing agency has an unlimited budget and storage capacity, there is always a finite probability that whatever stocks have been accumulated in the past will be inadequate for preventing the price from rising during lean years. That is even if the government has sufficient resources to prevent price from falling, it cannot always prevent the price from rising. Taking this factor into consideration leads to the result that buffer stocks may be destabilizing (Williams and Wright, 1991). In sum, the stabilization scheme will have negative benefits and high costs.
A more favorable scenario arises in a closed economy wherein a stochastic supply is the source of instability. In this case, if storage is costless and the stabilizing agency has perfect foresight, then stabilization can lead to welfare gains. A simple demonstration of this result can be obtained by graphing high and low linear supply curves that are assumed to alternate in odd and even years. By stabilizing the price at its mean level, the agency procures additional grain when supply is high and sells it to the next year when supply is low. Since in reality the agency is not omniscient about future supply, however, and since supply is random, not strictly alternating in odd and even years, the government will have to peg the price at something above the mean price, accumulate more in times of plenty, and deplete less in times of shortage. This will lower the probability that stocks will eventually be exhausted during times of rising prices. But pegging the price at the higher level has the effect of wiping out the gains from stabilization that occur in the contrived example described above. In addition, two problems remain. There is still the possibility that stocks will be exhausted and price will move above its pegged level. Also the irregularity and varying severity of bad years implies that the average inventory period will be longer than the one-year in the hypothetical example so that when storage costs are allowed for, they rise relative to the previous case. Again the conclusion emerges that the buffer scheme has high costs and is likely to have negative welfare gains.

Buffer-supported price band schemes are typically even more inefficient than price floor or price peg programs. The price band, like the peg, is inherently asymmetrical. With sufficient resources, the government may be able to prevent price from falling but it cannot always prevent price from rising. A price band scheme also incurs additional storage costs. Simply put, the problem is that the agency acquires grains at the floor price and then must wait until the price rises to the ceiling until the stocks can be released. That is likely to be a long wait, and storage costs (interest plus depreciation, plus grain lost in storage) are highly time sensitive. It would be much less costly to release the grains at a
lower ceiling price, in the limit at the price floor. That is, the optimal wedge between price floor and ceiling is likely to be zero (see Williams and Wright, chapter 14).

**Subsidies, Rent-seeking, and Disincentives to Private Storage**

So far, we have assumed that the agency always executes the stabilization strategy flawlessly. Many other actions can be taken by the stabilization agency that will make matters worse. If the agency simply buys when price is unusually low and sells when price is unusually high, then it does not need an annual budget. A small loan would suffice to begin operations, and the price margin would be roughly sufficient to cover costs of shipping, handling, and storage. For example, even though the NFA is granted a hefty annual budget (₱1.7 billion), consumer and producer subsidies, combined with inefficient operations, have resulted in a debt of ₱5 billion. NFA buys higher and sells lower than market price. For a given annual budget, the greater the subsidies to producers and consumers, the less the agency can buy and sell. In most developing countries, the agency operates with a budget that is small relative to the price targets. These is no reason to think that limited subsidy operations have more than a negligible effect on the market clearing price. They do not change the underlying fundamentals of demand and supply (based on marginal private benefits and costs) and are primarily inframarginal. In effect, privileged consumers and producers are given entitlement to buy and sell limited quantities at subsidized prices. These entitlement are equivalent to income transfers; aside from income effects, they do not influence the total amount bought and sold. The same results could be achieved much more cheaply simply by giving money to producers and consumers directly.

Balisacan et al. have noted that only 10% of farmers and 2% of consumers receive NFA subsidies. To the extent that NFA has a very limited effect on market clearing prices
and in effect provides only inframarginal transfers, a cheaper scheme would be to issue lottery tickets to buyers and sellers of grain and award price premiums to 10% of the farmers and 2% of the consumers. This scheme would save 75% of the NFA budget and also economize on the lobbying and political patronage activities ("rent-seeking") that otherwise determine who receives the subsidies and who does not.

A grains stabilization/subsidy scheme such as just described will also tend to amplify rather than dampen free-market price fluctuations. Consider first the case wherein the buy-and-sell operations of the public grain marketing agency are fully predictable. Since the agency buys higher and sells lower than the market, its operations will dominate and simply replace private storage on a one-for-one basis. In actual fact, things are even worse still. Due to budget uncertainties, conflict among the multiple objectives, and incentive problems inherent in the agency, the stabilization agency often further destabilizes price by buying at the wrong times and in the wrong places (Balisacan, Clarete, and Cortez, 1992). Moreover, these mistakes are not predictable. If a potential investor knew for example that NFA would continue concentrating its Mindanao corn-buying operations in Cagayan de Oro, he might construct a warehouse in Bukidnon or further into the Mindanao interior in order to buy grain after harvest (e.g. in September and February) and sell it before harvest when prices peak (e.g. April). The risk that NFA may commence operations in that area, however, may be sufficient to dissuade him from making the investment.

The timing and location of stabilization operations contain further perversities. When consumer prices are abnormally high, the stabilization agency will face pressures to release stocks at controlled prices. This will typically result in the need to purchase additional stocks which may induce speculative hoarding and drive market price even higher. Similarly while a textbook stabilization agency would buy and sell in surplus and deficit parts of the hinterlands, where prices are furthest from the price band or peg, NFA
concentrate its operations in the cities. These distortions should not be regarded as historical accidents of the Philippine case. They are, rather, the result of unattainable objectives which render the stabilization agency as a black hole for government spending and the attempts of the agency to cut its losses.

Matching Instruments to Objectives

Since buffer stocks are not appropriate for insulating domestic prices from international price fluctuations, what would be a more appropriate instrument? One possibility is to use a variable import tariff that exactly offsets any changes in international price. For example, if the government wants to prevent the landed price of corn in Manila from falling below ₱5/kg, they would simply impose a ₱1/kg tariff for every ₱1 that the world price falls below the ₱5 target. The variable import levy can maintain domestic price at the pegged level no matter how far below that level the world price falls. If world price rises above the peg, then an import subsidy can be used to lower domestic down to the peg.

Equivalently, the levy or subsidy can be expressed as a percentage of value. The percentage approach has the disadvantage, however, of providing worse stabilization when the government makes errors in forecasting the world price or if it is sluggish in changing the prevailing tariff. A constant percentage (ad valorem) tariff is equivalent to a variable but destabilizing specific tariff.

While the variable tariff is vastly superior to buffer stocks as a stabilization instrument, it still is welfare reducing, at least at high levels. Marginal producers whose costs are higher than world prices are induced by tariffs to divert resources that would be better employed elsewhere in the economy. Some amount of tariff can be justified by the
fact that alternative revenue sources also cause "tax friction" (distortions in economic incentives) but high tariffs are likely to be more distortionary than direct taxation (e.g. of personal and corporate incomes).

A partial and definitely welfare improving step towards trade liberalization can be achieved by replacing quantitative restrictions with tariffs that result in the equivalent protection of domestic producers. David (1992) estimates that in the Philippine case, an initial tariff on corn of 75%, to be gradually reduced to 50%, by 1996 would provide more than adequate protection to corn farmers relative to the effective protection afforded by quantitative controls.

Even assuming that a 50% would increase imports, the primary effect of imports would be to replace some of the corn shipped to Manila from Mindanao and stored until the lean period when seasonal prices are high (around March). A Mindanao farmer would benefit much more from better infrastructure than higher tariffs. Suppose, for example, that quantitative restrictions that allow the landed Manila price to rise to ₱7/kg in March are replaced by a high tariff that causes the landed domestic price to be ₱8/kg. After subtracting ₱3 for transportation, ₱1.50 for storage (5 1/2 months) and ₱1.20 for handling and other expenses, a farmer in the Mindanao interior receives ₱2.30/kg. Suppose instead that the government sets the tariff to cap domestic price at ₱6.50/kg, which lowers the marginal storage cost to ₱.55/kg by lowering storage time, and also cuts transportation costs in half by improving infrastructure. In this case the farmer receives ₱6.50 - ₱1.2 - ₱.55 - ₱1.50 = ₱3.25. That is, lower tariffs, which are more favorable to consumers and to the livestock/poultry sector, if combined with infrastructure improvement, can leave the farmer substantially better off.

Consider now the use of buffer stocks to insulate against price instability caused by fluctuations in domestic supply. Storage is extremely costly and wasteful. In the
biblical times of Joseph, storage against famine may have been warranted. In modern times, trade renders storage in good years as insurance against bad years unnecessary. Storage is only needed within years, e.g. from one harvest to the next, in order to smooth irregularities in production to match the more regular demand. The higher tariffs are raised, the more that inefficient storage will be substituted for trade, and increased farmer rents will be largely dissipated.

While buffer stocks are also inappropriate for stabilizing against domestic shocks to supply, international trade is ideal for that purpose. Placing quantitative restrictions on imports and exports directly undermines trade as an automatic stabilizer. The same is true of trade within a country. To the extent that supply fluctuations in different areas of the country are not perfectly correlated, trade between regions is a stabilizing force. Since better transportation and communication facilities enhance trade, these infrastructure improvements will tend to stabilize price. More importantly, by lowering the margin between producer and consumer prices, infrastructure improvements increase producer prices and decrease producer prices.

While international trade can stabilize against annual and seasonal fluctuations, regional fluctuations still remain. Transportation costs act like a price band around the price at the dominant market center. If the producer-to-consumer chain always passed through the same market center, then the ceiling of the regional price band would be determined by the market center price plus shipping and handling costs to the region; the price floor would be given by the central price plus shipping and handling from the region to the center (e.g. Manila). Regional prices are free to fluctuate within the shipping and handling band. As infrastructure improves, the regional bands converge on the central price and regional fluctuations correspondingly decline.
We are left with monopolistic price-fixing and speculation as sources of unacceptably high and low consumer and producer prices. If speculation is defined as the attempt to buy low and sell high, it is inherently stabilizing since it raises low prices and decreases high ones. While speculative bubbles of the type associated with financial assets are theoretically possible they can only be mild and short-lived. Firstly, storage is expensive with costs equal to the rental of the storage space plus shrinkage plus the rate of interest. Moreover, any speculative bubble would have to burst by harvest time. Since traders know that, they also know that the bubble must collapse the period before harvest since traders will be disposing of stocks. That in turn leads to even earlier disposal and so on.

The more serious possibility is that traders may from time to time find themselves in a temporary monopoly or monopsony position which they may try to take advantage of. Of all the reasons for state intervention into grain trading, this one is the most legitimate. Indeed, if there is any case to be made for NFA type operations, this is it. But monopoly regulation does not call for government owned trucks and warehouses and a large bureaucracy. The most potent monopoly-busting activity is coordination -- providing information and otherwise enabling individuals to make mutually beneficial trades, thereby promoting competition.

The focus of monopoly regulation and coordination should be the margin between farm gate and retail prices of grains. Margins that exceed reasonable costs of shipping, handling, and storage are prima facie evidence of barriers to entry and insufficient competitiveness.

NFA and similar agencies in other countries should either be disbanded or totally restructured as a grains marketing competitiveness council. The council's main responsibility would be to facilitate the negotiation and execution of grain marketing
agreements between diverse parties by lowering the costs of transportation, communication, and enforcement. The council would not need to own their own transportation and storage facilities since their primary function would be to facilitate trades within the private sector. On rare occasions when collusion results in monopoly or monopsony profits and the council is unable to facilitate deals outside of the cartel, it may decide to directly contract for the purchase and/or sale of grains directly. For example, if the councils' monitoring instruments revealed that a cartel was holding prices in a certain area substantially above competitive levels, it could purchase grain in another area and release it in the cartels' domain. This still would not require government owned equipment -- contracting capability would suffice. Such competitiveness activities have an automatic performance indicator. If the council is efficient at contracting, and if they act only when monopoly rents exist, they will make a profit. A government run competitiveness council would only make sense, however, if government has a comparative advantage in acting against the cartel (e.g. if private competitors would be punished).

Privatization of Grain Marketing

One proposal to take up the slack of an abolished or scaled-down public grain stabilization industry is to allow producers' cooperatives to lease public storage facilities, to buy directly from farmers, and to sell to rice traders or other points in the marketing chain as they may choose. Under some proposals cooperatives would also be able to borrow at favorable terms (e.g. from the Land Bank) and avail of the usual tax-free status of cooperatives.¹

¹ In reference to one such proposal, Balisacan et. al. (1992) state that “the proposal to develop marketing cooperatives among farmers is...bound to fail.” They point out that the multilayered marketing structure is evidence that further investments in transportation and communication are needed, not that marketing is inefficient given the existing constraints.
Despite the apparent successes of selected cooperatives (e.g. DAFEDACO), a federation of rice producer cooperatives in the province of Davao del Norte, obtained higher prices from 20% of farm sales, compared to approximately 8% for NFA, producer cooperatives should not be regarded as a panacea for farmers. First, farmers do not have comparable management expertise in grain marketing relative to grain traders and millers. Second, cooperatives are inherently political. They are likely to engage in favoritism, to fragment into smaller groups and to engage in political activities. To the extent that producer cooperatives are subsidized by low-interest rate loans, low warehouse leases, and tax-free privileges, they are likely to partially replace private traders with a corresponding loss of efficiency and management expertise. Even though the marketing subsidies would lead to an overall expansion of marketing services (i.e. private trader services would contract less than cooperative services would expand) in the short run, there would most likely be a slowdown in technological change and a corresponding loss in dynamic efficiency. Agricultural development is led more than anything else by an increase in specialization and exchange, and that process is led by the increasing productivity of the marketing sector in enhancing coordination. Cooperative policy should therefore be crafted so as to promote the evolution of diverse marketing institutions, not by picking the winners and top-down design but by the creative evolution fostered under free-entry and supportive public policies.

One way to avoid penalizing the private trading sector is to allow them to avail of some of the marketing subsidies offered to producer cooperatives. In particular, private traders should be allowed to compete with government subsidized producer cooperatives for the right to lease public storage facilities. Private traders should also be allowed to avail of Land Bank loans for expanded marketing operations provided that certain requirements are satisfied. For example, the total equity holdings by traders could be constrained to be less than 50%, with the remainder of stocks held by farmers and
possibly consumer interest (e.g. retailers). Since these marketing organizations would be profit-making, they would not have tax-free status and still be at a partial disadvantage relative to the full-fledged cooperatives.

Rather than overdesign the producer cooperative structure by trying to predetermine optional membership etc., the cooperative marketing policy dialogue should focus on formulating the rules for auctioning the public warehouses and/or leases, the necessary qualifications for applying for a Land Bank marketing loan, the requirements for maintaining tax-free status as a cooperative, and mechanisms for managerial and technical assistance.

**Price Bands Without Inventory**

As noted above, international trade can prevent price fluctuations that would otherwise be induced by fluctuating domestic supply. To the extent that domestic price instability is induced by fluctuations in the international price itself, an importing country such as the Philippines can stabilize price by a variable tariff/subsidy scheme that simply adds to or subtracts from world price until it equals the price peg.

Alternatively, and less welfare-reducing, price can be stabilized within a band of specific width. In this case, the variable levy can be used to defend the price minimum and the subsidy can be used to prevent domestic price from rising above the maximum. This is illustrated in figure 1a. In case the price ceiling is high enough to permit exports, it can be defended by an export tax (see figure 1b).

Figure 2 illustrates a more general case wherein both domestic supply and world price are potential sources of instability. The price ceiling is maintained by either an import subsidy or an export tax depending on whether supply is low ($S_L$) or high ($S_H$).
Figure 2: Import subsidy and export tax for ceiling; import tariff and export subsidy for floor.
The floor is likewise maintained by either an import levy or an export subsidy. Enabling legislation does not have to spell out these contingencies, however. It suffices to specify only that imports at world prices, $P_W$, above $P_C$ and below $P_F$ will be subsidized (taxed) by the amount $P_W - P_C (P_F - P_W)$ and that exports above $P_C$ and below $P_F$ will be taxed (subsidized) by the amount $P_W - P_C (P_F - P_W)$.

In summary, a price ceiling can be maintained by either an import subsidy or an export tax, depending on whether the ceiling lies in the zone of importation or exportation. Similarly, a price floor can be maintained by an import tariff or an export subsidy.

**Introducing Domestic Transportation Costs: The North-South Issue**

The discussion thus far has rested on the conventional framework wherein domestic transportation costs are ignored. In that framework, either exports, imports or both would be zero. Once transportation costs enter the picture, however, simultaneous exports and imports are possible. In the case of the Philippines, for example, Balisacan et al. (1992) note that it would be cheaper to export corn grown in the Southern Island of Mindanao to the world market than to ship it to the Northern port of Manila. However, so long as the transportation and handling costs from South to North are less than the difference between the c.i.f. price in the North and the f.o.b. price in the South, it will still be more efficient for the North to import from the South than for the South and North to export to and import from the world market. This situation is illustrated in figure 3, which assumes a P3.75/kg world price, e.g. in Thailand, a P.75 shipping and handling fee to and from the Philippines, and a P1.00 shipping and handling fee from North to South. In equilibrium, the North satisfies part of its excess demand from world imports at the c.i.f. price of P4.50/kg and the South receives P3.50/kg for its excess supply, all of which is shipped to the North.
Figure 3: Equilibrium in the North and South when c.i.f.-f.o.b. differential is larger than North-South trading costs.
Now suppose that the government is committed to a Manila ceiling price of P5.00/kg. If world price rises above P4.25, then an import-subsidy equal to world price minus P4.25 will be sufficient to maintain the P5.00 c.i.f. Manila price. Notice, however, that if world price rises above P4.75, Southern exporters would prefer exporting to the world market. To prevent such inefficient cross-shipping, a South to North subsidy should be imposed equal to the difference between c.i.f. - f.o.b. world prices and the South-to-North trading cost. The South-to-North subsidy, in this case equal to P.50/kg, is only needed when world price rises enough to make cross shipping attractive. More simply, the import subsidy to the North can be extended to shipments from the South as well as those from foreign ports. In this way Northern imports will automatically come from the cheapest source and inefficient cross-shipping will not arise. In addition, an export tax equal to world price - P5.75 is needed to maintain a P5.00/kg Manila price in the event that world price rises above P5.75/kg.

Suppose also that the government is committed to a floor price on the Southern port (e.g. Cagayan de Oro) equal to P3.00/kg. So long as world price remains above P3.25, the Southern port price, world price + import cost - South-to-North cost will automatically satisfy the lower bound constraint. If world price falls below P3.25/kg, however, an import tariff equal to P3.25/kg minus world price will be needed to sufficiently restrict imports. (Recall however, that the welfare foregone by consumers in paying the higher prices will exceed that gained by producers.)

In summary, a price ceiling can be maintained by an import subsidy/export tax scheme, only one of which will be needed at a given point in time. The import subsidy should be imposed on all imports to the North, including those from the South. This will avoid inefficient cross-shipping. The produce price floor can be similarly implemented by a variable import tariff.
It would be argued that the f.o.b. price net of shipping and handling costs could be profitably increased by public investments in infrastructure such as bulk storage and handling and port facilities. If this is true it is likely that investments in South to North transport would be at least as profitable.

While the variable import levy puts a floor on the c.i.f. Manila price, farmers will only receive that price minus the costs of storage and shipping and handling to Manila. For farmers in Mindanao, that price may be a small fraction of the c.i.f. Manila price. An alternative mechanism to support farm gate prices is an export subsidy. Since the costs of exporting for foreign ports is lower for some farmers then exporting to Manila and also avoids the cost of storage this proposal may benefit some farmers even if the export tariff is less than the import tariff. A better use of funds, however, may be to invest directly in infrastructure support for corn exports including bulk storage and port facilities, quality control, and technical assistance. Benefit-cost analysis of these facilities would include estimates of the quantities of exports that would result from specific infrastructure support. To the extent that an objective of the program is to increase farmer incomes, these transfers can be regarded as public goods for purposes of benefit calculation. For example, P1 transferred to a target beneficiary may be counted as P1.30, if P1.30 is the cost of transfers through alternative mechanisms.

Concluding remarks

Grain price stabilization is an excellent example of what government should not try to do. Even a successful and costless program that insulates the domestic market from international price fluctuations hurts both consumers and producers more than it helps them. In particular, consumers are deprived of a large consumer surplus that occurs
during times of low prices that greatly exceeds the surplus they can gain from being insulated from high prices. Programs that attempt to restrict international trade and stabilize against fluctuations in both international prices and domestic supply are extremely costly and likely to be destabilizing to boot. Government agencies charged with stabilization objectives are a black hole for public spending and foreign aid. There is no limit to the amounts that can be spent in grain procurement and disbursement and the costs of storage transportation and handling and administration. Yet even aside from the costs, these programs are unlikely to yield positive benefits.

The best approach is to promote infrastructure, market integration and international trade so that world prices can insulate against domestic supply shocks. A liberal trade regime thus provides both protection against domestic supply fluctuations and allows consumers and producers to reap the benefits of internationally fluctuating prices. If, for some reason, world price fluctuations are politically unacceptable then a variable import levy/export tax is the preferred instrument of stabilization, not buffer stocks. It is well known that quotas and tariffs that protect domestic producers against international competition simply allow inefficient producers and high cost methods of production. The Philippine case illustrates a particular kind of cost increase --- namely the substitution of storage and shipment from a surplus to deficit region for international trade. The extra transportation and specially storage costs thus incurred are thereby dissipated. It should not be thought that somehow farmers in the hinterland of Mindanao are benefited from this protection. Once the excessive storage and transportation costs are subtracted from the market price, these farmers are still stuck with only subsistence levels of income. On the other hand, these farmers would benefit from a combination of trade liberalization and transportation infrastructure which would allow them to obtain farm gate prices that more closely approach prevailing world prices.
Appendix: Methodology for Policy Analysis

The first step in building a model for policy simulations is to replicate the analysis above along with specific production functions, transportation costs and number of hectares in each category. One can then simulate the consequences of the price band policy for fluctuating world prices and stochastic North and South supply curves. Of particular interest are the different producer and consumer prices in different regions and the welfare effects on both consumers and producers.

Next, one can introduce seasonality and storage into the analysis. As a first approximation, harvest time can be taken as exogenous. Storage costs are readily available and can be calculated as warehouse rental fees + shrinkage costs + interest foregone. To be in equilibrium, storage in a particular region is increased until the marginal cost of providing grain through storage equals the marginal cost of importing grain. In a region such as Bicol, where grain is exported during harvest time and imported during lean months, grain will be stored until the marginal cost increases to the point that storage cost equals the cost of exporting and later importing at a higher price. (Note that the Bicol result requires lower storage costs in Manila and/or a higher discount rate in Bicol.)

In general, storage is a rather inefficient substitute for transportation. If climate is such that regions and countries can be classified according to the months when they have a comparative advantage in exporting, then trade among regions and countries can smooth irregular supply and demand. For example, to the extent that March is a lean month and the costs of providing March corn through the device of storage is expensive, it is likely to be more efficient to import corn during that period.
Since it is clearly inefficient to store grain for more than one year, intertemporal optimization can be avoided by assuming that grain stores are always exhausted immediately before the peak annual harvest begins.

The central equilibrium condition for the model is that the cost of producing corn in a certain time and place is equal across locations and times. Thus at the margin, the cost of producing February corn for Manila is the same in both Isabela and Bukidnon at the point of maximum storage.

The marginal producer in this model earns zero rents for grain production. When government changes the price support policy, the marginal producer still earns zero rent. It is the intramarginal producers who are affected. For example, if the Manila price is ₱4/kg, transportation costs are ₱2.20 and storage costs are ₱.80, then the farmer receives only ₱1.

The model can be used to compare the welfare consequences of alternative policies. The model would be particularly useful to dramatize the superiority of infrastructure improvements which lower the wedge between market destination, prices, and farm gate prices relative to policies which regulate prices in the market center. The model could also be used to compare government storage and import/export tax and levy schemes as alternative instruments for implementing price bands. The latter comparison could be accomplished by Monte Carlo simulations of fluctuating world prices and domestic supplies.
References


