

# Analysing Public Intervention in the Foodgrains Markets\*

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## I. Introduction

Government intervention in setting or influencing agricultural prices is so pervasive throughout the world that this fact alone evokes little surprise. What is perhaps more noteworthy of the Indian case is the continuity and stability of policies towards foodgrains markets in spite of changes in the economy and polity. The pressure to rethink food policy, however, has probably never been greater. Apart from the disquiet over the efficacy of existing policies, the dismantling of bureaucratic controls witnessed since 1991 in industry, trade and finance has led many observers to demand the same for agriculture in general and foodgrains markets in particular.

In this paper, we provide a perspective on the analysis of public intervention in the Indian food economy. As we see it, the task of policy evaluation is twofold. First, we need a mapping from the

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policy regime to market outcomes (e.g., the level and variability of food prices, incomes of consumers). Clearly, normative statements are not involved in this part of the exercise, which is purely analytical. Second, market outcomes have to be evaluated according to a social welfare function. Disagreement is to be expected about the appropriate social welfare function. We take efficiency and equity to be the criteria for evaluating market outcomes. The merit of such a perspective is that we are compelled to take into account the opportunity cost of public intervention, which is invariably the market outcome. This is clearly relevant for assessing the optimal division between public and private activity in the foodgrains sector. For instance, we would take the view that policies that serve neither equity nor efficiency should be junked without much ado.

The focus of this paper is, however, not so much on the normative aspects, as on the modelling of the foodgrains market. Market outcomes, depend, not only on the characteristics of the policy regime but also on the behaviour of private agents (producers, traders and consumers) which in turn is governed by their incentives and constraints. Essential to policy analysis, therefore, is modelling the behaviour of private agents to make it consistent with the available evidence. In our view, this aspect of research does not always receive enough attention in much of food policy analysis in India. In this paper, we provide examples, based predominantly on our research, where better understanding of the environment for private agent decision-making has large payoffs for policy design. The policy interventions and the institutions through which they are effected are not described here, as such detail is available elsewhere.<sup>1</sup>

## II. Procurement

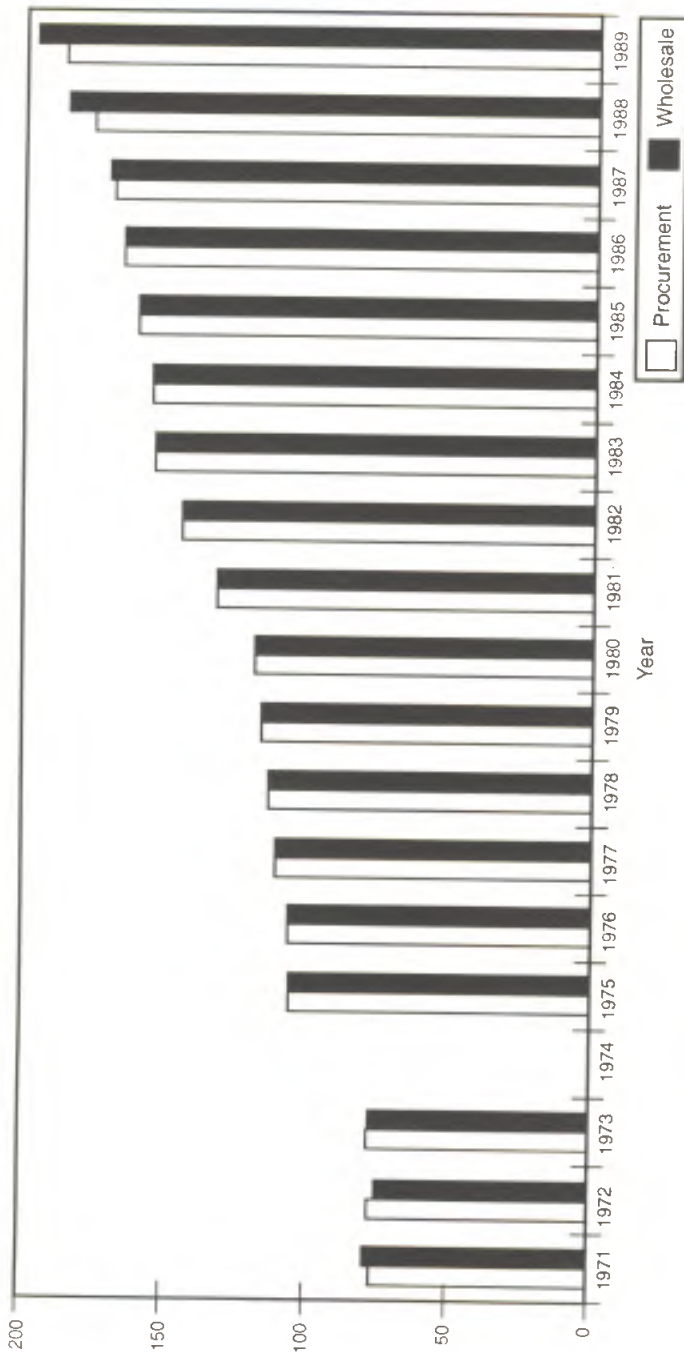
A distinctive feature of agricultural markets is that while production occurs at discrete points in time, consumption is continuous throughout a year. This is made possible by storage or by carrying supplies across time. As real resources are expended in the activity of storage, agricultural prices exhibit a seasonal pattern with the lows occurring at harvest time and the highs at non-harvest periods. In the wheat market, for instance, prices are lowest during the months of April, May and June (when the annual harvest

comes in) and at their peak during the months of January, February and March of the following year (when supplies are at their lowest).

While these facts are well known, their significance has not been explicitly recognised in most foodgrains market models. As a case in point, consider the models of procurement in the literature. Following Krishna and Raychaudhuri (1980), the usual practice is to specify procurement as an increasing function of output and the procurement price relative to an annual average market price (Krishna and Chhibber, 1983; Gulati and Sharma, 1990; Kahlon and Tyagi, 1983). However, such a model does not explain how, in the absence of a compulsory levy, wheat procurement occurs at all, for the annual average market price has systematically exceeded the procurement price. A coherent story can, however, be told if the seasonality of wheat prices is taken into account.

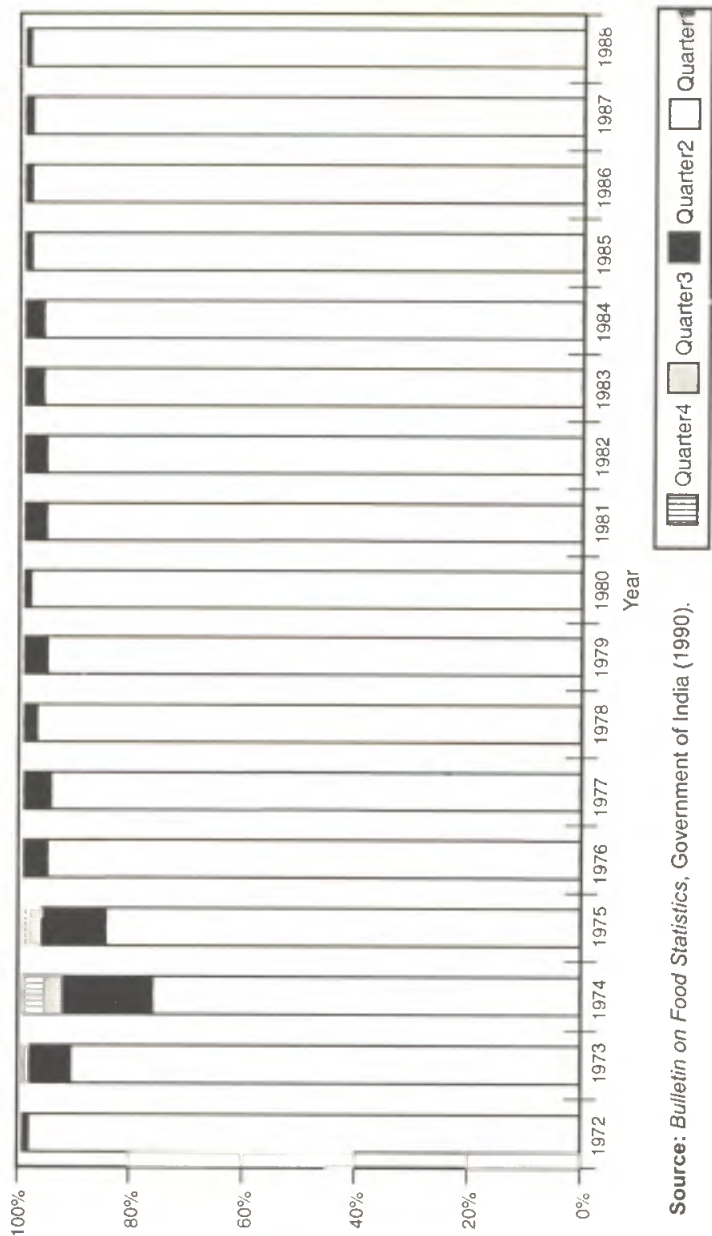
As is well known, the government procures wheat at the procurement price announced before the arrival of the annual harvest in April. It is also known that wheat sales to the government are largely voluntary (among others, see for instance, Dantwala (1993) and Krishna and Chhibber [1983]).<sup>2</sup> But this means that for procurement to be effective, the procurement price cannot be less than the market price. It has also been noted by others that although the government is not committed to buying everything it is offered at the procurement price, in practice it has worked in that way. As a result, procurement price is usually not greater than market price. Thus, we expect that whenever procurement is positive, the procurement price is quite close, if not identical to, the market price. The argument is confirmed in Figure 4.1 which compares the procurement price to the average first quarter price (April–June) in a major wholesale market for wheat. The market price, however, does not remain at the level of procurement price for the whole year. At some point, the costs of storage hike the market price to levels above the procurement price as the usual seasonal pattern of wheat prices asserts itself. Once this happens, farmers stop selling to the government. Consequently, procurement will occur in the early months of the marketing year, such as the first quarter (April–June), when it is more likely that the procurement price is the price ruling in the market. This is confirmed by the histogram in Figure 4.2, which plots the seasonal distribution of wheat procurement across different years of a marketing year. As can be seen, virtually all wheat is

Figure 4.1: Procurement Price and Wholesale Price of Wheat in Barnala (Punjab)



Source: Bulletin on Food Statistics, Government of India (1990). Information for 1974 is missing as the bulletin does not report prices in Barnala during the first quarter of 1974/75.

Figure 4.2: Quarterly Distribution of Wheat Procurement



Source: Bulletin on Food Statistics, Government of India (1990).

procured in the first quarter of a marketing year. Thus, the puzzle of wheat procurement, implicit in the static models, disappears when considered in a seasonal model. For a formal model along these lines, see Balakrishnan and Ramaswami (1995) and Ramaswami (1997).

The other question here is that of how changes in procurement price affect market price. This has been much analysed, but in our view somewhat unconvincingly. Our earlier discussion of wheat procurement contains the clue to the mechanism at work in the wheat market. As was noted earlier, the procurement price is also the price ruling in the wheat market during the early months of the marketing year. Profit-seeking arbitrage ensures that the lean season price exceed the procurement price by a proportion exactly equal to the rate of interest (being a proxy for storage cost). As this arbitrage relation is maintained in all times (when stocks are carried), an increase in procurement price causes the market price at all later points in time to increase as well.

How does our explanation differ from the literature? In their review of this question, Radhakrishna and Rao (1994) cite the work of Mitra (1978) and Patnaik (1975), according to which a rise in procurement price raises market prices because of 'excessively large speculative stock build-ups'. But by causing future supplies to increase, stock build-ups can only cause market prices (in the future) to fall.<sup>3</sup> Indeed, the explanation is just the opposite. Stocks are held by traders up to the point when the marginal return from storage is just offset by its marginal cost. An increase in procurement price decreases the marginal return but leaves the marginal cost of storage unaffected. Profit-maximising behaviour leads speculators to reduce storage until marginal returns are once again pushed up to the level of marginal cost. Note that the marginal return increases because lower market storage means higher prices in the future. In sum, a higher procurement price leads to higher market prices as well, because of a reduction in speculation and not because an increase in stockholding.<sup>4</sup> For a formal account of the process, we refer the reader to Balakrishnan and Ramaswami (1995).

The evidence for our argument is considerable. First note that we have already presented the fact of the procurement price being the market price in the early months of the marketing year. The seasonal pattern of wheat price (due to arbitrage) means that the

procurement price is the floor price. A simple consequence is the positive relation between procurement price and market price.<sup>5</sup> That this comes about because of a decline in private speculation is confirmed by empirical studies which, without exception, find procurement to be an increasing function of procurement price (Kahlon and Tyagi, 1983; Krishna and Chhibber, 1983; Krishna and Raychaudhuri, 1980; Gulati and Sharma, 1990).

### **III. Speculation**

As observed earlier, storage is commonly observed in agricultural markets. One concern about speculators has been whether they store 'too much' grain. The fear that hoarding can be responsible for 'unwarranted' price rises and 'artificial' scarcities has led the government to adopt policies that aim at restricting such activity. Examples of measures directed against speculation include the Essential Commodities Act (which imposes legal limits on private stocks), countervailing action through government operations (direct sales of grain by the government) and the prohibition of futures markets.<sup>6</sup> Critics of these policies contrast the wastefulness of government institutions with the efficiency of speculation in smoothing prices and consumption. In the 'efficient markets' paradigm, scarcities are real and never artificial. The rationale of government policies is that decisions about the amount of storage should not be left to speculators alone; rather their storage should conform to government guidelines. The issue of whether regulations on stocks are essential revolves on the question of whether speculators make wrong choices. In particular, do they store 'too much' or 'too little' relative to a desired norm?

It has been recognised that if markets are competitive and speculative expectations rational, then the outcome produced by speculative activity is efficient.<sup>7</sup> Judged according to criteria such as the size and number of traders, barriers to entry and the extent of spatial arbitrage, the evidence on Indian wholesale markets has been largely in favour of a competitive market structure. There is very little work examining expectations of speculators, although an answer to this question is necessary in deciding upon government policy. If expectations are rational, government action cannot improve efficiency in competitive markets. On the other hand, if

speculators make systematic mistakes in forecasting future prices, then there is a role for government intervention, the exact nature of which will depend on the form of forecasting mistakes, the information available to the government, and the costs of implementing corrective measures.

One problem for research in this area is the lack of direct information on speculative activity. In our studies, we have exploited procurement data to estimate models of speculation. As noted earlier, due to the seasonality of prices and the manner of public intervention, wheat procurement takes place in the early part of a marketing year. For a grain seller then, the opportunity cost of sale to the government is the market price of grain at a later point in time (and not the annual average market price, as implied by the static models of procurement that were discussed earlier). Thus, procurement is determined as a consequence of speculative decisions and reflects the price expectations of wheat speculators. This fact can be used to understand the determinants of procurement and also to test for the rationality of expectation-formation (Balakrishnan and Ramaswami, 1995; Ramaswami, 1997).

Ramaswami (1997) finds strong evidence that speculators in the Indian wheat market make systematic mistakes in forecasting future prices. The bias in their forecasts varies directly with past price spreads. This implies that relative to the rational expectations equilibrium benchmark, the intra-year allocation of wheat supplies has been inefficient. Thus, for instance, in years following large seasonal price rises, traders store too much wheat. At one level, these findings provide some support to the case for government controls on speculation as well as for countervailing measures such as sales of grain from public stocks.<sup>8</sup>

At another level, it is clear that expectation-formation is not exogenous but dependent on market institutions for the collection and processing of information. There is a body of empirical evidence which suggests that while non-rational expectations such as cobwebs persists in the absence of futures markets, the behaviour of the same markets is much more consistent with rational expectations in the presence of futures markets (Stein, 1992). Backward-looking expectations of the form witnessed in the Indian wheat market are indicative of a lack of co-ordination of storage plans among traders. Such expectations where an individual trader naively chooses to remain uninformed about the storage plans of other



traders, cannot be sustained in the presence of a future market. For instance, if past experience leads traders to expect a large seasonal price, the resulting supply of grain at a future date would depress the futures price invalidating the initial expectation. By disseminating information about the expectations of market participants, a futures market is an institution which achieves co-ordination of storage plans.<sup>9</sup> The legislated absence of futures markets in India removes an important mechanism for co-ordinating storage decisions of market participants and, therefore, makes it more difficult to forecast future prices.

To some observers, it may seem odd that we favour an institution that facilitates speculation, in spite of the findings of inefficiency in private speculative decisions. Our answer to this is twofold. First, as already remarked above, if futures markets are allowed, it is more likely that speculative activity is informed and thus produces the optimal inter-temporal allocation of supplies. Consequently, the need for public intervention would be that much less. Second, futures trading brings speculation out into the open, which can, in fact, enhance the effectiveness of public policy directed towards regulation. To elaborate this point, note that since traders handle about half of the marketed surplus, the market outcomes of policy depend on their responses to it. But such information is hard to come by, as it is not easy to document speculative activity. As Krishnaji (1990) notes 'the biggest hindrance in this respect [to an understanding of market outcomes of policy] is not lack of knowledge about production trends and demand elasticities, but our virtual ignorance about the operations of private traders at the different tiers of the grain markets and their impact on prices'. On the other hand, it is clear that if the government wishes to influence private storage, it must alter speculative expectations. It could do so through promises of action (such as augmenting supply in the future). But the credibility of such promises is always an issue since the lack of information on speculative activity does not allow assessment of their effectiveness. Futures trading permits the government to obtain reliable estimates of market expectations as well as the extent of private carry-over. If these market outcomes are unacceptable to the government, it can intervene by taking a position in the futures market in the desired direction. As the credibility of such a commitment is not in doubt, the public intervention gains in effectiveness.

#### IV. Credibility

The previous section touched upon the necessity of a credible public policy if it is to influence the actions of traders and producers. Many researchers have noted that private speculative behaviour is conditioned by its perceptions of the ability of the government to act in markets. How are such perceptions formed or, put differently, how does the government purchase credibility for its intervention? Ahmed and Bernard (1989) cite a survey among rice traders in Bangladesh, which shows that 'more than 90% of traders in both wholesale and retail groups consider open market sales by the government as an important factor in their stocking decisions'. The same authors conclude that 'the ability of the government to conduct effective open market sales.....depends greatly on opening stock'. Other researchers have also suggested the level of public stock, being a measure of the possible extent of public sales, to be a major determinant of speculative expectations of traders and their behaviour (Gulati and Sharma, 1990; Ravallion, 1990). Kahlon and Tyagi (1983: 471) quote an official document which stresses the need to maintain wheat reserves for otherwise 'this backdrop of a precarious balance in wheat stock can give rise to speculative tendencies'. Similarly, Dréze and Sen (1989:95) suggest that 'existence of public stocks....can go a long way towards reducing fears of future scarcity and also defeating the manipulating practices of private traders'. That this is also the implicit belief of Radhakrishna and Rao (1994) is illustrated by their comment that '...stock policy does not seem to have met with much success in influencing market expectations and thereby regulating speculative trade'.

The view that speculators look at the stocks with the government to predict government grain sales is, however, in one sense much too narrow and in another incorrect, in that stock policies which influence market expectations do not purchase credibility for public intervention. Balakrishnan and Ramaswami (1995) showed that if the level of public stocks drives speculative expectations, public intervention would be subject to speculative attacks. More specifically, in the Indian context, procurement may suffer from a loss of credence in the government's capability to hold down future price through grain sales. If a low stock level, for instance, signals a diminished capability for public intervention, that then feeds speculative demand, reducing grain sales to the government.

Balakrishnan and Ramaswami (1995) also show that in the Indian case, in spite of large fluctuations in stocks, fluctuations in public distribution sales are not important in explaining the variation in wheat procurement. The results imply that speculator's expectations of government grain sales have been stable in the Indian wheat market over the period 1970-90. Credibility has been achieved for the public intervention not by using stocks to discipline the market, but by maintaining a constant level of intervention largely invariant to the level of public stocks.

The Indian experience points to the useful role of imports in maintaining the credibility of a food security system based overwhelmingly on domestic supplies. In bad years, when public stocks are low, supplies to the public distribution network are affected by poor harvests as well as by speculative expectations. In such instances, a commitment to service the public distribution network, if necessary by imports, lowers the cost of domestic supplies. If such credibility is not perceived, speculative attacks may seriously affect the government's ability to maintain a steady level of supplies to the public distribution system. Thus, even in a virtually autarkic set-up such as that of India, trade has played an important role in ensuring the stability of the PDS. By thwarting speculative attacks, the marginal value of the import option has exceeded the value that might be indicated by its marginal role as a source of supply to the PDS.

These arguments lead to the view that the credibility of public intervention is based not just on the level of public stocks, but also on the government's ability to import food. Seen in this context, the requirements of credibility have possibly worked to limit the Indian public distribution network to a level which the authorities have found possible to commit. A higher level of food imports is constrained not only by economic factors but also by political considerations.<sup>10</sup>

## **V. Stabilisation**

Private trade rarely carries stocks across crop years. Dréze (1990) cites field studies about how private stocks are liquidated in anticipation of a new crop. Indeed, any other kind of behaviour would be surprising in light of the evidence on price movements. As Figure

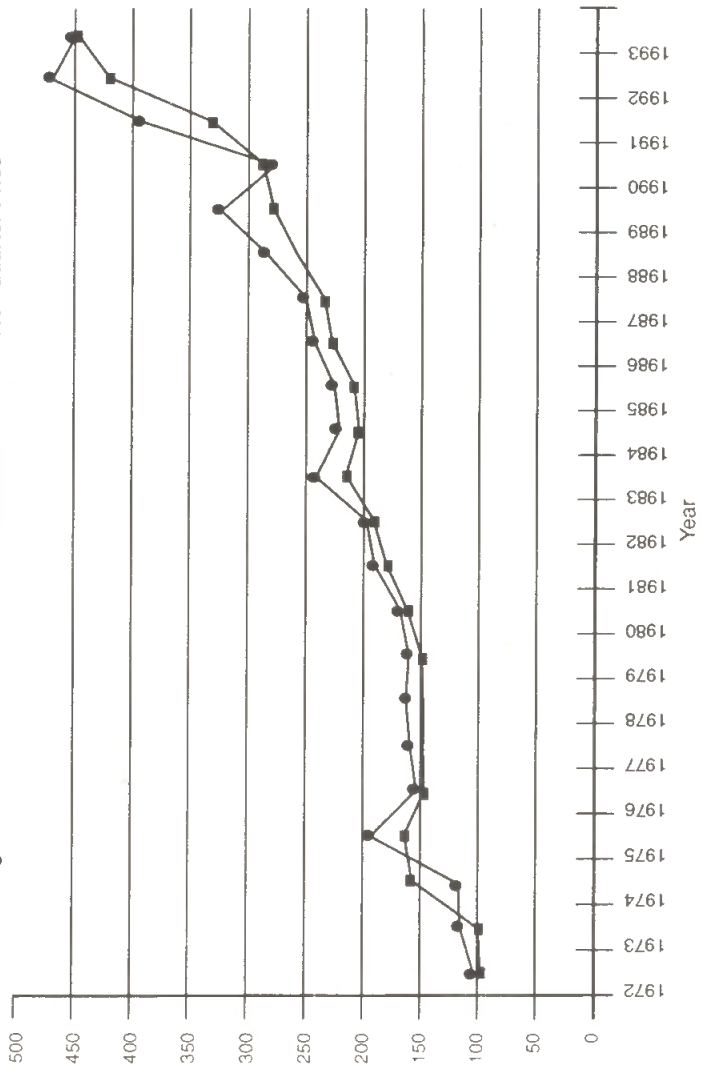
4.3 displays, the wheat price at the beginning of a marketing year is generally less than the price at the end of a previous year.<sup>11</sup> The ex-post profitability of inter-year storage of wheat is negative for virtually all of the 1970s and 1980s which suggests strongly that the same is true of ex-ante expected profitability as well.<sup>12</sup>

The absence of private trade in carrying stocks across years means that the appropriate role of the government in this activity does not involve the performance of private traders. The question, rather, is what is the market failure which public storage can address? It is, of course, known that the competitive market outcome (zero storage in this case) cannot be presumed Pareto-efficient unless all risk markets exist or unless agents are risk-neutral (Newbery and Stiglitz, 1981). In particular, in the absence of perfect credit markets, the ability of the poor to smoothen food consumption is limited. By compensating for credit market imperfections, price stabilisation through public storage can improve efficiency (Newbery, 1989).

Public storage is, of course, an important component of food policy in India. However, the extent to which it has stabilised prices is still an unanswered question. The difficulty arises because government operations in India do not follow formal price band stabilisation rules (i.e., a rule which states 'buy when price falls below a floor and sell when price rises above a ceiling') which means that the stabilisation outcome of public intervention cannot be judged with reference to pre-determined price bands. Clearly, a full analysis of this issue would require comparison of the historical market outcome with the market outcome in the absence of intervention. The necessity of constructing a counterfactual as a benchmark is the principal analytical problem.

One approach to this problem is to compare the variability in supplies (i.e., output adjusted for change in stocks) with the variability in production (Roy, 1984; and Krishnaji, 1988). According to Krishnaji (1990), year-to-year fluctuations in supplies are smaller than similar fluctuations in output.<sup>13</sup> In addition, public grain sales seem to be higher in drought years (Dantwala, 1993). However, Krishnaji regards the reduction in variability as inadequate. Further, he points to an asymmetry in stock policy whereby the accumulation of stocks in good years has been more noticeable than the depletion of stocks in bad years. He concludes that 'the stock management policy of the government has contributed in some measure

Figure 4.3: First Quarter Price and Previous Year's Fourth Quarter Price

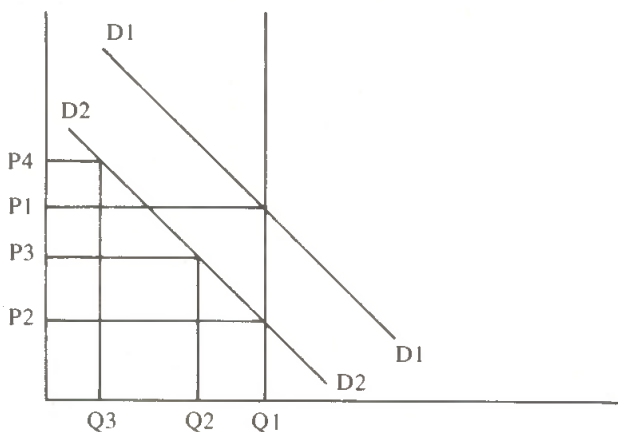


Source: Economic Survey, Government of India (1993) and Statistical Panorama, Food Corporation of India (1990).

to the inflation in grain prices and to the disadvantage of consumers'. Radhakrishna and Rao (1994) have a similar assessment of stock policy in India.

As noted earlier though, stock operations in India are not governed by formal or explicit mechanisms of any kind. Indeed, the available evidence suggests that stocks are passively determined as a consequence of government pricing decisions and the behaviour of producers and consumers. If there is no stock policy, then how does one understand the behaviour of stocks and hence annual supplies? While an answer to this question is not available, one can sketch a model for this process. In Figure 4.4, the vertical line at  $Q_1$  represents output.  $D_1D_1$  is the demand curve in the absence of any kind of food market intervention (procurement or public distribution).  $P_1$  is the resulting market price. Suppose the government supplies a certain quantity of grain through public distribution. Recipients of PDS grain would reduce their demand for grain in the open market, so that the demand curve shifts downward to, for instance,  $D_2D_2$ . The position of the demand curve depends in part on the level of issue price (see the discussion on the public distribution system in the following section). Accord-

**Figure 4.4**  
*Relationship between Stocks and Annual Supplies*



ingly, the price is now lower at  $P_2$ . To meet its supply commitments (fully or partially), the government must procure grain. Clearly, whatever the procurement price, it must be greater than  $P_2$  for the government to procure a positive amount when sale to the government is not compulsory (such as in the case of wheat).

Consider two alternative scenarios. In the first case, the government fixes the procurement price at  $P_3$  and procures  $Q_1$ – $Q_2$ . In the second case, the government fixes the procurement price at  $P_4$  and procures  $Q_1$ – $Q_3$ . In both cases, the procurement price is above  $P_2$  (the market price without procurement). This fact has been sometimes interpreted to mean that domestic procurement at incentive prices is always inflationary. However, there is an important difference between the two scenarios as the relevant benchmark is not  $P_2$  but  $P_1$ , which is the market price in the absence of procurement and public distribution. Seen this way, the procurement price in the first scenario is actually below the price that would otherwise rule the market. It is only in the second case that procurement pushes grain prices above the market outcome (in the absence of intervention). Procurement is potentially inflationary if government policy consistently fixes procurement prices above  $P_1$ , the price expected to prevail in the absence of any intervention. On the other hand, government policy is stabilising if the procurement price is below  $P_1$  (but possibly above  $P_2$ ) in years of low grain availability and above  $P_1$  in years of good harvests.

The model sketched above points to the fixation of procurement price as the key variable, which determines the inflationary or stabilising impact of government policy. Clearly, unless we know  $P_1$ , the model cannot be directly verified. Depending on government policy (stabilising or inflationary) the model can, however, be used to derive a hypothetical time series of public stocks which can then be matched with the observed time series.

## **VI. Public Distribution**

According to case studies (for example, Indrakant [1995]; Nair and Sivanandan [1995]) and anecdotal accounts, some consumers prefer grain from private retail outlets rather than from the public distribution system (PDS). The sizeable literature that has grown around the subject of evaluating the PDS has, however, largely

ignored this issue. Two questions arise. First, is it true that consumers perceive the quality of grain available in the PDS to be lower than that of grain from competing private sources? The technical issue here is how the hypothesis of quality differentials can be tested on the basis of aggregate data alone. Second, even if quality differentials exist, how do they matter? As we shall argue, quality differentials can adversely affect the living conditions of the poor. In addition, they also constrain the prospects of containing the budgetary subsidy on food. Restoring efficiency to the PDS restores equity as well as fiscal balance.

To answer the first question, consider the consequences for market prices following a hike in the issue price. Suppose, for the moment, that the grain supply through the ration shop is identical to the supply in the market. Then, an increase in issue price ought to decrease the market price of grain. The reasoning is as follows. So long as the issue price is less than the market price, consumers would demand grain in the market only after exhausting their ration entitlement. Now the market demand under rationing would depend, among other variables, upon the implicit subsidy received on the ration purchases. A small increase in the issue price, by reducing the subsidy, produces an income effect which lowers the demand for grain in the market and hence the market price.

In our empirical analysis, however, we found that a change in issue price does produce a change in the market price in the same direction (Balakrishnan and Ramaswami, 1997a; 1997b). The data, therefore, contradict the prediction that an increase in the issue price would lead to a decrease in the market price. The supposition that there is no quality difference between the PDS and market grain, upon which the prediction was based cannot, therefore, be true.

To explain the observed relationship between the issue price and the market price, we must allow for the possibility that goods supplied in the two markets are not the same. Consider, then, a model where consumers perceive the quality of PDS grain to be lower than the quality of grain available from the market. We can imagine that, in addition to the sale price (i.e., the issue price), the cost to a consumer of buying a unit of grain from the PDS also includes a money value of quality difference. Quality here refers not just to intrinsic grain characteristics but also to attributes of the retailing mechanism. The unobserved private costs, therefore, in-



clude the costs of transacting in the PDS. Field studies of the PDS show that these costs are not insignificant (see Nair and Sivanandan [1995] and Indrakant [1995]). Transaction costs arise because of the location of PDS shops, uncertain supply, waiting time in queues and the use of incorrect weights and measures. As the perception of intrinsic quality difference as well as the costs of transacting is individual-specific, the costs of buying grain from the PDS also differ among consumers. Clearly, of those consumers with access to the PDS, only those whose cost of buying grain from the PDS is lower than the market price would purchase grain from the PDS. Others whose private costs are higher would prefer to buy from the market.

Consider now an increase in the issue price. This has two effects on the demand for market grain. First, the increase in the issue price pushes the costs of PDS grain above the market price for some consumers. These consumers switch their demand to the market. This is the switchover effect, due to substitution. Second, for consumers who remain in the PDS, their market demand decreases due to the income effect from a lower implicit subsidy. Since the switchover effect and the income effect are in opposite directions, the aggregate demand for market grain and the market price increase whenever the switchover effect is stronger than the income effect. We can infer, therefore, that in the wheat market, where the market price has been demonstrated to be positively associated with the issue price, the switchover effect is larger than the income effect.

Can the existence of the switchover effect be shown directly? Since information on market sales is not available, a straightforward exercise of relating market demand to the issue price is not possible. Some researchers have regarded the decline in PDS offtake that follows a rise in issue price as evidence that consumers view PDS grain and market grain as substitutes (Radhakrishna and Rao, 1994). To see why this is incorrect, consider the implications for PDS sales of an increase in issue price. Once again, there are two effects. The switchover effect leads to a decline in the offtake as some consumers exit from the PDS. However, in addition, PDS sales may also decline because consumers who do not exit may purchase less grain because the reduction in subsidy makes them poorer. An inverse relationship between PDS sales and the issue price is, therefore, not conclusive about the existence of a switchover effect, as such a relationship could be due to the income effect alone.

Switchover effects can, however, be investigated by looking at the relation between PDS offtake and the open market price. If the open market price increases (issue price remaining constant), aggregate PDS offtake increases too, as some consumers switch back into the PDS. On the other hand, there is no change in demand for PDS grain from those consumers already buying from the PDS. Hence, the entire change in offtake would be evidence of a switchover effect.<sup>14</sup> Indeed, since issue prices change only infrequently, while market prices vary continuously due to seasonal and annual factors, most of the observed changes in offtake must be due to consumer switches between the market and the PDS.<sup>15</sup>

Table 4.1 presents the seasonal distribution of PDS offtake for wheat for the years 1988/89, 1989/90 and 1990/91. These are years in the recent past during which the issue price remained unaltered and for which we have data on the seasonal distribution of PDS offtake. As is well known, wheat prices are at a seasonal low in April and then rise steadily to peak in March of the next calendar year. Corresponding to that it can be seen that the PDS offtake is minimum in the first quarter (when the difference between the issue price and the open market price is at its smallest) and then rises as the gap between the market price and the issue price widens. Clearly, the observed changes in offtake are entirely due to consumers switching into the PDS from the market.<sup>16</sup> A formal econometric analysis is not presented here. Readers are directed to the estimates in Balakrishnan and Ramaswami (1997b) which support the positive association between PDS offtake and market price seen in Table 4.1.

Before we proceed to speak of the implications of the perceived quality differences, we deal with two issues: the precise relationship of quality differentials to the operation of the public distribution system and the validity of the potential argument that quality differentials may reflect an optimal intervention.

Why is PDS grain of lower quality? We believe that the lower quality of PDS wheat is evidence of inefficiencies in the operation of the public sector. As far as we are aware, there is no deliberate policy on the part of the government to procure inferior grain. In the case of wheat, government purchases take place at market prices,<sup>17</sup> which means that private traders acquire comparable quality grain at the same prices as the government.<sup>18</sup> At the point of sale, however, consumers do not regard the grain from the two

Table 4.1

*Seasonal Distribution of PDS Offtake for Wheat, 1988/89, 1989/90, 1990/91*

1988/89	WP	IP	PDS
Quarter I	259.03	204	1673
Quarter II	274.23	204	1912
Quarter III	307.17	204	1969
Quarter IV	323.40	204	2113
1989/90			
Quarter I	278.22	204	1401
Quarter II	288.41	204	1853
Quarter III	289.05	204	1886
Quarter IV	276.31	204	1818
1990/91			
Quarter I	286.5	234	1258
Quarter II	309.42	234	1503
Quarter III	330.43	234	1842
Quarter IV	392.82	234	2409

Source: *Economic Survey*, Government of India (1993) and *Bulletin on Food Statistics*, Government of India (1990).

Notes: Quarter I refers to the months April to June and so on. WP is a three-month average of the wholesale price index of wheat (1970/71 = 100). IP is the prevailing issue price (rupees per quintal). PDS is a three-month aggregate of wheat offtake from the public distribution ('000 tonnes).

sources as identical. Even when the issue price is below market price, some consumers (with access to the PDS) prefer to buy from the market. The number of such consumers increases as the issue price increases. Relative to the grain in the open market, consumers demand a discount on their purchases from the PDS, which represents their valuation of the cost of transacting in the PDS. The appearance of quality differentials at retail outlets must then be due to inefficiencies in the marketing chain, such as bad purchase decisions, lack of care in storage and handling, and indifferent service at ration shops. Whatever the reason, compared to private trade, the state apparatus produces a lower value of output for comparable input levels.<sup>19</sup>

We now consider the second issue, which is the argument that the differential quality may be an optimal arrangement. The literature on the targeting of benefits has long advocated policies that induce self-selection. In the context of the public distribution system, we have by now become used to seeing the proposal that the PDS focus on inferior grains. Could it be that the government is pursuing, albeit unwittingly, the right course of action by supplying

lower quality grain? Such an interpretation would be unjustified for several reasons. Theoretically, the argument for quality difference between the publicly provided private good and that available in the private sector is that by inducing high income households to opt out of the public scheme, the universal public provision of a private good redistributes income from the rich to the poor, even when the scheme is financed by lump sum taxation (Besley and Coate, 1991). The argument applies in greatest force, though, to indivisible goods where the individual either purchases from the public sector or the private sector but not from both. Here, on the other hand, since many households supplement their ration quota by purchases from the open market, their welfare depends on the open market price too, and hence on the quality difference. Second, since the PDS is not universal in its coverage of the poor, self-selection operates only within groups with access to the PDS and not to the entire population. There would still be significant number of poor households solely dependent upon the open market who pay a higher price for grain whenever higher income groups exit from the PDS, as the price differential exceeds the perceived quality differential. Third, the fact that lower quality is produced by inefficiency of the state marketing system means that the loss in quality must be reckoned as a dead-weight loss, which further limits the gain of redistribution due to self-selection. In sum, while a PDS that provides for self-selection is desirable, inefficiency in distribution seems a poor way of attaining it.

Finally, we turn to the implications of the inefficiency represented by quality differentials. These relate to concerns of equity and of macroeconomic stability represented by fiscal balances. Essentially, the finding of a positive relationship between the issue price and the open market price means that changes in the issue price matter not only to consumers who purchase their grain from the PDS but also to those consumers who buy grain from the open market and their welfare is, therefore, worsened by sharp increases in issue price. An indication of the quantitative significance of such effects is provided by the findings of Dev and Suryanarayana (1991) that 'at the all-India level, the dependence of the poor on the public distribution system in rural areas for rice, wheat, edible oils, coal and standard cloth is less than 16%'. Clearly then, it is inadequate to view the equity effects of a subsidised system of public grain sales solely in terms of the benefits of those with access to the PDS.

In this context, the role of quality differentials needs to be understood. As noted by us, in the absence of quality differentials, an increase in the issue price would actually decrease market prices. It is the existence of quality differentials, on the other hand, that reverses this relationship, as we have observed from our econometric exercise. As the strength of the switchover effect would vary inversely with the quality of PDS grain relative to that supplied in the open market, the extent of the increase in market prices following the hike in the issue price is inversely related to the quality of grain supplied through the PDS. Better management of the PDS leading to an improvement in quality is, therefore, desirable not only in itself but also because it can moderate switches out of the PDS which have a direct effect on open market prices.

Our analysis has direct bearing on some of the questions raised in connection with economic reforms currently underway in India. The official point of view is that 'while the PDS has to be continued to help the poor, the burden of subsidy on the central budget has also to be restricted' (Government of India, 1993). Efforts to contain the budgetary subsidy on food were particularly prominent in the early years of the reform process when the issue prices of wheat and rice were substantially raised (see Table 4.2). Yet the desired impact on the budgetary subsidy never materialised (see Table 4.3). As is well known, the change in issue prices was accompanied by an increase in the stock of foodgrains with the government, which resulted in higher expenses in the form of carrying costs and interests charges. The rise in stocks was itself in large part due to a fall in PDS offtake as the rise in issue price led consumers to switch out of the PDS. This means that in the presence of quality difference, the impact of a hike in issue price on the food subsidy would always

Table 4.2  
Central Issue Price

Month	Rice		Wheat
	Common	Superfine	
January 1991	289	370	234
February 1991	377	458	280
January 1993	437	518	330
February 1994	537	648	402

Source: *Economic Survey*, Government of India (1994).

**Table 4.3**  
*The Food Subsidy*

	(Rs '000 crores)
Year	Current Prices
1989-90	2476
1990-91	2450
1991-92	2850
1992-93	2800
1993-94	5537
1994-95	5100
1995-96	5250

*Source:* Union Budget Documents, Government of India (1997).

be limited and perhaps even perverse.<sup>20</sup> The government's dilemma is as follows: either it accommodates consumer valuations by keeping issue prices sufficiently below market prices or it ignores these valuations, but at the cost of carrying larger stocks. Either way, the scope for reducing the food subsidy is constrained by quality differentials between the grain supplied through the PDS and in the open market.

## VII. Conclusions

It is our premise that the evaluation of public policy should be preceded by an understanding of how interventions work. As we have stated in the introduction, this requires a mapping from the intervention to economic outcomes. The modelling that this entails would involve a steady interaction between economic theory and observation. Principally, there must be an account of how economic agents respond to policy interventions. This is no academic exercise but crucial to the understanding that is being sought.

This review is organised around models of procurement and public distribution proposed by us built on empirical foundations consistent with the data as observed. Several new insights have emerged.<sup>21</sup> We can now see that speculation cannot be of primary importance in explaining fluctuations in annual supplies. Speculation plays a major role in allocating supplies within a season, however. Government policy has a role in ensuring that seasonal movements in prices and supplies are consistent with the fundamentals. Allowing intra-year futures contracts would allow the

government to play this role effectively. Inter-year stabilisation requires public storage. For sustaining such an effort, public intervention must be credible for which the public authority has to be prepared to use the option of imports. Besides stabilisation, the other objective of food policy is to protect the food consumption of the poor by means of the public distribution system. This cannot be done effectively (indeed, perverse consequences for equity could follow) until consumers perceive improvements in the quality of grain supplied by the PDS. In the absence of such reform, raising issue prices can have only a limited impact on the food subsidy.

It is clear that an evaluation of the net impact of intervention on prices and poverty requires a complete model of the economy and this is not on offer yet. However, the formulation and testing of the elements of such a model is a prerequisite. The models put forward by us should go some way in satisfying this requirement.

## **Notes**

1. For instance, Balakrishnan (1991), de Janvry and Subbarao (1986), Krishna and Chhibber (1983), Krishnaji (1990) and Sarma (1989).
2. On the other hand, in the case of rice, a levy is the means of procurement. In view of this, it is surprising that Schiff's (1993) analysis does not make a distinction between interventions in the wheat and rice markets. His assumption that procurement is proportional to output (and therefore independent of procurement price) is not tenable in the wheat market where procurement is voluntary and determined in the market (and is, therefore, a function of the procurement price). For this reason, his interpretation of the boycott of wheat procurement by farmers in 1992 is also off the mark. Indeed, the action by farmers is not hard to comprehend once it is understood that the procurement price is the floor price in the wheat market (for evidence on this point, see the discussion that follows).
3. Future supplies must increase because stocks are not held forever. In particular, private stocks are rarely held from one marketing year to another. For more discussion on this point, see the section on stabilisation.
4. Procurement price could increase open market price through demand effects as well. For an investigation along these lines, see Dasgupta (1989).
5. For an earlier presentation of similar evidence, see Balakrishnan (1991). Radhakrishna and Rao (1994) regard the evidence in that study as 'too inadequate' for studying the role of speculation. Our understanding is different. As reiterated in the text, the arbitrage relation together with the fact of procurement price setting the floor level from which market prices rise is a

complete model of speculative activity and offers a consistent explanation of the link between procurement and market price. We do agree, however, that reduced-form regressions that relate the market price and the procurement price, as in the study by Gulati and Sharma (1990) do not shed light on the speculative activity that generates them.

6. Some of these interventions have other objectives as well – such as protecting the food consumption of certain target groups. The point is that the government has disregarded alternative forms of intervention (e.g., direct income transfers) towards the same objective but which take a more benign view of private trade.
7. This is true if a full set of markets is present. If some agents are credit-constrained, the market outcome may produce too little smoothing (Newbery, 1989). However, this calls for policies that augment private storage and does not validate policies that, on the other hand, restrict private storage.
8. The results do not suggest that traders always store too much wheat – the past experience may at times lead them to store too little. Government policy has to be intelligent enough to treat this outcome as undesirable as well.
9. Note that within a marketing year, the sources of uncertainty for an individual trader are about demand and about the storage plans of other traders. If demand changes predictably from year to year, then one can construct models (Grossman and Stiglitz, 1976) in which the futures prices perfectly reveal aggregate storage.
10. Imports are often politically controversial because they seem to negate the desired objective of self-sufficiency.
11. The only exception occurs in 1974, when the first quarter price of 1974–75 is greater than the last quarter price of 1973–74. The unusually high price in the first quarter of 1974–75 was due to the fact that instead of buying grain at market prices, which is the customary intervention in the wheat market, the government in 1974–75 decided to procure grain through a levy on wheat traders at below market prices (Chopra, 1981). By reducing supplies to the open market, the levy raised market prices even further. The levy method has not been employed since in wheat procurement.
12. Lowry et al. (1987) and Pinckney (1989) have also drawn attention to the fact that private inter-year storage is not likely to occur. Clearly, the frequency of stockout depends on the frequency of severe shortfalls in output. Rough calculations suggest that storage is infrequent and even when positive, it will be typically small (Newbery and Stiglitz, 1981).
13. In view of the negligible role of private trade in inter-year carryovers, it is hard to share Krishnaji's conjecture about the importance of speculative activity in determining annual supplies (repeated also in Radhakrishna and Rao, 1994).
14. For details see Balakrishnan and Ramaswami (1997b).
15. Of course, to the extent that the demand for foodgrains is a function of other variables such as income and relative prices any changes in these variables would also matter.
16. Allocation of supplies, on the other hand, was found not to be responsive to the seasonal price movements. We can be sure, therefore, that the observed changes in offtake reflect changes in demand.



17. This is documented in Balakrishnan and Ramaswami (1995). Others, including Dantwala (1993) and Krishna and Chhibber (1983), have also noted it.
18. If this is not so, i.e., if the grain purchased by private traders is of higher quality than grain bought by government, it means one of two things. It could be that the government and private traders purchase at the same prices but the government makes bad purchase decisions, which is itself indicative of inefficiency on the part of the government. The other possibility is that although the government makes correct purchase decisions, and although its purchases are at market prices, it buys up all the lower quality grain so that private traders deal only in higher quality grain acquired at high prices. The evidence against such an outcome is considerable. Note that since the government offers only one purchase price, its grain purchases must be of the same quality given efficient purchase decisions. Among other things, this means that annual fluctuations in procurement (which are considerable) exactly mirror fluctuations in production of lower quality grain. The available evidence, on the other hand, confirms the anecdotal accounts of competition for grain supplies between private trade and the government (Balakrishnan and Ramaswami, 1995; Ramaswami 1997).
19. In the case of rice, the government purchases the grain at below market prices by a levy imposed on rice mills. It would be surprising if the rice mills did not try to sell their lower quality stocks to the government, saving the better quality rice for the open market. This leads us to conjecture that quality differences between open market and PDS rice may be even more severe than in the case of wheat.
20. On the other hand, an increase in issue price can have dramatic impacts on the composition of food subsidy. Between 1990-91 and 1995-96, the share of the food subsidy financing food distribution and income transfer programmes fell from 70 per cent to less than 40 per cent. In 1994-95, as much as 60 per cent of the food subsidy in 1994-95 went to finance the buffer stock, sales on the open market, or export (World Bank, 1996).
21. We recognise that the results are drawn from empirical studies of the wheat market. Their applicability to the rice market remains to be addressed.

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