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PARALLEL MARKETS, PRICE THEORY, AND CHINA'S GRAIN POLICY

by

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Introduction

Every single day, China's grain policy directly touches the lives of more than one billion people. It is perhaps the most crucial single agricultural and food policy package in the world. About 60% of all cropland in China is devoted to food grains, mainly wheat and rice. Moreover, over 40% of China's direct per capita consumption of food (by weight) is in grains. Since about half of all household expenditures are for food, grain policy is a keystone of daily life in China.

Economists trained in the Western neoclassical tradition need to understand the basics of this policy in terms that are familiar to them. That is the central goal of this paper. Another related, but more general, aim is to examine how government controls and free markets may operate in parallel fashion. In particular, we will show how Chinese grain policy, both before and after the recent economic reforms, may be visualized within the context of the familiar concepts of partial equilibrium demand and supply theory.

Naturally, the historical and political richness of China's agricultural policy evolution is submerged in this purely economic approach. Yet anyone with even a modest appreciation of post World War II China can interpolate at least some of that nation's social and political

milieu between the lines of this discussion. In addition, several general discussions (in English) of the data, institutions, operational aspects, and social setting of Chinese grain policies in recent times have been published, including articles by An Xi-Ji, Calkins, Crook, Tuan, Watson, and Yan Rui-Zhen.

The ensuing analytical discussion will rely upon the presumption that the following familiar theoretical propositions are applicable in China:

1. The aggregate demand for food grain can be viewed as a negatively sloped schedule of the total quantities demanded by non-farm consumers at various prices which they might face, holding other things constant including other prices, incomes, tastes, and economic policies and programs.
2. A positively sloped function can be drawn as an aggregate measure of the marginal input cost to the Chinese agriculture for each additional unit of grain produced beyond the farm household subsistence demand, other prices, costs, and technology held constant. At least part of this function can be viewed as an aggregate supply curve for food grain.

In addition, we will assume for simplicity of exposition that imports or exports of food grains are very small or non-existent and that large year-to-year inventory acquisitions or disposals by the government do not occur. These two assumptions can be relaxed quite readily once the main lines of our argument are described. Our discussion also will imply that the vastness of China can be regarded as a single market for grain. This is a considerable simplification of reality but, in this context, a useful one since national grain policy is pervasive and evident in all locations.

Before 1978/79

The basics of the food grain policy before the economic reforms of 1978/79 can be described simply as full state control of grain acquisition from farmers and its consequent distribution to non-farm consumers. Mandatory delivery quotas and fixed delivery prices characterized the farm sector. Strict rationing and state pricing were in force at retail. Virtually all grain handling and distribution was in government hands. Private or parallel marketing was essentially illegal.

Using figure 1, consider how a policy like this might be viewed through the lens of static partial equilibrium theory. Let us regard SS as a measure of the marginal cost to Chinese agriculture for each additional unit of grain produced beyond subsistence consumption by farm households. The schedule DD is the non-farm demand function for food grains, measured at the farm level. It can be viewed as the usual, partial equilibrium derived demand curve for grain, considering the non-farm retail demand as the primary demand locus.

Any official government demand for grain beyond that obtained through mandatory contract procurement is included in DD. (This element of demand is important in the parallel market cases to follow.) We use the derived demand formation in order to focus both demand and supply considerations at the farm level, recognizing that other costs and economic functions are involved in processing and moving grain from rural to urban areas.

In this case, the government's behavior as the sole intermediary can be illustrated rather simply. It procures a given amount of grain from farmers by mandatory delivery quotas enforced by coercive power vested in the state through the collectives or state farms. No other off-farm sales

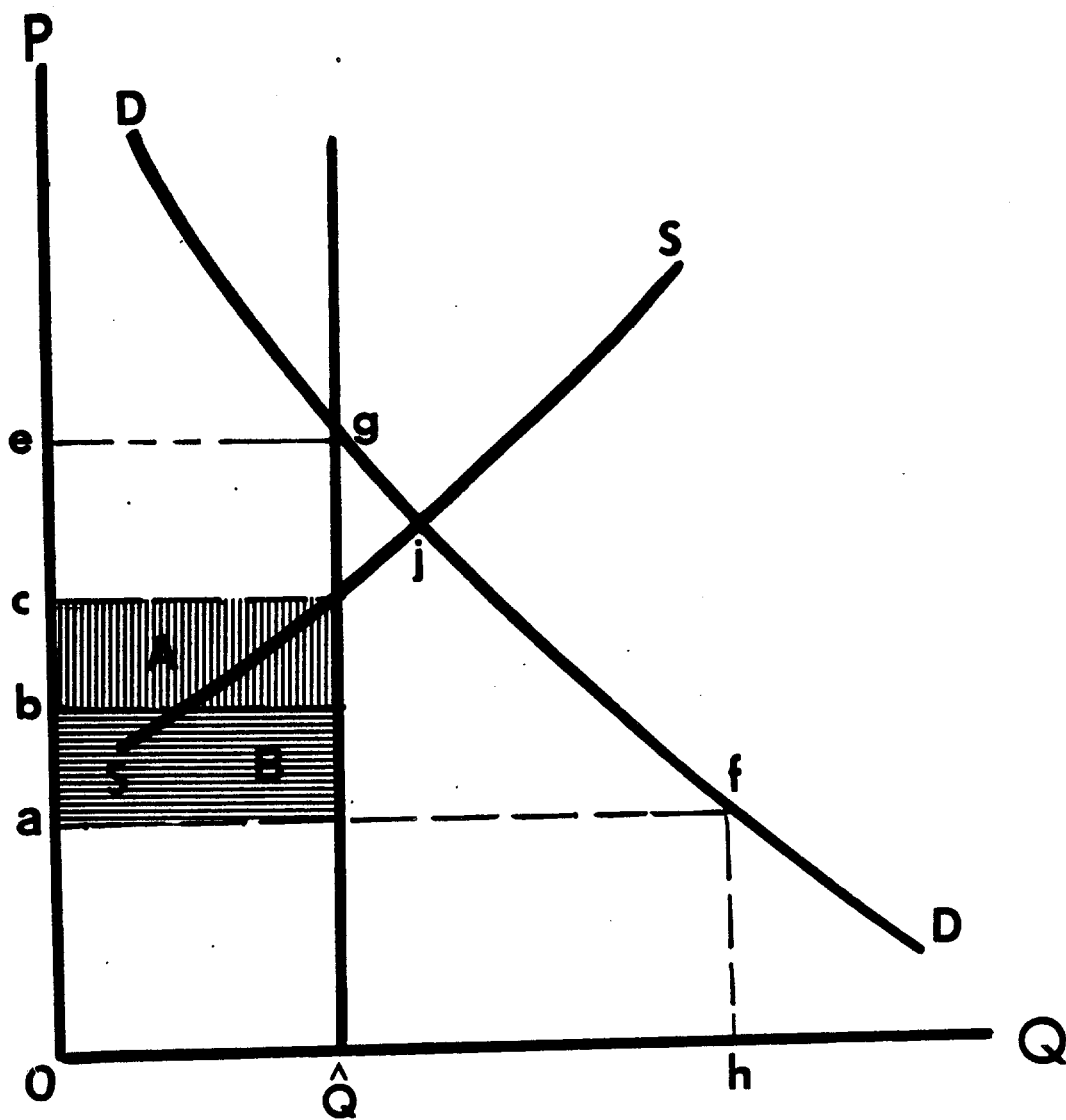


FIGURE 1

The pre-reform grain market

or transfers are permitted. Subject to the vagaries of weather and pests, this amount is \hat{Q} in figure 1. The marginal cost of this output is indicated as Oc. However, farmers may or may not be reimbursed this per-unit amount by the state. Theoretically, it could be more, or it could be less. It is plausible to think of it as less--perhaps Ob. Then the shaded area A can be viewed as an implicit production tax on agriculture. (If Ob were above Oc, then an implicit state production subsidy on \hat{Q} would be involved.)

Now consider the government's retail distribution policy. It has the volume \hat{Q} to disperse. If that amount were sold at whatever the market would bear, then price Oe would result. However, the pre-reform grain distribution system was (and still is) characterized by low, official retail purchase prices and a quantity rationing scheme based upon coupons issued to consumers on administratively determined grounds. Rationing based on queuing by consumers is not the basic model in the Chinese context although some elements of it are present. A recent article by Alexeev analyzes some aspects of rationing and pricing based on queuing with specific application to the Soviet Union. In China, ration coupons traditionally have been issued to consumers based on individual characteristics such as age, occupation, gender, residence, etc.

Assume that the state-established retail equivalent price is Oa in figure 1. The amount demanded in an open market at this low price would be Oh, but only \hat{Q} is available. The amount \hat{Q}_h represents the excess, and unfulfilled, demand at the price of Oa. In this setting, each ration coupon carries an implicit per unit value of ae, the difference between the demand price for \hat{Q} and the state controlled retail price.

Area B in this case is the monetary value of the consumer subsidy that would appear in the government's budget, given these price decisions. It is the difference between the price paid to farmers and the price received from consumers on the volume \hat{Q} . It might be either larger or smaller than area A, the implicit production tax.

In the figure 1 illustration, \hat{Q} is arbitrarily shown to be less than the volume that would be produced under fully open, free markets (where SS and DD intersect) but more than the amount that would be freely supplied at the low, controlled retail price equivalent. Although, this is probably a realistic illustration, other possibilities exist and can be examined within this basic framework.

For instance, \hat{Q} could be established at volumes to the right of point j--even beyond Oh. In this case, with farm price at Ob and consumption price at Oa, the government would be exploiting both farmers and consumers in order to achieve an output target beyond internal consumption demands. It could also be that the amount secured from farmers by government fiat (\hat{Q}) might exceed or fall short of the amount distributed at retail. Exports or stockpiling might motivate procurements in excess of retail distributions, while imports or stock draw-downs might be occur if farm procurement were less than consumption.

In this fully controlled system, prices, as set by the authorities, allocate neither production resources or consumption expenditures. They are basically accounting measures which assign costs to buyers and returns to farmers for this crucial staple commodity within the society.

After 1978/79

As the economic reforms in China's food and agricultural policy were introduced during and after 1978/79, several important aspects of the old system remained in place. However, numerous innovations and relaxations emerged across the entire system, including even the rather conservative grains policy. Important elements of the old grain policy still remained in place including (1) mandatory delivery quotas of grain levied against farm households and acquired at relatively low, government-determined prices and (2) the continued operation of a coupon-based rationing system for urban sales at low consumption prices.

One major innovation was the rapid development of a legal, reasonably open, free market for food grains in which producers, merchants and, consumers may participate as private agents. An important feature of this new, parallel marketing system is that the government itself now purchases grain supplies (beyond mandatory quota volumes) essentially in competition with the higher-priced free market.

Another major change from the pre-reform era is a significant increase in the decision making freedom allotted to farm households. Under the Household Responsibility System, once mandatory grain delivery quotas are filled at the official procurement price, the household may sell additional grain to the open market or to the government, at typically higher prices. In addition, it may produce and sell other agricultural commodities, and/or offer household labor and capital to non-farm enterprises. This system now allows prices to signal some farm household resource allocation decisions at the margin.

As with the pre-reform case, it is possible to cast this new situation

into the partial equilibrium context of traditional economic theory. In what follows, two polar cases are illustrated. In the first instance, it is assumed that no significant sale (or exchange) of ration coupons is permitted among consumers; it is effectively foreclosed by government enforcement. In the second instance, it is assumed that a fluid and freely functioning parallel market for these coupons exists alongside the parallel grain market. Reality is somewhere between these two extremes for most places in today's China. In both cases, the analytical complications of possible food grain imports or exports are ignored for simplicity of exposition.

Non-tradeable Ration Coupons

For this discussion, it is necessary to alter both the demand and supply sides of figure 1. The demand side needs to be altered to consider the demand for free market grain in the presence of non-tradeable ration coupon entitlements and low state-enforced prices for the rationed quantities. The supply side needs to be altered to take account of private grain sales by farmers both to the free market and to the higher-priced government purchasing track.

First consider the demand for food grain. In the non-farm economy, there are two major sub-groups of consumers, those who have access to ration coupons for low-priced grain and those who do not.^{1/} Most people who have no coupon entitlement are rural residents who have moved away from farms and villages, permanently or temporarily, to seek employment in urban areas as transient workers. Those who do have access to coupons may be further classified according to whether they have fewer coupons than they wish at prevailing state prices, more than they wish, or just the right

amount. We will assume for simplicity here and later that, aside from price considerations, consumers are indifferent between obtaining grain at state shops or in the free market.

Representative demand functions for non-farm consumers in each of four categories are illustrated in figure 2. Panel (a) of figure 2 shows a demand function for free market grain by a representative consumer with no access to coupons. It is that individual's total demand for grain; no adjustment is needed to account for rationing.

Panel (b) indicates the demand for free market grain by someone with insufficient coupons at the official price. The curve dd illustrates the total demand for grain by this person, \hat{q} is the individual's coupon entitlement and Oa is the official state price for rationed grain. For this person, Ob is the maximum demand price for the ration volume. The demand for free market grain for this consumer is indicated by the heavier function d^*d and is constructed as follows.

At free market grain prices lower than Oa , ration coupons would be discarded, and all purchases would be made in the free market. The free market demand would lie along the total demand. At free market prices between Oa and Ob , some additional quantities of grain, beyond \hat{q} , would be desired namely the horizontal distance between dd and \hat{q} at each price in that interval. At free market prices above Ob , no additional grain would be purchased since the demand price for any unit of grain along that portion of dd exceeds both the ration price Oa and the maximum demand price associated with \hat{q} , namely Ob . Hence, d^*d is the free market demand curve, given \hat{q} and Oa .

Panel (c) of figure 2 indicates the free market demand of a person

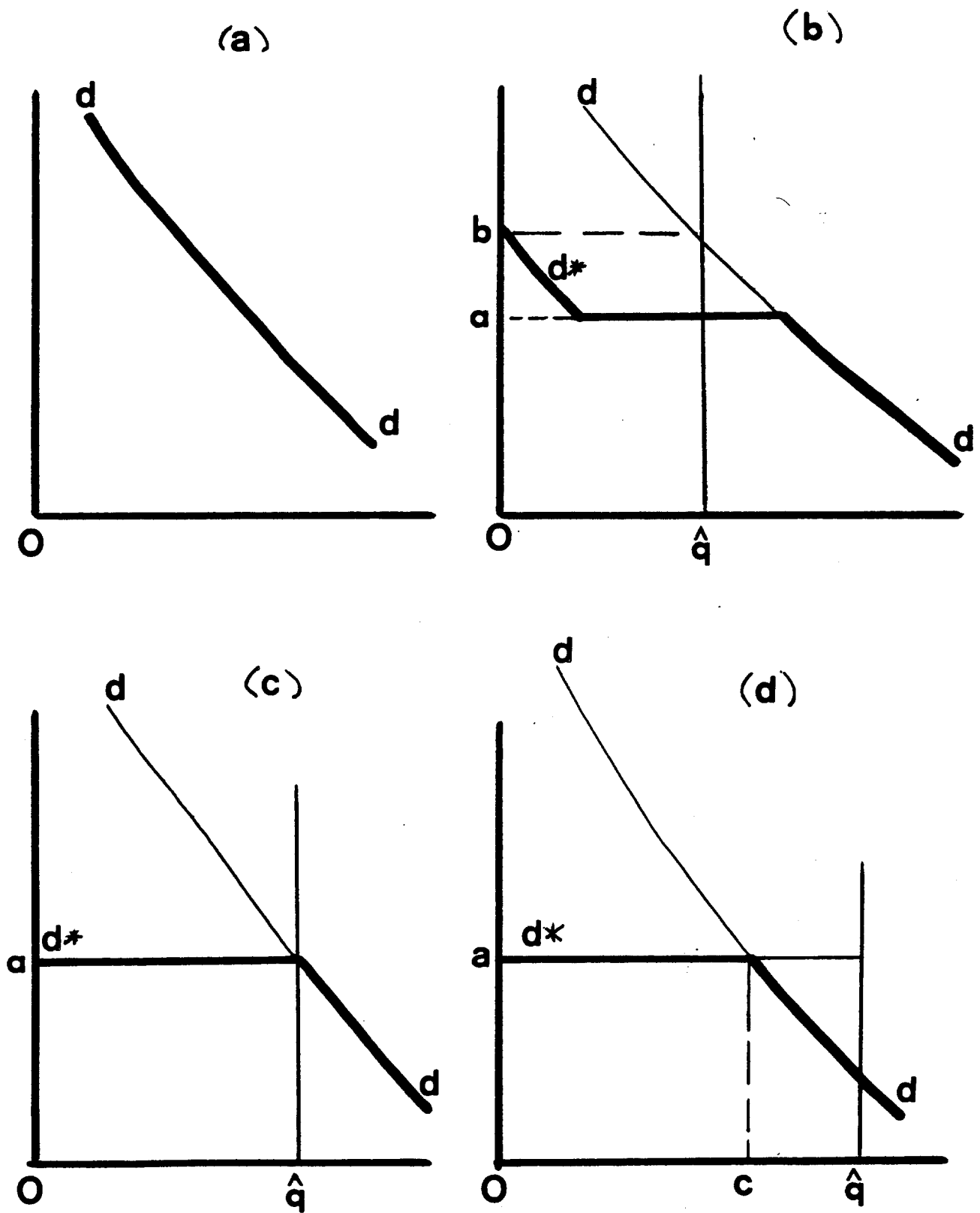


FIGURE 2

**Representative demand functions with
non-tradable coupons**

with exactly the correct amount of ration coupons given the official state price of O_a . The function d^*d is the appropriate free market demand in this case. No additional amounts would be demanded at free market prices above O_a , and all ration coupons would be discarded at free market prices below O_a .

Finally, panel (d) shows the free market demand function, d^*d , for an individual with more than sufficient ration coupons at the official price of O_a . Even if no free market existed, this person would discard coupons covering the volume $c\hat{q}$ at the state price of O_a . At prices below O_a , the free market demand would coincide with total demand. At open market prices above O_a , no free market demand would exist since all grain needs could be met with coupons at price O_a .

Next consider a horizontal summation of the demand functions of all consumers from each of the four representative groups of figure 2. The total grain demand, shown in panel (b) of figure 3, is DD . It is the sum of all dd functions. The aggregate free market demand, net of rationed consumption, is the heavier function D^*D . The portion of D^*D above the ration price of O_a is the free market demand by consumers who have either no coupons at all or insufficient coupons at price O_a . The horizontal segment, sm , of D^*D at O_a reflects the potential replacement of ration consumption with free market demand should the free price equal or dip slightly below O_a .

The quantity \hat{Q} in panel (b) is the total amount available through rationed distribution. At the price of O_a , the quantity r_s represents the amount demanded in the free market by those who have been issued no coupons. The quantity O_r is, therefore, the free market quantity demanded

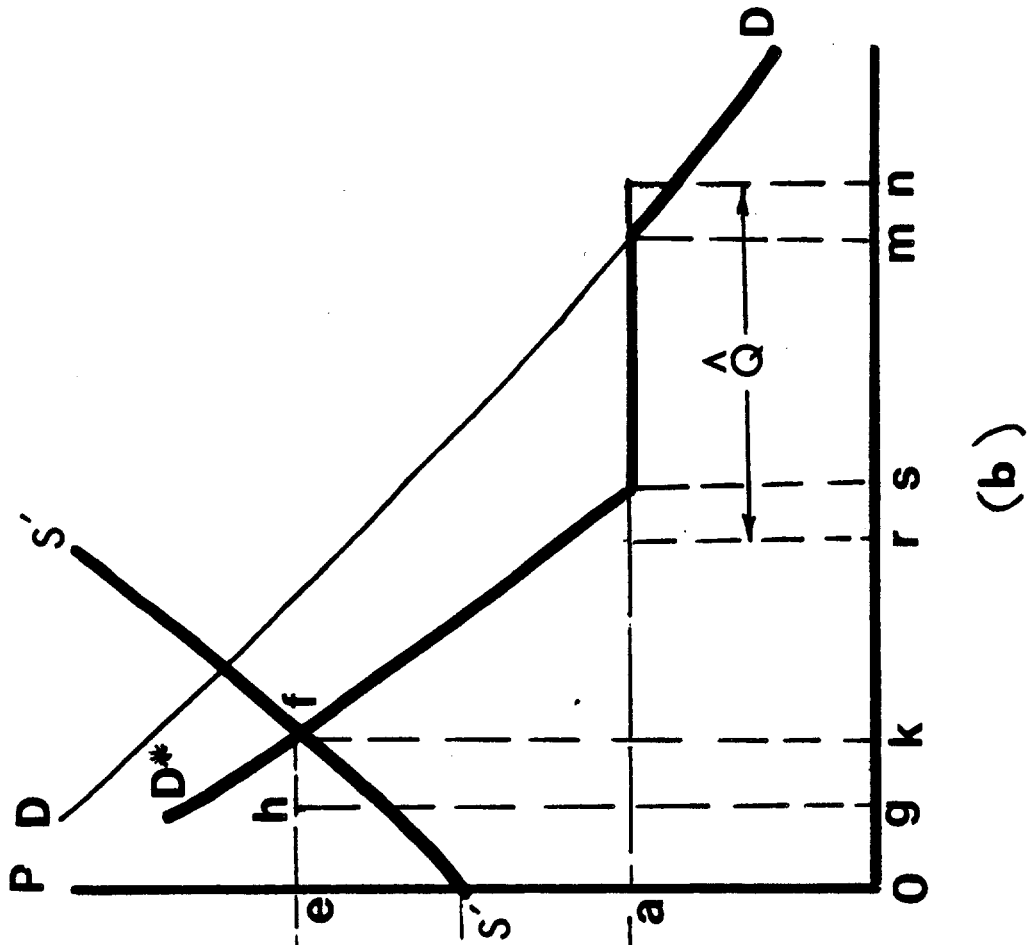
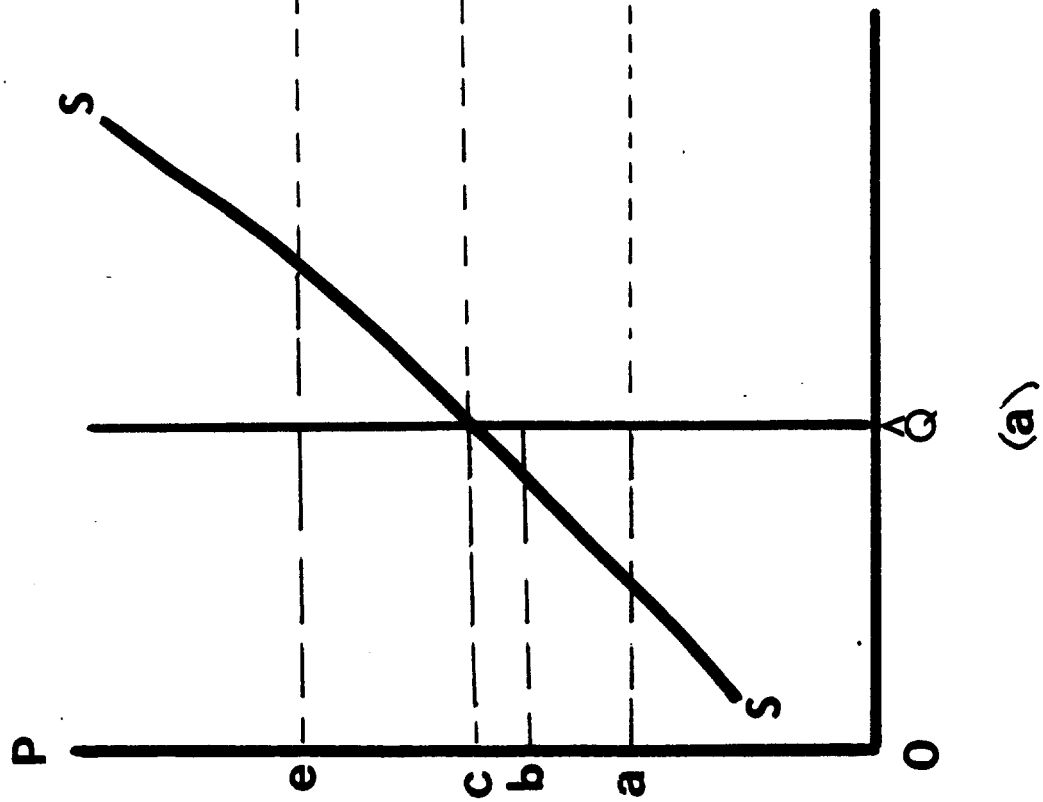


FIGURE 3
Parallel grain markets with
non-tradable coupons

by those whose ration entitlement is insufficient at the price of Oa . At the other extreme, the quantity mn is the total amount, if any, by which some individuals' ration entitlements exceed their needs at the price of Oa .

The supply side also needs to be reconsidered in the presence of a parallel free market. Panel (a) of figure 3 is basically the same as the supply side of figure 1. The aggregate marginal cost curve of food grain is depicted as SS , and \hat{Q} is the aggregate mandatory delivery quota. Farm households must deliver \hat{Q} at, perhaps, price Ob .^{2/} However, they may sell additional amounts privately on the open market. If the open market price is Oc or above, they presumably will sell at least some volume on that market.

The function $S'S'$ shown in panel (b) is the schedule of quantities that will be supplied to the open market at various prices above Oc by profit-seeking farmers. It is the supply function of free market grain and is the horizontal difference between SS and \hat{Q} .

The intersection of $D*D$ and $S'S'$ determines the free market price, Oe , and the amount traded in that market, Ok , when (1) the ration price is Oa and (2) when \hat{Q} is both the mandatory grain delivery by farmers and the amount available for state distribution to consumers. Farm revenue accounted for by the open market is the value $Oefk$ in panel (b). Three distinct grain prices emerge in this setting--the free market price of Oe , the state-controlled consumption price of Oa , and the state-controlled price paid to farmers for quota deliveries, Ob . The average per unit value (price) of grain received by farmers in this setting will be a weighted average of Od and Ob , where the weights are, respectively, the proportions

of sales to the free market and quota deliveries to the state. The average price paid by consumers will be a weighted average of the free market price and the official ration price with the weights being, respectively, the proportions of purchases in the free market and from rationed supplies.

With a parallel market for grain, the free market price allocates both farm production resources at the over-quota margin and marginal consumption expenditures beyond the rationed volume. With given supply conditions, the gap between the free market price and the official ration price is directly linked to the extent of excess demand for grain beyond \hat{Q} at various prices. The larger this excess demand, the wider this price gap will be. Alexeev shows that in a rationing environment based on queuing, as in the USSR, this price difference is linked directly to the time consumers expect to spend waiting in line for rationed volumes. This is equivalent to measuring the relative scarcity of ration coupons in the Chinese context.

A currently realistic situation can be identified in which the quota amount procured from farms by the government is less than it actually obtains for ration distribution and for other requirements such as stocks, military use, exports, etc. In this case, the government essentially acts as part of the open market demand. Its over-quota demand can be regarded as part of D^*D in much the same sense that panel (a) of figure 2 represents potential grain buyers who are wholly outside the ration system. In this case, the state actually competes with the free market for over-quota grain supplies, paying the over-quota price of O_e in panel (a) of figure 3.

Suppose, for instance, that the quota procurement is approximately equal to ration requirements, but the government needs an amount equal to O_g in panel (b) for other purposes. It buys that additional amount at the

free market price of O_e , thereby increasing government budgetary costs in the grain sector by the amount O_{ehg} . It may or may not recover those costs from its eventual disbursement of that volume. Other free market purchasers procure g_k at the price of O_e . It is, of course, possible for the government to manipulate the free market price to some extent by increasing or decreasing its open purchases in that market. However, the government can either purchase a given amount on the free market or manipulate the market price. It cannot do both.

Naturally, many other interesting scenarios and situations can be examined with the diagrams in figure 3 or with suitable shifts and variations on them. Recall that a key assumption in this particular analysis is that ration coupons are not transferable among consumers. Now let us look at the end of the spectrum where coupons can be freely sold, purchased, or traded among consumers.

Tradeable Ration Coupons

In this case, we assume, as before, that ration coupons are issued to individual consumers on administratively determined criteria. However, let us now suppose that these coupons, once they are issued, can be legally traded among the original recipients and others. Now there is a parallel market for both grain and state-issued coupons. This is tantamount to assuming that retail grain itself can be bought and sold openly from one individual to another, possibly including purchases from state ration shops for private sale to others. Thus, the coupons become a vestige of the earlier, fully controlled distribution scheme; here they are purely an income transfer from the government to the recipients.

No supply side changes from the previous example need be introduced

for this case. The parallel grain marketing system is still in place with the government operating as the sole procurer of mandatory quotas and as only one of several buyers in the legal, open market.

Now consider how coupons might be traded among consumers. Figure 4 shows the partial equilibrium demand function, dd , of a representative consumer who has been issued ration coupons equivalent to \hat{q} . Assume that the official rationing price in the state shops is Oa . At this price, the consumer pictured here would like to buy ak units of grain but is restricted to \hat{q} at the official price.

Now imagine that a parallel free market in grain exists in which the price for any and all buyers is Ob . Facing an unfulfilled demand for grain at the official ration price, this buyer would be willing to offer coupon holders money for their excess coupons as long as the official price plus the coupon exchange price does not exceed the free market price. Alternatively, this buyer would be willing to enter the free market for fg units of grain at the going price of Ob . In the coupon market, the consumer in figure 4 could offer the maximum amount of gj (in money) for each of fg units of coupons, this being the difference between the state price and the free market price. The dark shaded area indicates either the value of coupons purchased or the equivalent additional expenditures on free market grain above the official value.

Now suppose that the free market price was higher, at Oc . The consumer pictured in figure 4 would be willing to offer a maximum of me coupons for sale as long as the per unit value of each coupon in the market was at least eh . This is because the opportunity cost of consuming any part of \hat{q} is the free market grain price. As long as this opportunity

cost of consumption is higher than the grain's value in use, indicated by the demand price along dd at each quantity, the consumer would be willing and eager either to sell coupons to others or to resell grain purchased at the official price in the higher-priced free market. The diagonally shaded area in figure 4 is the value that would be earned by the consumer either by selling excess coupons or by arbitraging me units of grain between the rationed market and the free market.

These examples illustrate the idea that the ration coupon entitlement with parallel open markets in both grain and coupons is essentially an income transfer from the government to coupon recipients. In general, only part of that income transfer will be utilized for grain consumption if coupons can be traded. The article by Edwards also illustrates these points with indifference curve analysis.

As some coupon holders offer coupons or grain for sale, and as some consumers enter the free market for coupons or grain, the open market price of grain will be subject to change. It will rise or fall until the amount of grain supplied in the market (rationed plus free quantities) is equal to the amount demanded. Figure 5 shows how the total grain market will tend to adjust to these two parallel open markets.

If only \hat{Q} were available in the retail market, the grain price would rise in the free market to Oc . The rectangle $acfe$ is the trading value of the coupons issued. Some coupons will be bought and sold and some will be used for grain by the recipients themselves. All persons in the system will view the free market price of Oc as the opportunity cost of grain consumption and will act accordingly.

The picture will change if we allow farmers to respond to higher free

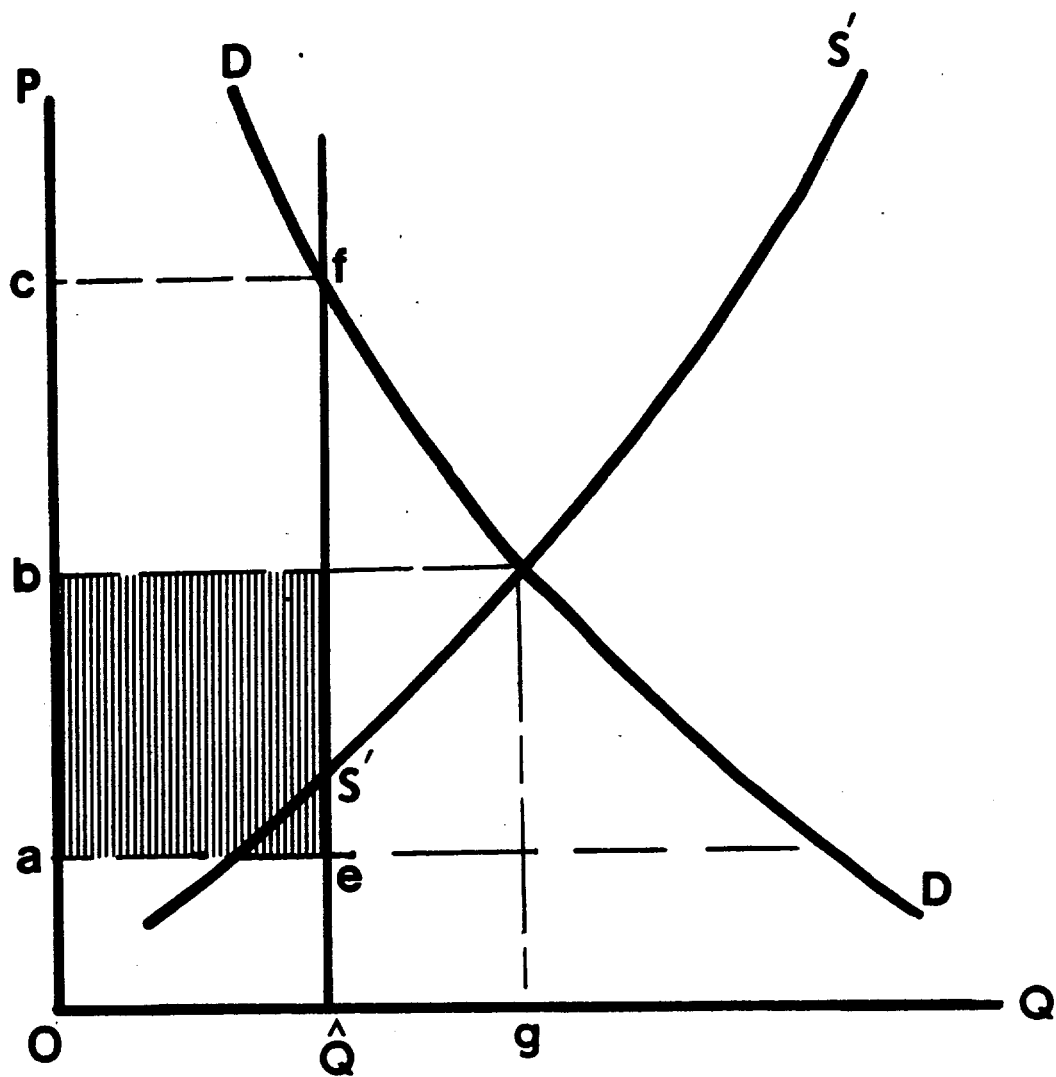


FIGURE 5

**Parallel grain markets with
tradable ration coupons**

market prices and sell output beyond \hat{Q} into the free market. This market supply function is shown in figure 5 as $S'S'$. It is the same construct as in panel (b) of figure 3 except that now it begins not from the vertical axis but from a point on the vertical extension of \hat{Q} . That point is the minimum price at which additional output will be called forth beyond quota deliveries. In fact, $S'S'$ is simply the upper portion, beyond \hat{Q} , of the basic marginal cost function SS shown in panel (a) of figure 3.

Any added production, beyond \hat{Q} , will tend to press down the free market price, to O_b in this illustration. This is the same price that would occur in a completely open market without quotas or rationing. The total amount O_g will be supplied and consumed of which \hat{Q}_g will be quantities not covered by coupons. Obviously, the free market price of O_b will lie between the official ration shop price of O_a and \hat{Q} 's full demand price of O_c . The cross hatched area in figure 5 shows the "rent" value of the ration coupons. It is the total market value of income transferred to coupon recipients by the government.

Some Comparisons and Extensions

When there are two parallel markets, one for grain and one for coupons, the free market equilibrium price will tend to be the same as in an uncontrolled market for that commodity. When there is a parallel market for grain but not for coupons, the free market price for grain will tend to be higher than if coupons are tradeable. This is because there are persons in the system who will demand additional grain but have no legal access to additional or, perhaps, any coupons. Those who have excess coupons relative to their needs cannot trade them legally. Hence, consumers as a group probably would prefer a system with parallel markets for both grain

and coupons. This is because free market prices are lower, and the coupons can be used either for food purchases or sold for money which then can be used freely. This general conclusion is similar to that suggested by both Flowers and Stroup and by Edwards via different analytical routes.

On the other hand, farmers probably would prefer a parallel system in which ration coupons are not tradeable. Their free market sales would earn more than otherwise, and, presumably, the prices paid to them for \hat{Q} would not be affected. This conclusion also echoes the view of Flowers and Stroup that producers will favor schemes in which coupons are not tradeable.

Naturally, both consumers and farmers, as purely economic actors, would prefer any system featuring one or more parallel free markets to a system with none. In China today, the grain market can said to operate someplace between these two theoretical extremes. Coupon trading is not strictly legal or encouraged, but it often occurs, without large risk to the traders.

The question of coupon life has not been confronted in this static analysis. The implicit assumption in the kind of reasoning used here is that the quantity variables represent amounts demanded, supplied, traded, or consumed per unit of time. The reality of Chinese grain coupons is that they do not lapse once they are issued; they can be used or saved. Where ration coupon trading or saving is possible, coupons become very similar to money. They can be used for low priced grain, traded for money or other goods, or simply saved for future contingencies. When, as now, there is a large inventory of unused coupons held in private hands, a widespread, vested interest in the continued operation of the rationing system is

created. Anyone holding coupons has a stake in the system. Any strong hint that the system were about to be discontinued or that existing coupons might not always be redeemable would likely cause a massive run on the state-controlled grain market that could not be easily contained.

The income effect of the traditional coupon disbursement also has not been explicitly considered but needs to be recognized. The various partial equilibrium demand curves described in this paper are drawn on the basis of a particular disposable income distribution which was assumed not to change within the context of the discussion. The value of the coupon distribution in use or in exchange is clearly an important part of the income for urban consumers. Any change in this distribution would affect the position of the demand curves in the price-quantity quadrant. A cut in the distribution would shift demand curves to the left, an increase would shift them to the right. In addition, rises (or falls) in the free market price of grain relative to the state's ration price would increase (or decrease) these income equivalents with consequent effects on grain demand functions.

Concluding Comments

The basic aim of this paper has been to illustrate the nature of China's grain policy with rather simple partial equilibrium ideas from neoclassical economic theory. An important distinction is made between the strong central controls exercised before the economic reforms were begun in the late 1970's and the increased, but not complete, reliance on open markets characterizing the 1980's. The operation of a partial free market for grain in China can be viewed as an example of pricing and allocation under parallel markets with consumer rationing.

The complex reality of grain production and distribution in China is surely not exhausted by this approach, and it may be somewhat artificial to bend that nation's arcane grain system into this abstract setting. Yet as long as economic reform and market forces play a role in China's agricultural and food policy, these ideas will fit the situation ever more closely.

FOOTNOTES

1. This paper's approach to consumer demand theory under rationing is quite elementary. It relies heavily on the partial equilibrium context in which a function can be drawn between prices and aggregate quantities demanded of a given product without the complexities of how administratively determined ration entitlements, once issued, continually affect the shape and position of the functions. More rigorous treatments of the theory of consumer choice under rationing are presented by writers such as Tobin, Deaton, and Howard. A very useful 1974 article by Edwards illustrates individual consumer choice under coupon rationing in circumstances similar to those posed in this paper.
2. Here we ignore the effects of input subsidies for fertilizer and diesel fuel which are paid to farm households as they deliver quota grain to the governments. Such payments would lower the SS function to the left of \hat{Q} .

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