AN ASSESSMENT OF CHINA'S GRAIN MARKETING SYSTEM: HISTORICAL EVOLUTION AND FUTURE DIRECTION

by

FU-NING ZHONG

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ABSTRACT

In the past four decades China relied on heavy investment in the producer goods sector to achieve rapid economic growth at the cost of current consumption. The grain procurement and rationing system was established to restrict rural consumption and to extract agricultural surplus for development purposes. However, the new economic policy since 1979 has gradually shifted to favor efficiency, and the government is now considering abolishing the procurement system. This suggests that the procurement system and the past development strategy itself may not be the appropriate policy instrument to achieve rapid economic growth in the long run.

Following Feldman, this study built a growth model to describe the past development strategy. It was found that the strategy did not bring about what policy makers had expected from it. The unexpected trade-off between sacrificing consumption for investment and economic efficiency led to the failure of the development strategy, and suppressed grain production was one major factor contributing to low morale and low economic efficiency.

Some costs of implementing the procurement system were analyzed in this study. A marginal income/work incentives model showed that the procurement system was most responsi-

ble for the low marginal income and low work incentives on collective farms, and caused a downward shift of the grain production curve. Furthermore, it is found that the procurement system prevented peasants from utilizing comparative advantage of their farm land in growing different crops. The extent of specialization and regional exchange was also restricted by the procurement system.

Economic theory suggests that while the free market may stimulate grain production, reduce distortion in resource allocation, and improve economic efficiency, a general tax scheme may raise the necessary investment funds from both grain and non-grain sectors. It is also recommended that the procurement system may gradually be abolished, and that state grain agencies may be turned into commercial enterprises, in order to reduce the disturbance and costs in the transitional period, and to encourage competition in grain marketing.

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Chapter I

INTRODUCTION

1.1 PROBLEM STATEMENT

A state monopolistic grain marketing system, or as the Chinese call it, the "unified grain purchasing and marketing system", was established in China in 1953. Under this system, a compulsory delivery quota was assigned to each production unit--an individual peasant, a producers' co-op, a People's Commune or a production team. These production units had the obligation to sell a fixed quantity of grain to state grain agencies at the administered prices. State grain agencies also had the sole right to purchase grain "surplus" from producers. The price for purchasing the surplus was set by the agencies, and the quantity of such purchase was often fixed.

Since 1985 the grain procurement system has been renamed the "contracted purchasing system". The new system is essentially the same as the old one. A "contracted purchasing quota" is used to substitute for the old "unified purchasing quota". However, the quantity of the quota, as well as the price, are still set by the state, and are not subject to real negotiation or contract. The only difference is that the failure to fulfill the quota obligation now is more tol-

erable due to the changing political and economic environment.

The procurement quota and the administered price were the two related instruments used by state grain agencies to accomplish their policy objectives. For a long time, the state channel was the only legal grain marketing mechanism. All private grain marketing was made illegal but was sometimes tolerated.

However, since the economic reform initiated in December 1978, free markets for grain have been formally reopened. The importance of the free markets has been increasing rather quickly. The state grain agencies themselves have become the major participants in the free markets. Now they purchase grain through both compulsory procurement and free market channels. As the quantity of quota has been gradually decreased, the share of grain purchased from free markets is increasing. The Chinese government is now considering freeing grain prices in the near future, and this has already been experimented within some areas.

Procurement quota and administered price are related to each other. If the state is going to buy grain at market prices, the procurement quota will no longer be necessary. Anyone can easily meet his/her delivery quota by buying grain from the free market and then reselling it to the state agencies at the same price. It means, therefore, after

35 years of implementation, the government now is preparing to abolish the compulsory procurement system totally.

The change in the grain marketing policy, or at least the intention to change the policy, raises several interesting questions. What were the objectives and the role of the marketing system? How did it perform in the past? Were its policy objectives justified? If so, was it an appropriate policy instrument? And why is it going to be abolished?

To answer these questions it is necessary to examine the objectives and performance of the grain marketing system in a broad framework. The basic objectives of the grain marketing system were: a)to extract agricultural surplus for industrial investment; b)to ensure increasing grain supply for urban use; and c)to distribute relatively scarce grain more equally among regions. All three objectives are related to each other and serve the same purpose--to speed up industrialization and the growth of the whole economy. In fact, the grain marketing system itself is a part of the overall economic development strategy, and should be examined accordingly.

In the post revolutionary era, pulling China out of poverty and backwardness was the common desire of both the people and the government. Logically, speeding up economic growth was the top priority. With abundant labor supply, capital seemed to be the only restrictive factor and invest-

ment was crucial to the growth rate. In a country more or less isolated like China in her early years, faster capital accumulation implied that a relatively large share of national income had to be diverted into investment. In other words, consumption had to be restricted in one way or another. The strategy may be expressed as speeding up economic growth as quickly as possible at the cost of current consumption.

As marginal propensity to consume is high in a low income country, restricting consumption required collective or centralized decision making. The government was more than willing to take that responsibility. State ownership gave the government direct power to allocate incomes from the industrial sector. But the strategy would not be successful if rural economy was left alone. As heavy taxes were not acceptable politically, a compulsory procurement system seemed to be a logical choice in the early 1950's. Through the procurement quota and the administered price, the government was able to extract agricultural surplus and turn it into industrial profit and investment.

Although sacrificing current consumption to economic growth was acceptable to some extent, the strategy to achieve the objective was not without its limits. Past experience suggests that overrestriction of consumption has done more harm than good. The effect of higher investment has been offset by the decline in economic efficiency. This

study examines the extent to which the strategy has served its aim, how the grain marketing system has played its role in the strategy, and the effect the system has had on grain production.

Lack of work incentives on collective farms has been noticed for years. It has been mainly attributed to the procurement system and the collective farming system itself. However, some studies, such as that by Israelsen, have suggested that the collective farming system itself may not necessarily lead to low work incentives.

Subject to the above mentioned growth strategy, the compulsory procurement quota, rather than price incentives, was the main measure to ensure increasing supplies of grain and other farm products. The administered price was used to extract investment funds. The marketing scheme was probably the dominant factor contributing to low work incentives. This study tries to identify to the extent to which the marketing system has influenced work incentives and how it has served its second objective--ensuring increasing grain supplies.

In the early 1980's some peasants were complaining of "difficulties in selling grain" while some others did not have enough to eat. This situation continued for several years, which indicated that the marketing system also had difficulties in meeting its third objective--distributing

grain more equally. This study also tries to identify the problems of the system in interregional grain transactions.

Furthermore, an efficient marketing system should be able to encourage a better use of comparative advantage among regions. This would also facilitate achievement of the other two policy objectives. However, as the evidence showed, such might not be the case. This study analyzes the performance of the marketing system in this aspect.

In summary, the fact that the Chinese government is preparing to abolish the compulsory grain procurement system suggests that the objectives and the role of the system should be reexamined in the context of the economic development strategy itself. The difficulties of the system in meeting its objectives indicate that whether the system is the right policy instrument is also questionable. This study will tries to analyze to the extent to which the development strategy is justifiable, the role of the marketing system in the strategy, and the extent to which the marketing system serves its objectives.

1.2 KEY LITERATURE

To examine the development strategy, a formal economic model is necessary, but none has been presented in China, not even for discussion. However it is believed here that a theoretical model might be built to explain the actual economic development to some extent. This model may not exist explic-

itly in planners' minds but may underlie their objectives, with the basic assumptions and constraints in their mind. At best, an ideal model might be able to explain the strategy as if the planners had actually followed the model.

After the founding of the People's Republic, the major task facing the government was to speed up industrialization and economic growth. The basic constraint in resource endowment was the extreme shortage of capital while labor supply was abundant. Any model or plan must be based on these conditions and the above objective.

In the 1920's, the Soviet Union faced the same issue: how to speed up economic growth when capital was scarce. A growth model was built by Feldman in 1928, his study was reinterpreted by Domar, and summarized by Taylor(Domar, 1957 and Taylor, 1979). The model divided the whole economy into two categories: capital goods and consumer goods. Capital was assumed to be the only scarce factor and the output/capital ratio was assumed to be constant. A closed economy and fixed prices were the other two assumptions. According to Feldman, the allocation of new investment between the two categories was the major policy variable. Subject to the savings rate, the model should determine the growth pattern of each category. In 1953, Mahalanobis built an essentially equivalent model for India, as India faced the same problem after independence(Also see Taylor, 1979.). This similarity suggests that a kind of Feldman's model might be able to explain China's economic development strategy.

The assumptions of the economy being divided into two categories and that of a closed economy with fixed prices do not conflict significantly with the rigid centralized plan, which was usually made in physical terms, especially between the mid 1950's and the mid 1970's. Capital being the only scarce factor seems to be an appropriate assumption. The assumption of a constant output/capital ratio may not hold in reality but might be taken as an approximation.

Although Feldman took the savings rate as a parameter to explain economic growth patterns, and despite the Chinese government saying that the investment/consumption ratio was the major policy variable, the savings or investment rate does not have an independent effect in this kind of model at all. If the whole economy is divided into two categories, the real investment, which equals savings, is fixed at any time regardless of whether prices are fixed or not. As one can not use consumer goods to invest, any potential increase in capital goods must come from the new investment in that category made in the previous year. Thus in the long-run, the investment or savings rate is to be determined by the allocation of investment between the two categories.

Accordingly, Feldman's model will be modified in this aspect in this study. The modification may largely simplify the description of the potential growth patterns of the economy. In this study, different growth patterns will be examined for three alternative policy objectives: gross

total output, net total output and total consumer goods. The validity of the model and the results of violation of the assumptions will then be explored.

The low work incentives on collective farms have been analyzed by many authors: Bonin, Bradley, Cameron, Chinn, Domar, Israelsen, and Ward. As summarized by Bonin and Putterman(1987), the compulsory procurement quota and administered price are two of the major contributors to low work incentives. The collective farming system itself is another important factor leading to low work incentives.

A study by Israelsen, however, found that collective farming may not necessarily lead to low work incentives(Israelsen, 1980). In his model, three kinds of ideal economic organizations were identified--a commune, a collective and a capitalist farm, and the marginal income of a typical individual worker was used to measure work incentives. The results are quite interesting. If all three kinds of farms have identical production functions and operate in the optimal range, the collective farm, where incomes are distributed solely according to work, is likely to provide its members with the highest work incentives.

On a commune, where incomes are distributed equally among members, the marginal income is at the lowest level, being only a small fraction of the corresponding marginal product. On a capitalist farm, the marginal income is likely to be

equal to marginal product. On a collective farm, the marginal income of an individual worker is a convex combination of marginal product and average product. In the optimal production range, where average product is greater than marginal product, the marginal income of a collective worker is greater than marginal product and hence greater than the marginal income of his counterpart on a capitalist farm. In this case, the low work incentives are likely to come solely from the marketing system.

Israelsen's model is very useful in identifying and measuring the effect of the grain marketing system on work incentives and on the total output. However, there are neither ideal communes nor ideal collectives, as defined by Israelsen, in China. In reality, Chinese People's Communes are a mixture of Israelsen's commune and collective. Therefore, to separate the effect of the procurement system on work incentives from that of internal structure, a modified model is needed to describe the behavior of members in a Chinese People's Commune. This is attempted in this study.

Another problem with Israelsen's model is the failure to incorporate production cost into the calculation of marginal income. The introduction of cost may change the magnitude of the marginal income on a collective farm. This study tries to analyze to what extent the introduction of production cost will change the general conclusion.

The classical theory of comparative advantage suggests that relative productivity differentials will determine a country's specialization in production, and the direction of trade between two countries. Through trade, an economic gain will be achieved without hurting either party(Ricardo). This theory has been used to analyze the relative export shares of two or more goods from two countries to the rest of the world. MacDougall, for instance, found that the relative output/wage ratios between the U.S. and Britain varied among goods(MacDougall, 1951). As a result, the relative export shares from the two countries were determined by the difference in the relative output/wage ratios. Later, Balassa repeated similar research(Balassa, 1963). Since the relative output/cost ratios were used as the measures of comparative advantage between the U.S. and Britain in producing various goods, he concluded that comparative advantage determined the relative export shares.

The two studies suggest that after properly expressing the comparative advantage in some measures, the relative export shares, or in general, the relative specialization in production, could be explained under the free-trade assumptions. In other words, contradiction to this principle may indicate the existence of some restrictions on trade, and a potential loss in comparative advantage.

In the case of China's agriculture, the appropriate measure of comparative advantage might be the relative land pro-

ductivities in growing different crops. A modified MacDougall/Balassa model will be built to test whether the procurement system has prevented Chinese peasants from taking advantage of the productivity of their land in growing various crops.

1.3 SCOPE AND OBJECTIVES

The compulsory grain marketing system is a policy instrument serving the economic development strategy. Therefore, to examine the objectives of the grain marketing system inevitably involves examining the strategy itself. In this study, the performance of the system in serving the development strategy will be examined with a growth model which is believed to underline the development strategy.

Stimulating increasing grain supply and distributing grain more equally are the other two major objectives of the marketing system. To achieve its goals, the system should be able to encourage regional grain transaction and the utilization of comparative advantage. The performance of the marketing system in these aspects is examined with appropriate models as well as relevant evidence. For the purpose of this study, the analysis focuses on the institutional aspects of the marketing system.

Free markets for grain have been reopened since the late 1970's. The quantity of grain traded in these markets has been increased rather quickly. The importance of free mar-

kets as a complementary and as a potential alternative to the state marketing channel has become more and more apparent. In this study, the economic significance of the free markets is analyzed, and the role of these markets in the near future is discussed.

The objectives of this study are:

1)to analyze whether the procurement system facilitated rapid economic growth in the long run;

2)to analyze the relationship between the procurement system and labor productivity on collective farms;

3)to identify the potential losses due to resource misallocation caused by the procurement system;

4)to analyze the economic significance of reintroducing the free market mechanism; and

5)to discuss the potential changes in China's grain marketing system in the near future.

1.4 HYPOTHESIS

The three basic objectives of the grain procurement system--to extract investment funds, to ensure increasing grain supply, and to distribute grain more efficiently--are related to each other, and subject to the more fundamental strategy of rapid economic growth. The procurement system was designed to restrict rural consumption and to extract agricultural surplus for investment purpose.

However, it is believed here that the overrestriction on consumption might have led to sharp declines in economic efficiency, which might have offset any potential gain in economic growth due to heavy investment. Therefore, although the aim of the development strategy might be justified, the extent to which the existing policy serves its goal is still questionable. And the cost of implementing such a policy should be assessed, and be compared with the cost of other alternatives which would have served the same objective.

The first hypothesis in this study is that, in the long run, rapid economic growth cannot rely on heavy investment in physical capital alone. With given technology, the output/capital ratio may not reach its potential if economic efficiency is too low. In other words, the actually realized output/capital ratio may depend on work incentives which are partially determined by the level and growth rate of current consumption.

The second hypothesis is that the cost of the procurement system is likely to be higher than that of a free market system accompanied with an appropriate tax scheme. The procurement system was directly responsible for the lack of work incentives on collectives farms, and is the dominant factor leading to low work incentives in grain production today under the production responsibility system. Furthermore, the procurement system prevents the full utilization

of comparative advantages in agriculture, and results in losses in resource allocation. In theory, a free market system does not have these disadvantages, while an appropriate tax scheme may provide the same quantity of investment funds without such distortions.

1.5 BRIEF STATEMENT ON METHODOLOGY

Given the abundant labor supply and the assumption of a fixed output/capital ratio, the Chinese government chose the development strategy which emphasized physical investment at the cost of current consumption. This was done by long-standing allocations of a relatively large share of total investment into the producer goods sector. This strategy was expected to bring about faster growth first in producer goods and then in consumer goods. The growth rates in the two sectors were supposed to increase until a final equilibrium level was reached.

However, this development strategy may be challenged by the empirical evidence which contradicts the expected outcome. If the growth rates in both sectors actually decline over time under that strategy, the output/capital ratio may not be constant. Furthermore, if a more or less balanced allocation of investment between two sectors, which means less investment in the producer goods sector compared with the previous case, can lead to higher growth, then it may be taken as evidence that the output/capital ratio is inversely

related to the share of investment in the producer goods sector, at least in a certain range. If this is the case, the most plausible explanation is that the output/capital ratio partly depends on work incentives which are determined by the level and growth rate of consumption. Under this situation, another approach which requires less investment in the producer goods sector may lead to higher growth in the long run.

When there are other alternatives to achieve the same objective, the relative costs have to be considered. The most direct cost of the procurement system is the low labor productivity in the grain sector itself. Lack of work incentives on collective farms may be attributed to many factors, with institutional arrangement and the procurement system being the most likely. If it can be demonstrated that a)collective farming does not necessarily lead to lower work incentives compared with private farming, and yet the procurement system is bound to do so, and b)the quota-forced labor input cannot reach the production frontier, then the cost of the procurement system may be identified. That conclusion would be consistent when applied to the present household farming under the so-called "production responsibility system".

Another major cost of the procurement system is the unrealized gain in regional specialization and trade. In addition to the inadequate transport infrastructure, the rigid

procurement quotas are likely to prevent efficient resource allocation among crops in all regions, and to prevent grain being shipped to where it was valued higher. If, during some time period, some peasants were relatively free to make their own decisions regarding resource allocation they might have acted differently in order to maximize their income. The different manners might be used to test, and to measure the loss or unrealized gain under the quota system.

Contrary to the procurement and rationing system, the free market does not have a negative impact on work incentives, does not distort resource allocation, and does not prevent grain being used where it has the highest value. In other words, the free market system serves all the policy objectives, except extracting investment funds, assigned to the procurement system at lower costs. Therefore, if it is accompanied with an appropriate tax scheme, the free market may be superior to the existing procurement system. As such, it is treated as an alternative in this study.

1.6 ORGANIZATION OF REST OF THE THESIS

Following this introductory discussion, the next chapter provides a description of the evolution of the grain procurement system in China. This is followed by three chapters which analyze the role of the compulsory marketing system in economic development, the effects of that system on work incentives, and the effects of the system on regional grain

transactions. The sixth chapter discusses the economic significance of reintroduction of a free market mechanism and its future as a policy instrument. Finally, the major findings of the study are summarized in the seventh chapter.

Chapter II

STATE PROCUREMENT AND RATIONING SYSTEM

2.1 ROOTS OF GRAIN PROCUREMENT AND RATIONING POLICY

The main purpose of this study is to assess whether the state procurement and rationing system was an appropriate instrument to achieve its policy objectives for development in China. To facilitate the analysis it is necessary to look back at the history of the system: why it was established, how it functioned in the past, and how it has been changed over time. This chapter gives a brief description of the evolution of China's grain marketing system in the past four decades.

Although the state monopoly procurement of grain was introduced in China in late 1953, the involvement of the Chinese government in grain marketing started well before that. It dates back to the period of the Third Civil War(1946-49). At the beginning, government involvement in grain marketing was a kind of war-time measure and a method to fight inflation, but soon was given other policy objectives.

During the Second World War and the subsequent civil war, China suffered severely from inflation. It is reported that,

with the same amount of money, one could buy a beef animal in 1936 but only two grains of rice in 1949. According to Professor Xu of Nanjing Agricultural University, the general price index increased by 2.5 million times from 1937 to 1948 in Congqing City, the national capital during the Second World War, and the price of rice in Shanghai City increased by 43.7 times during the first eight months of 1948(Xu, 1983). This extremely high inflation rate was a major force contributing to the overthrown of the Kuomintang Government.

When the Communists entered the cities following their military victories in the late 1940's, their first task was to stabilize prices. This was considered very crucial to their final success. As the expenditure on food was the dominant part of living expenses in a poor country like China after 10 years of war, if the price of food could be controlled, so could the inflation. By redistribution of land to individual peasants through land reform, the Communist Party had won the support of the majority of the rural population. With the very strong political support of Chinese peasants and rapid recovery in agricultural production at that time, it was not difficult for the new government to acquire surplus grain and sell it in cities at low prices. According to Walker, the government's role in grain marketing had been increased in the early 1950's, although much of the grain was still marketed by private merchants(Walker, 1984). In 1952, the government collected 19 million metric

tons (mmt) of grain as an in-kind agricultural tax and purchased another 13 mmt. The total quantity acquired by the government was about 63 percent of the market needs in urban areas.

But, grain marketing, like any other economic activity, could not rely on political enthusiasm over the long term. As Walker pointed out, the gap between the state "list" price and that offered by private merchants was widened to about 20-30 percent in the early 1950's. As a result, state grain purchasing agencies found it more and more difficult to buy grain at their "list" prices.

Besides the difficulty in purchasing grain at the "list" prices, a more important fact was that, after three years of recovery, China started its First Five Year Plan in 1953. The core of the strategy was to build up the heavy industrial sector in a short time period, and the long term objective was to speed up economic growth through steadily investing a relatively larger share of the total national income into the producer goods sector. To achieve this goal the Chinese government believed that it was necessary to control the allocation of the total national income, at least to raise investment funds to the extent it desired.

In the industrial sector, most heavy industrial enterprises at that time were already owned by the state through nationalization of foreign enterprises and confiscation of

bureaucratic capital. Three years later, in 1956, all private enterprises were placed under state control in the form of "joint state-private ownership" or cooperatives. Through the state and "joint" ownership in the industrial sector the government could exercise its power to restrict urban consumption and allocate more resources to investment directly.

But the private or collective ownership in rural areas gave the government no role in revenue allocation. With agricultural surplus left out, the capital accumulation would not be as fast as desired, or as fast as possible. To increase agricultural taxes were not attractive politically and the government was unable to keep grain prices at the desired low level, so price schemes were chosen to extract agricultural surpluses. By purchasing grain and other agricultural products at relatively low prices and selling industrial products at relatively high prices, the state could extract the agricultural surpluses to invest in the industrial sector. The surpluses from the rural sector would appear as industrial profits collected from state enterprises.

As the low administered prices might reduce work incentives, resulting in less input and less output, procurement quotas were used to guarantee increasing grain supply. The rationing and planned supply were used to improve the equality in grain distribution, especially when grain supply was short. Therefore, a compulsory procurement and rationing

system was so designed to serve the policy objectives of speeding up economic development.

2.2 EVOLUTION OF PROCUREMENT SYSTEM, 1953-84

On October 16, 1953, the Central Committee of the Chinese Communist Party released a document entitled "Solution on Implementation of Planned Purchase and Planned Supply of Grain", which gave monopoly power to state agencies over grain marketing. Under this system, the state grain department was the sole buyer and seller. A grain procurement quota was assigned to each individual producer, indicating how much grain must be sold to the state at a given price. If a peasant could not produce enough for his own needs, as he might produce an industrial crop, or as the yield on his land was too low, the grain department would tell him the amount he was entitled to buy from the state. After collectivization, the quota was assigned to the cooperative, and to the production team when the People's Commune replaced the cooperative.

At the beginning, the quantity of quota was set according to the assessment of harvest, and the total amount in any area had to meet the state purchase plan. As it was extremely difficult to assess harvest accurately, and as this method could not encourage peasants to produce more, a "sanding (three-fix)" scheme was introduced in the spring of 1955. The so called "three-fix" refers to the fixing of the offi-

cially expected output, procurement quota, and possibly, grain supply.

Under the "three-fix" scheme, the expected (planned) output, procurement quota, and supply plan were made known before planting and would not change after harvest, except in the event of a severe disaster. The quantities were fixed for three years before any adjustment. Later on, this three-year period was extended to five years. Grain procured in this way was usually refered to as "fixed quota purchase", or "dinggou". Of course the state would encourage peasants to sell more than the specified quota when their actual output turned out to exceed the officially expected amount, but the selling was not made compulsory at the beginning.

As the demand for grain increased over time, the state had to increase its purchases. Since the procurement quota was fixed for a certain time period the state introduced "chaogou", or "above quota purchase" in 1957. The quantity of above quota purchase would be set annually in the spring, in the light of a possible difference between "actual" and "official" expected outputs, with the latter fixed along with procurement quota. This above quota purchase was said to be "obligatory", not compulsory. That is, the state would persuade peasants to sell that specified quantity of grain. There would be no penalty for failing to meet the requirement. Actually, after collectivization the state had little difficulty in persuading the above quota selling in the late 1950's.

From 1957 to 1972, the state paid the same price for "fixed quota purchase" and "above quota purchase". As the above quota purchase was not compulsory, the state found it increasingly difficult to acquire that amount despite the pressure it exerted on the leaders of cooperatives and subsequently communes. Therefore, a price premium of 20-30 percent was paid for the above quota purchase since 1972 to give peasants some incentives. As the price premium was not enough to ensure the purchase of the desired amount, the "above quota purchase" was made compulsory at least in some areas later on. In this case, if a production team had a bumper harvest and the output greatly exceeded the officially fixed expected output, a certain percentage, usually 30-40 percent, of the difference was required for the "above quota purchase" at the "above quota price" (quota price plus premium).

At the same time as the introduction of the above quota premium, the state introduced another category of grain procurement: "yigou", or "negotiated purchase". Production teams were relatively free to make decision on selling grain in this category. The price for this purchase was more flexible. In some areas it was the same as that for above quota purchase but in some other areas it was 30-50 percent higher.

Thus during the late 1970's there were four categories of state grain procurement: 1)"zhenggou", which refers to in-

kind agricultural tax; 2)"dinggou", which refers to fixed quota purchase; 3)"chaogou", which refers to above quota purchase; and 4)"yigou", which refers to negotiated purchase. In practice, the first two were combined into one and usually refered to as "tonggou", or "unified purchase". Sometimes it was also refered to as "quota purchase" for convenience.

At the beginning, the quantity of grain in-kind tax was set as a fixed percentage of the normal or expected output for each piece of cultivated land. Its nominal amount was thus determined with the quota price. As time passed, the quota price was raised several times but the nominal agricultural tax was fixed or even reduced in many areas. In practice, the tax, in nominal form, could be paid with the selling of other products such as cotton. And the quantity of grain set for in-kind tax was combined with that set for fixed quota purchase into a single figure. Therefore it was meaningless to distinguish grain acquired as "in-kind tax" from "fixed quota purchase".

In 1979 the state once again raised the grain quota price by 20 percent on average, and combined the third category, "chaogou", and the fourth, "yigou", into one category. The premium for this new category, also referred to as negotiated purchase, was set at 50 percent over the new quota price. Therefore, from 1979 to 1984 there were only two categories of state grain procurement: quota and above quota purchases.

2.3 GRAIN RATIONING AND PLANNED SUPPLY SYSTEM

To make the state monopolistic procurement program work, some form of control over grain distribution was essential. The state rationing of grain for human consumption and the planned supply for industrial and other uses were introduced into Chinese society almost at the same time as the "unified purchase" of grain.

In rural areas human consumption rationing was set in this way: grain producers were supposed to feed themselves with what was left after state procurement and the deduction for seed and feed. For those whose grain output was substantially lower than some officially determined figures, especially those who produced industrial crops, the state would supply them with a certain amount of grain. From 1955 onward, the quantity of this planned supply was fixed as a component of the "sanding(three-fix)" scheme. It was determined according to one's age, and local consumption level. Sometimes it was related to one's sale of industrial crops to the state.

A rationing system started in urban areas in August of 1955. The rationing standard was set according to one's age and occupation. A grain coupon was issued to each person who was classified as an urban resident, and could be used in state grain stores, food stores, restaurants, etc. Usually this coupon was locally-specific. It could only be used within the city or the province of issuing, but a kind of

nationwide acceptable grain coupon was also in use to facilitate travelling.

Grain coupons were issued monthly. In some areas they could be used at any time once they had been issued. In some other areas, they were generally valid for one month, or for the rest of the year. In many places, especially in the North, for example, in Beijing, the coupon was grain-specific. Not only was the total rationing quantity fixed, the proportions of rice, wheat flour, and coarse grain were also fixed. In the South, for instance, in Nanjing, the coupon was non-grain-specific in general. But in some years, the quantity of a specific grain would be assigned as an individual ration.

Generally speaking, the amount of monthly grain rationing was adequate in urban areas, except in the years of food crisis(1960-62), when the non-staple food supply was extremely short. Since the late 1970's, grain coupons were not necessary when people ate out, or bought manufactured foodstuffs such as cake or cookies. A 10-20 percent extra nominal charge would be levied on the grain involved.

By the early 1980's the majority of urban residents might have accumulated some amount of grain coupons so the monthly rationing was no longer binding in total quantity. But the coupon was still in use for two reasons. First, in many areas the grain coupon was grain-specific. The state grain

marketing system could only manage to feed most people with relatively adequate grain in total quantity. But people did not necessarily like the mix of grains supplied. The second and more important reason was the price difference between state purchasing and retailing. As mentioned above, in the 1980's, the average purchasing price was almost twice as high as the retail one. So the state would not give peasants any chance to sell grain to the state at a higher price and then buy back at a lower price.

In 1985, the grain rationing supply to rural areas was changed. Before 1985, some peasants were officially recognized as non-grain producers and entitled to grain rationing, paying the same price as urban residents, or paying the price which only covered quota purchasing cost. Since 1985, they have had to buy grain from the free market, or from state stores but had to pay the full cost which was equal to the above quota price plus marketing cost.

The state planned grain supply for industrial and other uses started at the same time as rationing, and was known as "unified grain marketing" when combined with rationing. Industries, such as textile, brewing, pharmaceuticals, etc., used grain as their input and were subject to state planned supply. The state also supplied grain to feed processing factories and animal farms. This planned grain supply was provided at a price similar to that for rationed grain before 1985.

Since 1985, those industries had to buy their grain input from the free market or from state stores at the going market prices, like those rural residents who had been subject to grain rationing. The state grain or commercial department might still supply them with grain but the price charged would have to cover the purchasing and marketing costs. These industries were encouraged to buy grain from the free market.

Restaurants and food manufacturers are somewhat different from the above mentioned industries. In the past their operation could be regarded as a form of rationing. They collected grain coupons when selling their products and paid it to grain stores when buying raw grains. Since 1986, those restaurants and food stores, which are more traveller oriented, have been supplied by the grain department at the "negotiated price", or have had to buy grain in the free market. In either case, their operation is like that of private merchants acting in the free market. Customers pay the market price for their consumption there and no grain coupon is accepted.

2.4 PROCUREMENT POLICY SINCE 1985

"Ten Measures Regarding Further Enlivening Rural Economy", a new policy, was released by the Party Central Committee and the State Council on January 1, 1985. The first measure was to reform the state procurement system. In the case of

grain, the "unified purchase" was to be abolished and a new "contracted purchase" would be in effect starting with the 1985 summer harvest.

According to the new policy, the commercial department, which was in charge of grain purchasing, would enter into agreements with peasants before the planting season on the type and quantity of grain delivery at the new price set by the state. Actually the quantity was still unilaterally set by state agencies. The new price in 1985 was set equal to the weighted quota and above quota prices with the former accounting for 30 percent and the latter, 70 percent. This 30-70 ratio was based on the fact that in 1984 above quota purchase already accounted for 70 percent of the total, therefore the average price would be kept at the previous level.

If peasants had a surplus after fulfilling the "contracted purchase" quota, they were free to sell it in the free market. State agencies could buy this surplus in the free market at the price determined by market forces if they wanted to do so. They also had an obligation to buy the above quota quantity offered by peasants at the former quota price if the market price dropped below that. As a sharp decline in market price was predicted for 1985 following six consecutive bumper harvests, the former quota price was set as the floor price to protect peasants.

Stated in the "Regulations Regarding Agricultural and Sideline Products Purchase and Marketing Contracts" (the State Council, January 24, 1984), the quantity specified in any purchasing contract had to be in accordance with the state purchase plan if the product was subject to the state unified purchase scheme such as in the case of grain, and the contract was bound by law. In this aspect the "contracted purchase" is only another name for the "unified purchase".

However, there was a difference in the price structure. Under the previous scheme, the marginal price was higher than the average so peasants were encouraged to produce and sell more. Under the new scheme, the marginal price was the same as the average, and 10 percent below the previous marginal one. So peasants now were encouraged to sell extra grain somewhere else, or to use it themselves.

This change reflected three related factors: budget subsidy burden, irrational price structure, and successive bumper harvests. From 1956 to 1983, the quota price for grain purchase was raised by 100.7 percent (Commerce and Price Department, State Statistics Bureau, 1984). Considering the above quota premium and the increasing share of above quota purchase, the average price increased by 229.0 percent (State Statistics Bureau, 1984).

But, grain retail prices in urban areas were kept constant during the same time period. The state saw it as meaningless to raise grain retail prices and wages at the same time. As the cost structure and demand elasticity vary from product to product, the subsequent adjustment in the economic plan was too complicated to the centralized decision makers. Therefore the state simply subsidized grain marketing agencies and consumers with budget revenue. Most grain subsidies were paid to the grain department to cover its losses. In the case of grain rationing, only a small amount of subsidies was paid directly to state employees, known as "mitie (rice subsidy)", to compensate for a grain retail price increase in the 1950's.

During the 30 years, the price differential had been widened to about 60-70 percent, with the retail price lower than the purchase one and without accounting for the marketing costs. Therefore the subsidies went out of control in the early 1980's. Lardy estimated that the state subsidies of food consumption had been 23.8 to 25.6 billion yuan in 1981, which accounted for about 23 to 26 percent of the total revenues of all central and local governments(Lardy, 1983). According to Professor An, Beijing Agricultural University, the government subsidies for marketing agricultural products were more than 20 billion yuan in 1981(An, 1983). He pointed out that the subsidies on grain, cotton, and edible oils accounted for 17 percent of the government budget-

ary revenue in 1981, compared to only 3.4 percent in 1978. The subsidies increased again in 1982, and that on domestic cereals alone reached 15 billion yuan which accounted for more than 13.3 percent of the total state budgetary revenue.

The desire to reduce the budgetary burden was largely enforced by the voices from grain or commercial departments who were in charge of grain procurement and distribution. With the purchasing prices higher than retail ones, the more grain they handled the larger would be the losses incurred in their operation. Compensation for such losses might not be so easy to get immediately and they must fight for additional funds needed in building new facilities in order to handle extra grain. In the meantime, since China already had six bumper harvests in a row, from 1979 to 1984, the "difficulty in selling grain" became more and more serious, as the grain or commercial departments were reluctant to solve problems in grain storage and transportation, and as the pressure on the state budget was too high.

The complaints from peasants and grain or commercial departments impressed many people including policy makers that grain then was oversupplied and some measures must be taken in order to change agricultural production structure which would lead to more efficient allocation of resources and higher per capita income in rural areas, and to reduce budgetary burden at the same time.

However, the situation has changed since the summer of 1985. Grain output went down by a big margin as much land had shifted to other uses and as the average grain yield dropped for the first time since 1979, which might indicate the reduced incentives in growing grain under the new scheme and due to inflation.[1] On the other hand, as the state had abolished its control on meat production and marketing, meat prices and then feed grain prices increased dramatically in the free markets. If the state wanted to buy extra grain in the free market it had to pay a price higher than it set for the contracted purchase, not as low as expected at the "protective" former quota price.

After only one year's practice(1985), the policy regarding contracted purchase was revised again given the new circumstances. The contracted quantity would be fixed for a three year period, and the total quantity for the whole country was to be reduced by 20 percent in 1986. The remaining procurement would be made at free market prices. This time it was not to protect peasants from free market price being too low but simply to increase peasants' income and incentives as market price was higher. So the state procurement system seemed to have gone back to where it was, with a

[1] As mentioned before, the new "contracted" grain purchasing price was 10 percent below the previous marginal price--above quota price. Also, while the grain purchasing price increased only one percent in 1985 over 1984, the general retail price index increased by 8.8 percent and the overall purchasing price index for all farm products increased by 8.6 percent(State Statistics Bureau, 1986). Therefore, grain production was less attractive to Chinese peasants in 1985.

new title and probably a higher price level.

But the grain marketing system did not really stop there. The state grain distribution system has embodied some free market elements. Part of the grain handled by it now is not based on compulsory procurement quota and rationing and supply plan. The price for this part is flexible and market oriented. Although this amount is very small compared with the total quantity handled by state agencies, further development in this direction can be expected as the Chinese government has announced its intention to reform the marketing system until finally freeing grain prices.

One objective of economic reform is to improve the overall efficiency of China's economy. The Chinese government realizes that this objective cannot be achieved unless market mechanism is established to guide resource allocation and to reform the structure of the economy. It has taken two steps in this direction: a) reducing the scale of quantitative planning, and b) reforming the price structure.

In the process of reforming the price structure, it has been proposed to free grain prices totally in several years, and experiments have been carried out in some places in 1988. The current two-digit inflation has postponed the process of the reform of price structure. However, no matter how slow is the pace of the reform, with occasional or frequent pauses, the reform of grain marketing system appears to be moving in the proposed direction.

Chapter III

ECONOMIC GROWTH AND COMPULSORY AGRICULTURAL MARKETING

3.1 CHINA'S DEVELOPMENT STRATEGY AND MARX'S MODEL

As discussed earlier, the grain procurement system was used as a major policy instrument to achieve rapid economic growth in China. Therefore, to justify the adoption of the system inevitably requires examining the development strategy itself. This chapter develops a growth model which is believed to underlie China's development strategy in the past four decades. Following Feldman, this model is a growth version of Marx's social reproduction theory. Empirical evidence is then used to test the validity of the model, and the role of the procurement system is assessed.

Past experience suggests that China followed a development strategy which relied on physical investment, especially that in the producer goods sector. As Table 3.1 shows, during most of the time of the first six Five Year Plan periods China invested more than 25 percent of her national income, with the heavy industry sector always getting relatively large shares.

This policy was supposed to bring about the fastest growth possible, first in the producer goods sector and later in

TABLE 3.1

Output and Investment Among Selected Sectors

	total output*			investment**			accumulation
	ag. %	l.in. %	h.in. %	ag. %	l.in. %	h.in. %	rate*** %
53-57	49.6	29.8	20.6	7.1	6.4	36.1	24.2
58-62	30.9	28.9	40.2	11.3	6.4	54.0	30.8
66-70	37.6	31.4	31.0	10.7	4.4	51.1	26.3
71-75	31.1	30.0	38.9	9.8	5.8	49.6	33.0
76-80	29.4	31.3	39.3	10.5	6.7	45.9	33.2
81-85	33.8	32.4	33.8	5.1	6.9	38.5	30.8

* The value products of agricultural, light and heavy industrial sectors are taken as a whole, ignoring other sectors such as transportation, construction, and services. All entries are average figures for the first six Five Year Plan periods.

** All entries are average shares of state investment during the same periods. They do not add up to 100 due to investment in other sectors.

*** Accumulation rate is the ratio of net investment to national income, economy wide.

Source: Chinese State Statistics Bureau. China's Statistical Yearbook, 1986.

the consumer goods sector. Finally, in the long run, the peoples' livelihood would be improved at an unprecedent rate as production capacity would have been expanded at the highest rate possible. However, as the consumer goods sector always got a relatively smaller share of total investment, this potential achievement would be at the cost of consumer goods or peoples' livelihood in a certain time period.

This development strategy could be explained best with a simple labor/capital model such as Feldman's. In 1928, Feldman built a growth model for the Soviet Union, starting from Marx's reproduction theory(Domar, 1957 and Taylor, 1979). In 1953, Mahalanobis introduced an essentially equivalent model for India(Taylor, 1979). The two models had the same basic point that the growth of the whole economy depended on the expansion of the physical production capacity, hence a faster capital accumulation would bring about faster economic development. It was not surprising as the capital shortage was the dominant common phenomenon in the 1920's USSR and the 1950's India, which overrode the differences in social institutions between the two countries from the development point of view.

The shortage in capital stocks suggests that a similar model might be relevant to the Chinese economy after 1949. There were some other reasons in addition to capital shortage. China's economic planning was heavily influenced by the USSR in the 50's and the early 60's. Marxian economic theory tended to heavily influence policy formulation and the selection of policy instruments. As a matter of fact, when the new economic policy started in 1979 there was a widespread discussion on Marx's reproduction theory. Therefore, a growth version of Marx's model might be useful in analyzing Chinese economic development policy.

Before such a growth model is built, it is useful to review Marx's reproduction theory, and to discuss its basic assumptions. The social reproduction theory, as presented in Volume II of Das Kapital, postulates that the whole economy can be divided into two departments: Department 1--producer goods, i.e., capital goods, raw materials, and intermediate goods, and Department 2--consumer goods. W1 is the symbol used by Marx for the total output of producer goods and W2, the total output of consumer goods. The total output of the whole society, W, is the sum of each department. The total output of each department, W1 or W2, can be decomposed into three terms (in value forms): C, V and S. C represents constant capital, equal to the sum of capital replacement, raw materials and intermediate goods consumed in production. V represents variable capital, equal to wage payrolls. S represents surplus value, equal to gross profit. The mathematical relationship between outputs and their components can be expressed as follows:

$$W1 = C1 + V1 + S1,$$

$$W2 = C2 + V2 + S2, \text{ and}$$

$$W = C + V + S = W1 + W2.$$

In the case of simple reproduction, i.e., when W1 and W2 are reproduced at the same levels over time, the condition of V1 + S1 = C2 hold. Under this condition, after putting aside C1 to replace the producer goods consumed in Department 1 itself, the rest of the output of Department 1, which

equals V1 + S1 in value terms, is equal to the producer goods consumed in Department 2(C2). Then, after inter-department exchange, all producer goods consumed in Department 2 in the previous year will be replaced by new producer goods provided by Department 1 and people engaged in Department 1 will get their share of consumer goods. The production of the whole society will be maintained at a constant level.

If V1 + S1 > C2, there is excess supply of producer goods. The social reproduction will be expanded and growth will take place. In this case, the excess supply of producer goods, or net investment, I, is equal to the difference between V1 + S1 and C2. I can be invested in either department 1 or 2, or it can be invested in both departments in some proportion.

If I is entirely invested in Department 1, the reproduction of Department 2 will be kept constant but that of Department 1 will be expanded as the new investment will expand capital stocks in the department, and provide more raw materials and intermediate goods. In turn, the increased output of producer goods will provide more capital goods for further investment. If this procedure continues, consumer goods will be reproduced at a constant level over time but producer goods will increase at the highest rate possible.

On the contrary, if I is totally invested in Department 2, there will be no increase in producer goods. Consumer goods will increase at the highest rate, but only at the beginning. As C2 increases at the highest rate but V1 + S1 is kept constant, soon the difference between V1 + S1 and C2 will approach zero. As the quantity of investment I declines to zero, no further increase will be possible in consumer goods.

Away from the two extremes, by investing I in both departments in different proportions, different growth patterns for each department can be obtained. There must exist a case in which the two departments will increase continuously and proportionally. This balanced growth may not be attractive to policy makers. If their objective is to increase the total output, which is an indicator of a nation's strength, at the highest rate possible, they may choose to set the share of investment in Department 1 as large as possible. Unlike the increase in the output of Department 2, which will be consumed immediately, the increase in producer goods will expand capital stocks which are sources of further growth. Therefore, the more they invest in Department 1, the higher the growth rate will be. This will be discussed in detail later.

Marx's reproduction theory fits China's economy quite well. There are four basic assumptions in Marx's model: 1)the whole economy is divided into two departments;

2)capital is the only scarce factor; 3)the economy is closed; and 4)prices are fixed. The first one, i.e., the division of the economy into two departments with no shifts of capital stocks between them, is not too strong an assumption for a centrally planned economy. As there is seldom transactions of capital goods among factories and as all factories usually continue to produce the same type of goods according to the government plan, the assumption is likely to be met.

The second assumption that capital is the only scarce factor in social production seems relevant to the Chinese economy. From the mid 1950's to the mid 1980's, the quantity of arable land per rural household dropped from about 0.8 to 0.5 hectare, while the use of farm machinery was widely spread out. Most peasants could not fully use their labor on such a small piece of land but had to stay in agriculture because the industrial sector was not able to absorb the surplus supply of labor. Therefore, with 800 million underemployed rural residents, a surplus labor force was always available.

The third assumption of a closed economy does not violate China's reality too much. China's economy was quite closed in terms of the ratio of foreign trade to GDP. According to the International Monetary Fund, the ratio of China's export to GDP was less than one percent in 1980. This ratio was likely even smaller before 1980, and it is unlikely that

there have been dramatic changes in this ratio in the past several years. Therefore the assumption is approximately satisfied.

The fourth assumption of fixed price is really not necessary as long as prices have no effects on social reproduction. In Marx's model, a change in price level will change W, C, V, and S proportionally and leave social production unchanged. The model can be viewed in physical or real terms.

3.2 A GROWTH MODEL FOR CHINA'S ECONOMY

The satisfaction of these assumptions suggests that Marx's reproduction theory can be used to describe China's economy. A growth model is built on the theory used by Feldman for the Soviet Union 60 years ago. In interpreting Feldman's model, Domar took the ratio of investment between two departments and the savings rate as two policy variables which jointly determined the growth patterns of investment funds, national income, and consumer goods. However, it was found in this study that the ratio of investment and the savings rate could hardly be taken as two separate policy variables. The quantity of actual investment[2] was restricted by the excess supply of producer goods, which was the

[2] In a centrally planned economy the quantity of investment is basically determined by the government plan regardless of the voluntary savings. In reality, the savings rate is forced to match the planned investment rate. Therefore it is more appropriate to use the investment rate rather than the savings rate.

result of the above-proportional investment, i.e., the investment share exceeds the share of capital stock, in Department 1 in previous years. In any time period, a high investment rate implies a larger proportion of the total investment being allocated into the producer goods sector. The objective of increasing the investment rate can only be achieved through increased allocation of investment into the producer goods sector first. Therefore, it is convenient to use only one policy variable to analyze those growth patterns.[3] It is found in this study that, given the ratio of existing capital stocks in the departments, the growth patterns can be expressed as functions of the ratio of investment between two departments.

To turn Marx's reproduction theory into a growth model, further assumptions are required concerning production technology. Although capital is assumed to be the only scarce factor, capital stocks do not appear in Marx's model. Here it is assumed that the production capacity is always fully in use and that coefficient a is the output/capital ratio, K is the capital stock and t is time, such that

(3.1) $W1_t = a_1 K1_{t-1}$, and

(3.2) $W2_t = a_2 K2_{t-1}$.

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[3] In reality, some goods can be used in both production and consumption. In this case, if the products of Department 1 are used for consumption or the products of Department 2 are used in production, the investment rate may be altered and not dependent soly on the previous allocation of investment funds. However, as this study assumes a totally divided economy, this case can be ruled out.

Furthermore, as W is the total output including material costs such as capital depreciation, raw materials and intermediate goods, it is assumed that coefficient b is the ratio of net to total output, i.e. the ratio of value added to total output. It is obvious that b will have a value between zero and unity: $0 < b < 1$. Then, we have

(3.3) $V1_t + S1_t = b_1 W1_t = a_1 b_1 K1_{t-1}$, and

(3.4) $V2_t + S2_t = b_2 W2_t = a_2 b_2 K2_{t-1}$.

From these assumptions we can derive the following equations:

(3.5) $I_t = a_1 b_1 K1_{t-1} - a_2(1-b_2) K2_{t-1}$,

(3.6) $W_t = a_1 K1_{t-1} + a_2 K2_{t-1}$, and

(3.7) $Y_t = a_1 b_1 K1_{t-1} + a_2 b_2 K2_{t-1}$,

where Y is net national income, equal to the sum of consumer goods and net investment, or, in other words, equal to net products in both departments (See Appendix A for details.).

The growth rates of W, W2 and Y are three alternative policy objectives. The growth pattern of the whole economy depends on which objective is chosen by the policy makers, as well as on the values of coefficients a and b. As the values of those coefficients are mainly determined by technology, the policy variable in this model is the proportion of investment in Department 1 to the total. Denoting this ratio as r, we have following relations:

$$I1 = rI, \text{ and}$$

$$I2 = (1-r)I,$$

where I1 is the investment in Department 1 and I2 is that in Department 2.

As simple reproduction is not of interest here, only expanded reproduction is considered. Thus, it is assumed that V1 + S1 is greater than C2 and growth takes place. As dK = I, growth rates of investment, total output, consumer goods, and national income can be derived from equations (3.2) and (3.5)-(3.7):

$$(3.8) \quad gI = \frac{dI_{t+1}}{I_t}$$

$$= a_1 b_1 r - a_2(1-b_2)(1-r),$$

$$(3.9) \quad gW = \frac{dW_{t+1}}{W_t}$$

$$= (a_1 r + a_2(1-r))\left(b_1 - \frac{1 - b_2 + b_1}{\frac{a_1 K1_{t-1}}{a_2 K2_{t-1}} + 1}\right),$$

$$(3.10) \quad gW2 = \frac{dW2_{t+1}}{W2_t}$$

$$= a_2(1-r)\left(\frac{a_1 b_1 K1_{t-1}}{a_2 K2_{t-1}} - (1-b_2)\right), \text{ and}$$

$$(3.11) \quad gY = \frac{dY_{t+1}}{Y_t}$$

$$= (a_1 b_1 r + a_2 b_2 (1-r))\left(1 - \frac{1}{\frac{a_1 b_1 K1_{t-1}}{a_2 K2_{t-1}} + b}\right).$$

If we assume that the values of a and b coefficients are constant over time, then those growth rates are determined by policy variable r and the ratio of capital of Department 1 to that of Department 2. This capital ratio, K1/K2, may change over time, but its value at any point of time is determined by policy variable r in previous years, and the base year ratio given. Therefore, by choosing different values of r, policy makers can alter the growth pattern of the economy.

The assumption of constant a and b coefficients requires fixed technology and constant efficiency. If productivity changes over time, so will the growth rates even if the policy variable r is kept constant. The violation of this assumption has very important implications on the actual results. As such, it will be analyzed in detail later. To simplify the analysis, let us assume that $a_1 = a_2$ and $b_1 = b_2$. Then equations (3.8)-(3.11) can be written as follows:

$$(3.12) \quad gI = abr - a(1-b)(1-r) = a(b+r-1),$$

$$(3.13) \quad gW = a\left(b - \frac{1}{\frac{K1_{t-1}}{K2_{t-1}} + 1}\right),$$

$$(3.14) \quad gW2 = a(1-r)\left(\frac{bK1_{t-1}}{K2_{t-1}} - (1-b)\right), \text{ and}$$

$$(3.15) \quad gY = a\left(b - \frac{1}{\frac{K1_{t-1}}{K2_{t-1}} + 1}\right).$$

Now assume that the value of r is constant over time, i.e., the policy makers set an optimal value of r according to their objective and keep it constant. Then there are three possible growth patterns for each of I, W, W2, and Y. The first one is a proportional or balanced growth. If r is set such that

$$r/(1-r) = K1_0/K2_0,$$

i.e., the distribution of I in two departments is equal to the capital ratio of the two departments at the base year, denoting this value of r as r*, we can derive the proportional or balanced growth rates from equations (3.12)-(3.15):

$$gI^* = gW^* = gW2^* = gY^* = a(b+r^*-1).$$

It means, for a constant value of r*, investment, total output, consumer goods and national income will increase at constant rates which are functions of r*. As the condition $r^*/(1-r^*)=K1/K2$ holds over time, capital stocks of two departments increase proportionally and the ratio of them keeps constant. Therefore, equations (3.8)-(3.11) have constant values given all constant coefficients. Furthermore, when $a_1 = a_2$ and $b_1 = b_2$, they are of the same value.

Now let us look at the second growth pattern. If the policy makers want to speed up the growth of the economy, they may choose to invest more in Department 1 in order to get higher increase first in capital goods and then in consumer goods. The value of r in this case will be set at r' such that $r' > r^*$.

From equation (3.13), it can be found that

$$gI' = a(b+r'-1) > a(b+r^*-1),$$

which means that the investment will increase at a higher rate than in the case of proportional growth. From equations (3.14) and (3.16), it can be found that gW' and gY' will be the same as gW* and gY* at the very beginning. However, as $r'/(1-r') > K1/K2$, K1/K2 will continue to increase until it reaches the value of $r'/(1-r')$. As a result, gW' and gY' will increase from $a(b+r^*-1)$, and gradually approach $a(b+r'-1)$. The growth pattern of consumer goods is somewhat different. As $r' > r^*$, from equation (3.15), gW2' will be less than gW2* at the beginning. But as the ratio of K1 to K2 increases, so does gW2' until it reaches $a(b+r'-1)$. At the extreme, when $r' = 1$, no increase in Department 2 is possible and gW2' will be zero. As I reaches the highest rate, gW' and gY' will increase with a higher speed, and approach the highest level sooner.

On the other hand, if policy makers want to increase consumer goods faster in a short time period they may choose the third growth scenario. In this case, they will choose a lower value of r, denoted as r", such that $r" < r^*$. Obviously gW2" will be greater than gW2* initially(See equation (3.15)). But as K1/K2 declines, so does gW2", until it reaches $a(b+r"-1)$, which is less than gW2*. The growth rates of W and Y will be the same as gW* and gY* at the very beginning and soon decline to $a(b+r"-1)$, which equals to

gI", and is less than gI*. If the value of r is set such that b+r" < 1, i.e. r" < 1-b, gI" will be negative and I will soon become zero. As a result, gW", gY", and gW2" all will become zero in a short time period.

Those growth patterns are illustrated in Figure 3.1. The case of r < 1-b is ruled out as we are interested only in sustained growth and no one in a developing country like China would choose a policy leading to zero growth in the long run. The case of r = 1 is also ruled out as no increase in consumer goods, which means a decline in per capita consumption as population increases, is not politically acceptable . Therefore the value of r is assumed to be set such that 1 > r > 1-b, and is assumed to be constant once it has been set up.

The assumption that $a_1 = a_2$ and $b_1 = b_2$ may not hold in reality. However, introducing different values for those coefficients only makes the analysis complicated. The general conclusion will not be changed. There will still be three kinds of growth: proportional, high and low. When the investment ratio is set equal to capital stock ratio, I, W, W2 and Y will increase at constant rates (See equations (3.8)-(3.11).), although those rates may differ from one another. When the ratio of investment shares is greater than the ratio of capital stocks, i.e., in the case of high growth, gI will be greater than in the case of proportional growth. Compared with those in the case of proportional

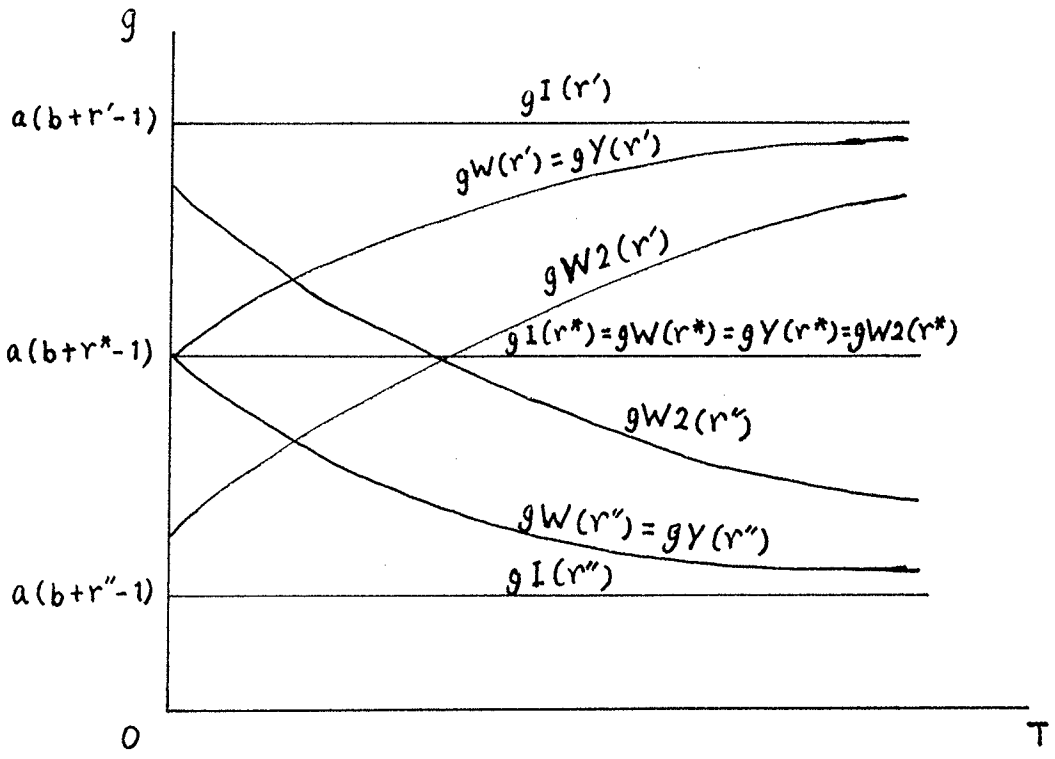

Figure 3.1: Growth Patterns

growth, gW2 will be smaller at the beginning, gW and gY will be indeterminate, depending on the relative magnitudes of a and a , and b and b . Nevertheless gW and gY will be greater than gW2. All three growth rates will continue to increase until the value of r/(1-r) reaches K1/K2. In the case of low growth, what will happen is just the opposite to that in the case of high growth, and will not be repeated here.

3.3 POLICY CHOICES AND IMPLICATIONS

From the above analysis, proportional growth is both balanced and sustained. A constant growth requires that the ratio of investment shares is set equal to the ratio of capital stocks at the base year. As a matter of fact, in either high or low growth cases, when the ratio of capital stocks eventually reaches the ratio of investment shares there will finally be proportional growth. Therefore by properly choosing the investment ratio, r, policy makers can alter the growth patterns in the short run and the final proportional growth rates in the long run.

Besides balanced growth, policy makers may choose other scenarios according to their policy objectives. The most likely are the maximization of consumer goods W2, total output W, or national income Y. If there are no massive changes in vertical integration and if there are no changes in the b coefficient, national income and total output will move proportionally and in the same direction. Policy makers are likely to act in the same manner regardless whether their objective is to maximize total output W or national income Y. As total output W has a problem of double-counting, this section focuses on the policy implication of maximizing consumer goods W2 and national income Y in order to simplify the analysis.

If their objective is to maximize consumer goods, policy makers may have three alternative choices. They may want to

maximize consumption level in a very short time. In this case, they may choose a small value of r. The extreme case is that r equals zero, when consumer goods increase at the highest rate in one year but no further growth will be possible. It is unlikely for any policy maker to choose this alternative.

Or, they may want to maximize the final equilibrium growth rate of consumer goods. In this case, they may choose a high value of r. As analyzed earlier, the higher the value of r the higher the growth rate of consumer goods will be in the infinite future as it will approach the growth rate of investment I. The limit is r=1. Although for consumer goods to increase r cannot be set equal to one, it can be set very close to one. However, when r approaches one, gW2 will approach zero in early years, which may not be attractive to policy makers.

Another alternative is to maximize the present value of consumption over a long time period. This is similar to maximizing the area under the gw2 curve. As illustrated in Figure 3.1, the gw2(r') curve is under gw2(r*) at the beginning. The higher the value of r' is, the lower the gw2(r') curve will be at early years. And when future growth is to be discounted, the difference between gw2(r') and gw2(r*) will be smaller than it appeared in Figure 3.1 in later years. Therefore, the area under gw2(r') is not necessarily greater than that under gw2(r*) . That is to say, the high

growth scenario is not necessarily superior to the balanced one if the present value of consumptions is to be maximized. The optimal value of r', in this case, will depend on the discount rate.

When policy makers choose to maximize national income Y, the optimal value of r is likely to be set higher than in the case of proportional growth. Figure 3.1 has demonstrated that, if a equals a , and b equals b , the gY(r') curve is always above gY(r*) curve. The conclusion is not so obvious if the condition of $a_1 = a_2$ and $b_1 = b_2$ does not hold. Even so, the high growth scenario is still likely to be chosen. Intuitively, r is likely to be set higher if the objective is to maximize Y rather than W2 in finite time. As the consumer goods increase at a lower rate the country will have more producer goods to invest in Department 1 and get further increases in producer goods which are crucial to future growth in both producer and consumer goods sectors.

However, the optimal value which maximizes gY will be different from from that which maximizes gW2. As analyzed before, when policy makers want to maximize consumption in a long time period, the value of r will not necessarily be set higher than in the case of balanced growth. But, when policy makers' objective is to maximize national income Y, the high growth scenario is bound to be chosen as the gY(r') curve is always above gY(r*). And the greater the value r', the higher the gY(r') curve will be. So the value of r is likely to

be set as high as possible in order to maximize national income Y. If the policy objective is to maximize total output W, the desire to set a higher value of r may be even stronger.

3.4 PROBLEMS IN PRACTICE

The discussion in the last section indicates that the high growth scenario will be chosen when the policy objective is to maximize total output W or national income Y. As a result, the ratio of investment between two departments, r, will be set relatively high. However, there are some constraints on the value of r. First of all, even though extra labor is always available, no one will work for nothing. Therefore when the production in Department 1 is to expand, wage payroll V1 has to increase to accommodate the expansion. Hence, an increase in production in Department 1 itself requires a corresponding increase in Department 2. Secondly, a decline in per capita consumption is not acceptable to both consumers and policy makers. As population increases over time, total consumer goods must increase to keep consumption unchanged. Thirdly, people may have an expectation on their consumption level and this expectation will put pressure on policy makers to increase consumer goods over time.

According to the above analysis, beyond a certain point, the value of r may not be socially and politically accepta-

ble, or even technically feasible. To achieve a long term sustained growth of the whole economy, or even the sustained growth of producer goods alone, the increase of consumer goods cannot be ignored. Furthermore, it is quite likely that keeping consumption at a low level for a long time period may lower people's morale and thus reduce economic efficiency. As a result, the potential of existing production capacity may not be fully materialized and some inputs may even be wasted, i.e., the assumptions of constant a and b coefficients may be violated. In this case, the model may not work as expected. The effect of relatively large investment on economic growth may be offset by the effect of reduced efficiency.

The existing data do not give us the appropriate figures of capital stocks and investment in either the consumer or producer goods sector. However, the comparison of the shares of output and investment among agricultural, light and heavy industrial sectors may be taken as evidence that the Chinese government chose the high growth scenario during most of the past four decades(See Table 3.1). Another comparison, which indicates that the growth of consumer goods had always fallen behind that of either total output or national income before 1979, may be taken as further evidence that investment in Department 2 had always been less than proportional(See Table 3.2).

TABLE 3.2

Growth of Total Output, National Income and Consumer Goods

	Total output	National income	Consumer goods
	----percent----		
1953-57	11.3	8.9	6.5
1958-62	-0.4	-3.1	-2.0
1966-70	9.3	8.3	5.0
1971-75	7.3	5.5	4.9
1976-80	8.3	6.0	6.9
1981-85	11.0	9.7	10.5
1953-78	7.9	6.0	4.5
1979-85	10.3	8.6	10.5

* The entries in the first six rows are average annual growth rates for the first Five Year Plan periods.

Source: Chinese State Statistics Bureau. China's Statistical Yearbook, 1986.

During the First Five Year Plan period(1953-57), this scenario led to the following growth rates: 11.3 percent for total output, 8.9 percent for national income and 6.7 percent for consumer goods. As suggested by the model, this strategy was to bring about higher growth rates for both total output and national income. Consumer goods would then be able to increase at an accelerated speed. Although its growth rate was low at the beginning, it would eventually increase at the same constant rate as total output and national income. An annual growth rate of 6.5 percent is already quite good, let alone higher in the future.

But it was not the case in practice. Even excluding the critical period of the Great Leap Forward(1958-62), the annual growth rate of total output had dropped to 9.3 percent during the Third Five Year Plan period(1966-70) and to 7.3 percent during the Fourth Five Year Plan period(1971-75). The annual growth rate of national income declined to 8.3 percent in 1966-70, and to 5.5 percent in 1971-75. And that of consumer goods, to 5.0 and 4.9 percent respectively. On the average, the annual growth rates for total output, national income, and consumer goods were 7.9, 6.0, and 4.5 percent, respectively, in the time period of 1953-78.

These records indicate that, after 26 years of practice, this development strategy did not bring about higher growth in consumer goods production. On the contrary, the growth rate of consumer goods had declined over time. Even Department 1, or the producer goods sector, itself did not benefit from the strategy for a long time. Although it always got more than a proportional share of investment, its growth rate declined instead of increasing.

The declines in those growth rates may have been caused by many factors such as changes in technology or production structures. However, one apparent reason for the failure of the strategy is the deterioration of economic efficiency. Human beings are not machinery. Material rewards, in addition to spiritual rewards, are necessary to keep them work-

ing efficiently. This is supported by the evidence presented in Table 3.2. It is unlikely that the trends in technology and structural changes have dramatically reversed after 1979. Therefore, the improved growth rates since 1979 are likely due to improved efficiency responded to a significant increase in consumer goods. This will be discussed later.

The 4.5 percent growth rate of consumer goods during 1953-78 only represents a 2.3 percent increase in per capita consumption, and most of that increase occured in the early stage. In rural areas per capita consumption increased only at an annual rate of 1.7 percent during the 1965-78 period. In urban areas, the growth of real wage rates was negative. Nominal wage rates were kept constant in the period of 1957-78, with real wage rates actually declining by 12 percent. The level of per capita consumption in urban areas did increase in the period. However, this was due to the increase in workers per family. In 1957, 30 percent of urban population was employed. This figure was doubled in 1978 to about 60 percent, which led to the increase in per capita consumption despite the decline in real wage rate.

The slow growth in consumption, especially the decline in real wage rates, might have negative effects on work incentives. As a result, production capacity was not likely to be fully utilized and inputs were not likely to be used as effectively as expected. Therefore, the values of a and b coefficients in the model were likely to have decreased over

time. If this trend continued, no matter how much was invested in the producer goods sector, the growth of total output and national income could not be pushed further at the expense of consumer goods.

The failure of the strategy led to a nationwide debate on the purpose of social production in the late 70's and the early 80's when the political environment became relatively favourable. Most economists in China criticized the previous policy as being "production for its own sake" and prefered proportional growth at that time. The debate seemed to have had a positive impact on the new economic policy. Nevertheless, the debate suggested that something had to be done and policy makers responded to this signal by encouraging consumer goods.

A major feature of the economic reform starting in 1979 was the emphasis on a balanced growth in two departments. According to the Yearbook, the annual growth rates were 10.3 percent for total output, 8.8 percent for national income, and 10.5 percent for consumer goods during the 1979-85 period, with per capita consumption increasing at 9.2 percent per year.

In this time period, all three growth rates were almost the same. The more interesting result was that they were all significantly greater than their counterparts in the previous time period. Even compared with those at the beginning

of the previous period, i.e., in the First Five Year Plan period, the growth rate in the 1979-85 period was the same for national income and higher for consumer goods.

The comparison of the situations before and after 1979 might be taken as evidence that the values of a and b are inversely related to the growth of consumption level. As the growth of consumer goods is determined by policy variable r, the values of a and b are inversely related to the value of r, at least in a certain range. If economic efficiency is positively related to the growth of the consumption level, a sustained growth of producer goods or total output requires a certain growth of consumer goods. By the same token, a sustained growth of consumption requires that the growth of producer goods is at least as high as that of consumer goods, otherwise it will soon decline.

Under the current situation, the balanced growth scenario seems to be the best choice. The growth of consumer goods, in this scenario, seems to be adequate to maintain the values of the a and b coefficients at satisfactory levels. The growth rates of all three policy alternatives--total output, national income, and consumer goods--are likely to be sustained, and higher in the long run. The optimal value of r depends on identifying the mathematical relationship between r and the a and b coefficients. This is beyond the scope of this study.

3.5 ROLE OF COMPULSORY AGRICULTURAL MARKETING SCHEME

As mentioned before, the compulsory agricultural marketing scheme was the major policy instrument in implementing the government's development strategy. The monopsonistic procurement quota and the associated low price have successfully restricted peasants' income and consumption, and turned agricultural surpluses into industrial profit and investment in the hands of the government.

Lack of comparative data makes it almost impossible to assess how much of peasants' income has been transfered into investment in the industrial sector through the scheme. However, in the case of grain marketing, there is evidence that the price in the free market was about 30 percent higher when the compulsory procurement was implemented in the early 1950's(Walker, 1984). During 1979-84, the grain procurement price was raised by about 98 percent on average, which was a part of the economic reform policy. But, even then, the price in the free market was still about 40 percent higher in 1984(China's Statistical Yearbook, 1985).

The actual difference between a real competitive market price and the quota price may not necessarily be so big. State agencies procure most of the grain surpluses through the quota system. The quantity of grain marketed in the free market is only the residual. In many years the free market for grain was even illegal. Following economic reform, the free market for grain expanded quite rapidly.

But, even in the mid 1980's, the quantity of grain marketed through the free market was about five mmt, only about five percent of what was handled by state agencies. Peasants could sell their grain in the free market only after they had fulfilled their quota obligations. Because the quantity was so restricted, prices in the free market were not likely to be the same as those under more competitive conditions. Nevertheless, the big gap between free market and quota prices suggests that a substantial proportion of peasants' income has been transfered by the marketing scheme.

If we assume that the real competitive prices of farm products are about 20 percent higher than average procurement prices, the loss to peasants would be about 20 percent of their gross income. Recently the loss has accounted for about 100 billion yuans a year in total, or 120 yuans per capita. From 1952 to now, this transfered income accounts for about 40 percent of the total investment in the whole economy. The large income transfer has enabled the government to carry on its development strategy to the extent it did in the last decades. Otherwise it could not invest 25-30 percent of total national income every year for such a long time period.

As analyzed before, such a development strategy might be quite successful at the beginning. The whole economy, especially the producer goods sector, might increase very rapidly at the cost of relatively slow growth in the consumer

goods sector. Sooner or later, the suppressed consumption would have negative impact on productivity. The growth of the whole economy would slow down no matter how much national income was continuously invested.

This large income transfer has restricted the growth of the agricultural sector itself. During 1952-78, grain production increased only 2.5 percent per year, barely exceeded the population growth rate. During the period of 1979-84, the average grain procurement price was raised by about 98 percent. As a result, the income transfer was reduced and the increased net income stimulated a much faster growth in grain output--about 5 percent per year.[4]

But this pace did not continue. After the new "contracted purchasing" scheme was introduced in 1985, there has been no further reduction in the income transfer. The new policy may actually have lowered average grain procurement prices in some areas. As the new contracted purchasing price is the weighted average of former quota and above quota prices at 1984's level, peasants will get the same average price if they sell the same quantity as they did in 1984. However, if they sell more to state grain agencies, the additional delivery will be paid with the same weighted price, which is 10 percent lower than the former above quota price. In this

[4] According to Carter and Zhong(1988), growth rates of major modern inputs were significantly higher during 1965-78 than during 1979-84. Therefore, the faster growth of grain and other farm products after 1978 resulted from policy changes, and price incentives were a major component of the change.

case, the average price for the total delivery will be lower than what peasants would have received in 1984. With the inflation rate being about 6 percent for a couple of years and rising to 18.5 percent in 1988, the actual income transfer from the grain sector may have increased again. Consequently, grain output dropped about 7.4 percent in 1985, and did not reach 1984's level subsequently. Although the government has called on peasants to make greater efforts to increase grain production, it is still too early to say how fast grain output will increase under the current marketing scheme.

The compulsory marketing scheme has had negative effects on the growth of the whole economy as well. As the food bill accounts for about 50 percent of a household's total expenditure, the supply of agricultural products has a very significant impact on individuals' actual consumption and their morale. Before 1978, suppressed agricultural production had forced the government to use a variety of coupons to distribute limited consumer goods, especially foodstuffs. During 1979-84, the fast growth of farm products enabled the government to abolish all coupons for foodstuffs except grain. The relatively plentiful supply of foodstuffs was associated with improved efficiency and accelerated growth of the whole economy.

However, when the growth of some farm products, especially that of grain, has slowed down or even declined since

1985, the shortage of food has not only forced the government to restore the coupon system for many kinds of foodstuffs, but also caused high inflation recently. The inflation rate was about 10 percent in both 1986 and 1987 in urban areas, which may be largely attributed to the shortage of food and the associated price jump in the free market. According to official figures, 40 percent urban residents saw their real income declining in 1987 due to high inflation.

Obviously, if this trend continues, it will soon jeopardize the success of any further economic growth. The improvement in efficiency achieved in the last couple of years might be lost in a very short time period. The recent situation suggests that, although policy makers have realized the importance of current consumption on the long run economic growth to some extent, the measures taken have proved inadequate.

Chapter IV

PRODUCTIVITY AND COMPULSORY MARKETING

4.1 MARGINAL INCOME AND INCENTIVES

In the last chapter it was argued that the grain procurement system had suppressed grain production. In turn, the shortage in grain supply led to low efficiency in the whole economy, which might have contradicted the objective of the development strategy. The negative impact of the procurement system on economic efficiency was one of the major costs of adopting such a system. In this chapter, the effect of the grain procurement system on productivity in the grain sector itself is analyzed. Marginal income under various institutional arrangements is taken as a measure of identifying the impact of the grain procurement system on work incentives. In the last section, it is shown that the production function curve may be shifted downward by the procurement system.

The relatively low productivity of peasants in socialist countries such as the Soviet Union and China has attracted many researchers' attention. Beside physical conditions, e.g., weather, climate, technology, land and/or capital labor ratios, the lack of incentives is considered to be a major factor contributing to low productivity. There are

two institutional arrangements which are considered responsible for the low work incentives in collective farming. One is the production organization and the other is the compulsory procurement system(Bonin and Putterman, 1987).

Although a production organization of any kind may have various motivations, when its individual members make decision regarding their labor supply, economic rewards seem to be the most important factor(Israelsen,1980). The type of organization determines how total income is distributed among the members, while the procurement scheme determines how much is the total income. Jointly, they determine an individual's total and marginal incomes. Following Israelsen, an individual's marginal income is taken as the measure of his/her work incentive for purpose of this study.

Obviously, given the number of workers and the total income of a production organization, an individual's marginal income varies with the type of the organization. Israelsen suggests three types of theoretically pure organizations, namely, commune, collective, and capitalist farms. These are used in examining how an individual's marginal income is determined by the internal distribution system. Since there exists no such pure model in reality, a mixed commune-collective model is examined.

A commune is defined as a producer co-operative in which the total income of the co-operative is distributed accord-

ing to need. For the sake of simplicity, each member is assumed to get an equal share of the total. A collective is defined as another kind of co-operative in which the total income of the co-operative is distributed according to work. A worker on a competitive capitalist farm is paid with the wage rate determined in the labor market.

In examining an individual's work incentive in the three types of organizations, some equations are adopted from Israelsen's research. As he did not explicitly incorporate rent (fixed cost) into the function of marginal income, this study tries to derive the marginal income function with fixed cost included. The effect of the procurement system on work incentive, under this situation, is analyzed. A model of the mixed commune-collective farm is also developed in this study to give a closer assessment of work incentives in Chinese reality.

According to Israelsen, if identical production functions are assumed for all three types of organizations, with labor being the only variable factor and output price fixed (equal to 1 for simplicity),[5] the total income, Y, of each farm is:

(4.1) $Y = F(L)$,

[5] Someone may argue that producer cooperatives may have different production functions, namely, lower output/input ratios caused by mismanagement and inefficient supervision. This might hppen if the cooperatives are assigned other political or social objectives. However, in this study, producer cooperatives are assumed to be voluntary institutions and purely economic organizations, working for the benefits of their members. Therefore, these cooperatives can be as efficient as any capitalist and private farm.

where F(L) is the production function with L being the total labor supply on the farm. Following Israelsen, we initially assume no fixed cost. Later we consider the effect of fixed cost on an individual's marginal income.

The total labor hours L is the summation of those contributed by all n members on the farm such that

$$(4.2) \qquad L = \sum_{i=1}^{n} l_i ,$$

where l_i is the labor hours contributed by ith worker.

Then, an individual's income on a commune is:

$$(4.3) \qquad y_i = (1/n)F(L).$$

His/her marginal income is a fraction of the marginal product(See Appendix B for details.):

$$(4.4) \qquad \frac{dy_i}{dl_i} = \frac{1}{n} F'(L) = \frac{1}{n} MP.$$

An individual's total and marginal incomes on a collective farm are:

$$(4.5) \qquad y_i = (l_i/L)F(L), \text{ and}$$

$$(4.6) \qquad \frac{dy_i}{dl_i} = \frac{l_i}{L} F'(L) + (1 - \frac{l_i}{L})\frac{1}{L} F(L)$$

$$= \frac{l_i}{L} MP + (1 - \frac{l_i}{L}) AP,$$

which is a convex combination of marginal and average products.

On a capitalist farm, an individual's income and marginal income are:

(4.7) $$y_i = wl_i \text{, and}$$

(4.8) $$\frac{dy_i}{dl_i} = w,$$

where w is the wage rate determined in the labor market.

Under the condition that farms are free to make their production decisions all farms will operate in the range of positive marginal product and falling average product. This means that the condition

$$AP > MP > 0$$

hold. In addition, workers on the capitalist farm will be paid with the marginal product such that w = MP in equilibrium.

It is clear that, if AP > MP, a convex combination of AP and MP is greater than MP. Thus, under competitive conditions and provided all farms operate in the optimal range, members on a collective farm will have the highest marginal income and hence greatest work incentives. Those on a commune will have lowest marginal income and least work incentives. The marginal income and work incentives on a capitalist farm will be in between. Therefore, Israelsen's model suggests that, given all the above assumptions, a collective farm may provide peasants with greater work incentives than a capitalist farm could, at least in theory.[6]

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[6] The suggestion that members of collective farms may be paid more than their marginal products contradicts Euler's

The validity of this interesting result depends on many assumptions. We shall examine the effects of relaxing some of the assumptions. First, let us consider the effect of fixed cost C. Israelsen examined the effect of an increase in rent (fixed cost) on work incentives, but he did not show the marginal income function with fixed cost included. After introducing fixed cost C, the total distributable income or total net income will be

$$Y = F(L) - C. \tag{4.9}$$

On a commune, personal income becomes

$$y_i = (1/n)[F(L) - C], \tag{4.10}$$

which is lower than that in the case of fixed cost excluded. But the marginal income is the same:

$$\frac{dy_i}{dl_i} = \frac{1}{n} F'(L). \tag{4.11}$$

Both total and marginal incomes of workers on a capitalist farm will not be changed by introducing fixed cost C, as they are determined in the labor market.

On a collective farm, however, an individual's marginal income will change because the fixed cost will be multiplied by his/her share of labor input which is a variable in the individual's income function. In this case, the total and

---

theorem for the following two reasons: first, since total net income is distributed entirely according to work, no remuneration is given to capital except for depreciation. Second, while Euler's theorem requires constant return to scale, the production function assumed here has only one variable input with decreasing return, and with other inputs fixed. So Euler's theorem does not apply.

marginal incomes of an individual become

$$y_i = (l_i/L)[F(L) - C], \text{ and} \tag{4.12}$$

$$\frac{dy_i}{dl_i} = \frac{l_i}{L} MP + (1 - \frac{l_i}{L}) NAP, \tag{4.13}$$

where NAP is the net average product per labor hour, i.e., the average value added by each labor hour. For an average member, i.e., $l_i/L = 1/n$, equation (4.13) becomes

$$\frac{dy_i}{dl_i} = \frac{1}{n} MP + (1 - \frac{1}{n}) NAP, \text{ or} \tag{4.14}$$

$$\frac{dy_i}{dl_i} = \frac{1}{n} MP + (1 - \frac{1}{n}) aAP, \tag{4.15}$$

where a, $0 < a < 1$, is the ratio of net to gross total output.

Obviously, the marginal income and hence the work incentives are higher on a collective farm than on a commune. But the comparison between collective and capitalist farms is not so clear. For the marginal income to be higher on a collective farm, i.e.,

$$(1 - 1/n) NAP + 1/n MP > MP, \text{ or}$$

$$(1 - 1/n) NAP > (1 - 1/n) MP,$$

condition NAP > MP must hold. Otherwise the individual member's marginal income will be lower than the marginal product which is assumed to be equal to the wage rate on a capitalist farm.

As pointed out by Cameron, the conventional analysis of marginal income may not apply to co-operative enterprises(Cameron, 1973a). He argues that an individual's decision to work an extra hour may not be independent of the decisions made by other members in the same cooperative. Some members who have the same preference may make exactly the same decision. In this case, a member may know in advance that his/her decision to work or not to work will be followed by certain amount of other members, and he/she must take this into consideration in calculating expected marginal income.

Under this situation, the expected marginal income is different from that resulting from independent decision making. If m members in the cooperative of n members in total, $m < n$, share the same preference, the partial derivative of total labor input with respect to the labor input of anyone among the m members is equal to m, not one. Therefore, by using the chain rule, equations (4.11) and (4.15) become:

$$\frac{dy_i}{dl_i} = \frac{m}{n} F'(L) = \frac{m}{n} MP, \text{ and} \tag{4.16}$$

$$\frac{dy_i}{dl_i} = \frac{m}{n} MP + \left(1 - \frac{m}{n}\right) aAP. \tag{4.17}$$

It is not difficult to find out that the comparison of expected marginal income[7] under interdependent decision mak-

[7] Following Cameron(1973a), we refer to the marginal income in the situation of interdependent decision making in co-operative enterprises as expected marginal income for convenience.

ing leads to the same conclusion as in the case of independent decision making. As long as not all members in the cooperative act in the same way, i.e., as long as $m < n$, the expected marginal income on a commune is a fraction of marginal product. Its magnitude varies with m and is generally greater than that in the case of independent decision making. On a collective farm, the expected marginal income is still a convex combination of marginal and net average products. As weights of the two components have changed, the absolute value of the expected marginal income is generally smaller than that in the case of independent decision making. However, it is still greater than marginal product, which is supposed to be the wage rate on a capitalist farm, under the condition NAP > MP, or aAP > MP.

The validity of the inequality depends on two factors. The first is the magnitude of coefficient a. The greater the value of a, i.e., the higher the ratio of net to total output, the more likely the inequality will stand. The second is the difference between average and marginal products. The greater the difference, the more likely the condition will hold.

Both the value of coefficient a and the difference between AP and MP are strongly influenced by output price. An increase in output price raises the values of total, average, and marginal products by the same percentage. But the percentage increase in net average product is higher

given that the fixed cost is not affected by the increase in output price. Therefore, after adjusting the scale of measurement, it can be viewed as that a higher output price leads to a higher value of coefficient a, which will shift aAP curve up, given TP, AP, and MP curves. At the same time, a higher output price pushes the optimal output to a higher level, which will increase labor input and enlarge

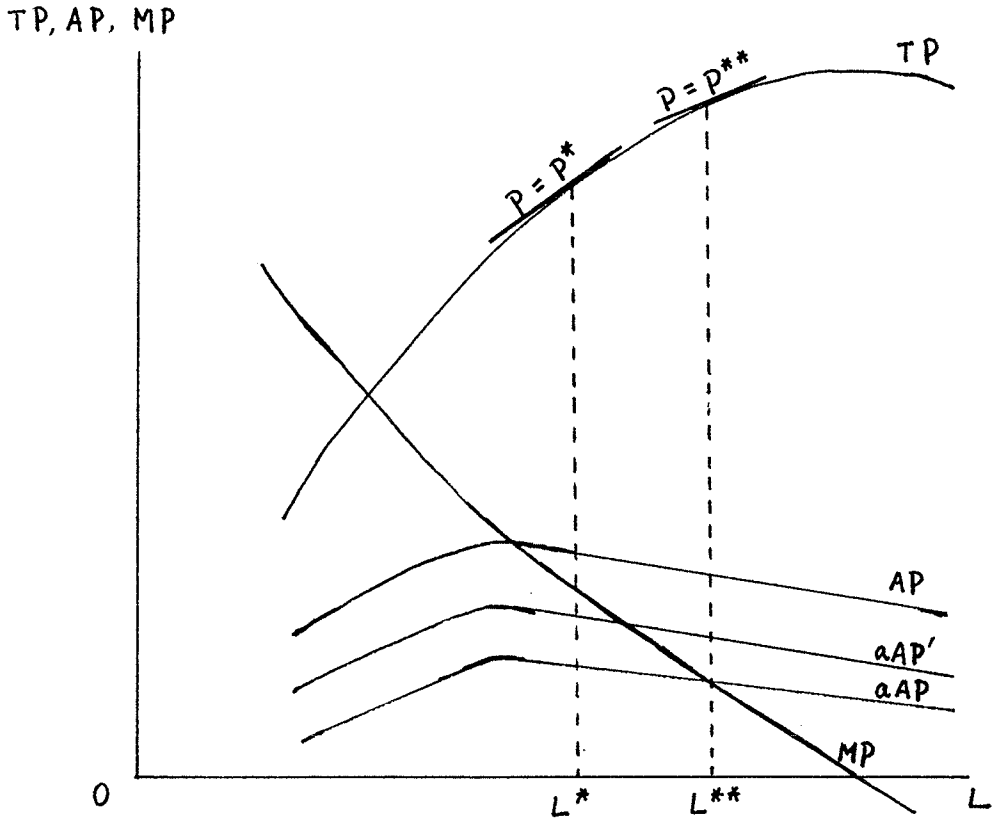

Figure 4.1: Price Effect on Marginal Income on a Collective Farm

the gap between AP and MP(See Figure 4.1.).

If the output price is P*, the optimal labor input level is L*, given the preference of workers between income and

leisure. At this point, aAP curve is below MP curve. This means, at this input/output level and relative output price, a capitalist farm will provide workers with higher marginal income. When the output price increases to P**, aAP curve is shifted up to aAP' and the optimal input level increases to L**. At this input/output level, aAP' curve is above MP curve which indicates that a collective farm will provide its members with higher marginal income and greater work incentives.

From the above analysis, it is obvious that, although a commune is deemed to provide lower marginal income compared with a capitalist farm, a collective farm may not be. The comparison between collective and capitalist farms, in terms of marginal income, depends on the shape of the production function curve and the relative output price.

In many developing countries where agricultural labor supply is abundant, the marginal product of labor is quite low. This is especially true in China. China's farm land/labor ratio is among the lowest in the world and peasants are restricted to farming in their home villages. The opportunity cost of labor was almost zero up to the late 1970's. Therefore output was pushed close to maximum while marginal product went down to near zero. In this case, a collective farm seems to be able to provide higher marginal income and greater work incentives to its members than a capitalist farm could.

4.2 MARGINAL INCOME IN THE PEOPLE'S COMMUNE

Unlike its name, China's People's Commune is not a pure commune as defined earlier in this study. Theoretically, it is a kind of producer cooperative. All means of production are collectively owned and members contribute only their labor and share income accordingly. But it is not a pure collective as defined above either. In reality the People's Commune is a mixture of the two "pure" types of cooperatives.

In theory, net income in the People's Commune is supposed to be distributed "according to work". A workpoint system was developed for internal distribution purposes. An individual member earns a certain quantity of workpoints upon the completion of a specified task or after working a specified time period. The workpoints are accumulated for each member. By the end of a year, total net income is divided by the total number of workpoints and each member gets his/her share.

However, in practice, some portion of the total net income is distributed "according to need". Basic necessities, especially food, are normally rationed with little difference among members, no matter how much work one has done or whether one is not in labor force at all. At the very beginning food was provided free, and the rest of the income was distributed according to one's accumulated workpoints. Soon this free provision of food was abandoned as it contributed a great deal to the disaster of 1959-62(Chinn,

1978 and Putterman, 1985). After the short experimental period, individual members had to pay for the rationed food and other products produced on the farm. But as those products, especially food, were under-priced, the ration, which was usually unrelated to workpoints, was in fact a kind of internal subsidy and partial distribution "according to need".

The workpoint system itself was not necessarily a measure serving distribution purely "according to work". There were two methods of counting workpoints. When workpoints were assigned to a specified task and an individual earned his/her workpoints upon the completion of the work, the system was quite consistent with the principle of "according to work", provided that the quantity of workpoints was consistent with the difficulty of the work and the required time in doing the work. This may be called a "piecework" system.

Another approach was the "labor-rating" system. Under this system, the quality of each member's labor was rated and "standard" workpoints were assigned to his/her labor hour. An individual earned his/her workpoints according to his/her labor hours and "standard" workpoints. In this case, there would be a departure from the principle of "according to work". The difference among the "standard" workpoints assigned to individual members might not reflect the true difference in labor qualities, let alone the true difference in the work done. It might respond to other criteria such as equality and political attitude(Chinn, 1978).

If every task were well monitored and supervised, and if the rating truly reflected the real contribution to the final output, there would be little difference between the two systems. However, given the difficulty and bias in labor-rating and the difficulties in monitoring and supervising, the "labor-rating" system is likely to be inferior to the "piecework" system in terms of incentives and efficiency.

Under the "labor-rating" system, a worker was concerned only with the hours he/she worked, which earned him/her workpoints. They might not care whether the work was properly done or whether the work was useful at all. The incentives for them to work longer might be higher but the incentives for them to work efficiently were lower compared with what would happen under the "piecework" system.

On the other hand, as there was little difference in labor-rating for different workers, the incentives might be lower for prime workers but higher for others. As the system might result in small difference in hours worked, and even smaller difference in workpoints earned by different workers, it was a special kind of measure to approach equality. As such, the "labor-rating" system might increase the share of equal distribution among all members.

Hence, even if a theoretically pure collective provides greater work incentives than a capitalist farm under certain

circumstances, the People's Commune may not do so under the same conditions. In this case, the internal distribution system plays an important role. It determines whether the People's Commune is more like a pure commune or a pure collective, and it narrows the range in which the People's Commune is able to provide higher marginal income as a collective.

Therefore, a model which combines the characteristics of a pure commune and a pure collective is needed in analyzing the work incentives on a Chinese People's Commune. For the sake of simplicity, let us assume that a proportion of total net income is distributed "according to need", or equally distributed among members, and the rest is distributed truly "according to work". Then, the individual's income in the People's Commune can be described as follows:

$$(4.18) \qquad y_i = b/n\,[F(L) - C] + (1-b)\,l_i/L\,[F(L) - C],$$

where b is the share of distribution "according to need" $(0 < b < 1)$. The marginal income of individual labor is:

$$(4.19) \qquad \frac{dy_i}{dl_i} = \frac{b}{n} MP + (1-b)\frac{l_i}{L} MP + (1-b)\frac{L-l_i}{L} NAP.$$

For an average worker, $l_i/L = 1/n$, it can be written as:

$$(4.20) \qquad \frac{dy_i}{dl_i} = \frac{1}{n} MP + (1-b)\frac{n-1}{n} NAP.$$

Again, following Cameron's argument of expected marginal income, m members in a People's Commune have the same pref-

erence and know in advance that they will make the same decision to work or not to work an extra hour. Using the chain rule, their expected marginal income is as follows:

$$(4.21)\qquad \frac{dy_i}{dl_i} = \frac{m}{n}\,MP + (1-b)\left(1-\frac{m}{n}\right) NAP$$

$$= \frac{m}{n}\,MP + (1-b)\left(1-\frac{m}{n}\right) aAP.$$

Clearly, the comparison of marginal income on a People's Commune and that on a capitalist farm depends on the share of equal distribution on the Commune, and the difference between marginal and net average products at the existing production level. When the total income is entirely distributed according to work, i.e., b=0, the marginal income on the Commune is a convex combination of marginal and net average products and hence greater than marginal product which is the marginal income on the capitalist farm. On the contrary, when the total income is equally distributed among all members, the marginal income on the Commune is a fraction of marginal product and less than the marginal income on the capitalist farm. Besides the two extremes, given the gap between marginal and net average products, the comparison depends on the share of equal distribution, i.e., the value of b.

On the other hand, given the internal distribution system, i.e., given the value of b, the comparison depends on the magnitude of the gap between marginal and net average

products as long as b<1. As the procurement system strongly influences the level of production through the quota assignment, and sometimes to a lesser extent through price incentives, its impact on the magnitude of the gap between marginal and net average products is very significant. When the gap is sufficiently large and the value of b is sufficiently small, a People's Commune may provide its members with higher work incentives than a capitalist farm does.

The formula for marginal income suggests that the work incentives on a Chinese People's Commune depend on the internal distribution system and the procurement price.[8] The larger the share of distribution "according to need", the less the work incentives. And the higher the procurement price, the greater the work incentives.

This is supported by history. When the Commune was first established in late 1958, food was provided free, which alone accounted for more than 50 percent of net income, and the "labor-rating" system was used to substitute for the "piecework" system which had been dominant in the previous Advanced Producers' Cooperative(Chinn,1978). All labor was paid approximately equally as the difference in labor-rating was quite small at that time. All together, the share of equal distribution, b, was estimated at about 0.7-0.8 in the Chinn study (0.5 for free provision of food,[9] and the other

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[8] In the case of above quota delivery, the relevant measure is the above quota price, otherwise quota price may apply.

[9] According to Chinn, free provision of farm products was as

0.2-0.3 for the lack of difference in labor-rating). This internal distribution system, along with the low procurement price, partly led to the big drop in agricultural production during 1959-62(Chinn, 1978 and Putterman, 1985). Compared with 1959, grain production dropped by 26 percent in 1961, from 193.5 to 143.2 mmt. There might have been many other causes, but lack of incentives must be a major one.

To overcome the crisis, the Commune was reorganized after 1961. The basic accounting and distribution functions were shifted from the Commune to the Brigade and then to the Production Team. The "piecework" system was restored as the main method of counting workpoints. Free food provision was abolished, but grain was still under-priced. As the grain price was usually 40 percent higher in the free market and as grain rationing accounted for about 50 percent of net income, the value of b might have gone down to 0.15-0.2. On the other hand, the grain procurement price was raised by 89 percent from 1959 to 1962 while the prices of manufactured inputs were increased by only 10 percent at the same time. Therefore, at the same output level, the marginal income in 1962 would be 5-6 times higher than that in 1959. Presumably, the improved work incentives were one major source of the recovery after 1962.

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high as 70-80 percent on some Communes at that time.

During the "Cultural Revolution"(1966-76), "labor-rating" was widely used again following the "Learning from Dazhai" Drive, and the procurement price, which was below the 1962's level, was kept almost constant in the ten years. Thus it was no wonder why grain production had increased so slowly(about 3 percent a year), even though modern inputs, such as chemical fertilizers, irrigation equipment and tractors, had been increased very quickly(12.5 to 56.7 percent annually in the time period of 1965-78).

Since 1979, various types of "production responsibility systems" have been adopted in China's agriculture. The essence of all of these "responsibility systems" except the so-called "full responsibility system", is to link one's income, both in-kind and cash, to one's performance or to the outcome of one's work. In this case, the value of b has been brought down to zero.

On the other hand, the procurement price increased by 78 percent during 1979-83. The big increase in the procurement price led to a greater value of average product AP, and greater value of coefficient a. Thus, the marginal income of grain producers in 1983 is likely to be twice as high as that in 1978. Improved work incentives are believed to be the major source of the rapid growth in grain production during the period of 1978-84, about five percent a year.

After 1983, the "full responsibility system" became the dominant institution in China's agriculture. Under this system, the use of farm land was contracted to individual households. After deduction of tax and certain fixed charges for local administration, public service and welfare expenditures, the net income was held entirely by the family. In fact, it was a kind of private farming. The marginal income under this system was the value of the marginal product, the same as on a capitalist farm.

Given the production function and output level, the value of the marginal product depends solely on the procurement price. There has been no significant change in price since 1984. As a result, grain production has gone down from the 1984 level. It indicates that, compared with other forms of "responsibility system", going back to private farming did not bring about further increase in grain production, when the price did not increase further.

Under other forms of "responsibility systems", a production team is very close to a "pure" collective. The marginal income of labor should be roughly equal to a convex combination of marginal and net average products. Under the "full responsibility system", a peasant family is basically a private producer, and the marginal income should be equal to marginal product. As the current value of a is around 0.5 in grain production,[10] collective farming would provide higher

[10] According to China's Statistical Yearbook 1986, in 1985, the cost of material inputs accounted for 38 percent of

work incentives in the range where AP > 2MP. As grain production has likely been pushed up close to its maximum, marginal product MP should be very small. Therefore, the inequality, AP > 2MP, is likely to stand, and collective farming under some "responsibility system" is likely to provide higher work incentives than private farming.

Also, as there is no internal distribution effect in both cases, the change in work incentives will respond solely to changes in procurement price. In collective farming, the derivative of marginal income with respect to price can be roughly expressed as follows(See Appendix B.):

$$(4.22) \qquad \frac{d^2 y_i}{dl_i\, dp} = \frac{d(aAP)}{dp} = \frac{da}{dp} + 1.$$

When m members make the same decision, the response of their expected marginal income to price change becomes

$$(4.23) \qquad \frac{d^2 y_i}{dl_i\, dp} = \frac{d[m/n\ MP + (1 - m/n)\ aAP]}{dp}$$

$$= \frac{m}{n} + (1 - \frac{m}{n})(\frac{da}{dp} + 1)$$

$$= (1 - \frac{m}{n})\frac{da}{dp} + 1.$$

But , it will be smaller in private farming:

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total value output in the whole cropping sector. There were no data available on capital depreciation. However, the expenditure on capital goods accounted for 16.3 percent of total revenue from cropping. With capital depreciation being considered, the net output is around 50 percent of the total value product.

$$(4.24) \qquad \frac{d^2 y_i}{dl_i\, dp} = \frac{dMP}{dp} = 1.$$

It is clear that the incentive response to price is greater on a collective than on a private farm, as da/dp > 0.

Thus, if the optimal output is in the range of AP > 2MP, a collective farm may produce more grain than will a private farm. Given the same preference between income and leisure, an individual is likely to work longer when marginal income is higher. A similar increase in price will stimulate higher output on a collective than on a private farm. However, when a production or delivery quota is imposed, the procurement price[11] is likely to be substantially below what is required to produce the same quantity under optimum conditions. Then the negative effect of price on work incentives is also greater on a collective than on a private farm.

4.3 PRODUCTION EFFICIENCY AND PROCUREMENT POLICY

Many authors have attributed the low work incentives to the difficulties in monitoring and supervising farming activities. For instance, J. Y. Lin assumed that the degree of supervision determined the work incentives in Chinese People's Communes. In his opinion, the cost of supervision was so high that there was no supervision at all. As a result, each individual got full workpoints for the hours worked,

[11] Whether the relevant procurement price is the quota or above quota price depends on whether the collective farm makes above quota delivery or not. In general, the above quota price seems not high enough to stimulate the desired production and delivery.

but not for the true efforts contributed to the final output. Only under the "household responsibility system" ("full responsibility system"), which in fact was a kind of private farming, would the supervision be perfect(Lin, 1988).

The actual hours may differ from the true efforts contributed to the final output. The difficulty in supervision is only one of the factors responsible for the difference. The internal distribution system, and the nature of forced labor due to the quota system are two other and probably more important factors. The effect of the internal distribution system has been analyzed earlier, and the effect of the forced work is discussed in the next section. The cost of supervision may not be as high as Lin believed. In a traditional agriculture like China's, the team management may have good knowledge, from past experience, on what work should be done and when it should be done, and on what quantity and quality should be required for that work. Their knowledge may improve over time. Also, any loss due to imperfect supervision, if it is inevitable, should be weighed against the gain in the economy of scale. As irrigation is crucial to Chinese agriculture, some scale or coordination is necessary for any effective farming. Therefore, if a production team is a true co-operative, in terms of voluntary and open membership, distribution based on the "according to work" principle, and autonomy in decision making, the efficiency loss due to imperfect supervision may not exceed the efficiency gain in the economy of scale.

So, if the policy objective is to increase grain production, it is not necessary to go back to private farming. Rather, the production team should be made a true collective. And more importantly, the market should be competitive. That could be done by gradually abolishing the procurement system. As a start, the procurement price should be gradually increased. When the price reaches the point at which the output level chosen by peasants themselves is equal to the quota, the quota itself will no longer be needed. If the policy objective is to increase production beyond that level, the best way to achieve the target might be the use of price instruments in the long run.

Up to now, grain production in China has been assumed efficient whether on a commune, a collective, a capitalist or a private farm. Producers are assumed to make their own decision according to relative prices. And the output is always on the production frontier curve. However, it is not likely to be the case in reality. There are many factors influencing production efficiency, such as the non-economic objectives of the production organization, the internal structure, the quality of labor, especially that of management, and the market conditions. In this study we will only discuss the impact of procurement policy, which is considered important in any time and under any condition.

The objective of the compulsory procurement system is to ensure the quantity of state grain purchases, and to pay low

prices in order to extract funds for industrial development. Under this system, there must exist a gap between the quantity set by quota and the quantity that peasants are willing to produce given the price. In a sense, peasants are forced to produce beyond the optimal level from their own point of view. It can be anticipated that enforced work will not be done as efficiently as work by one's own choice. Thus, under the procurement system, grain output is quite likely to be lower than it would be in the case of free choice at the same labor input level. At least this is the case when the quota is beyond the optimal output level determined by the

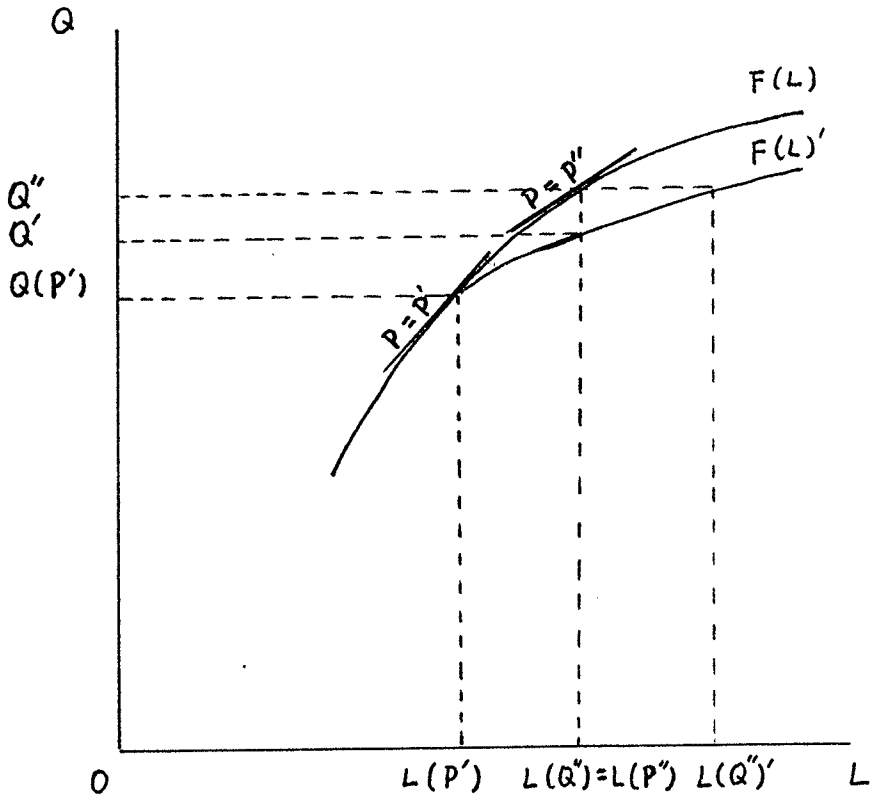

Figure 4.2: Effect of Procurement on Production Efficiency

procurement price(See Figure 4.2.).

Given the production function F(L) and the procurement price p', the optimal output level is Q(p'), and the input level, L(p'). But the quantity of output imposed by quota is Q", which is higher than Q(p'). If the price is higher at p", Q" might be the optimal output level by peasants' own choice. Then they might be willing to supply their labor up to the level L(Q") = L(p').

However, given the price p' and the quota quantity Q", there is a gap between the level of labor supply chosen by peasants and that required by quota. As forced by delivery quota, the extra labor input beyond L(p') is likely to be less efficient on collective farms. So the total input of L(Q") may not produce the required output level Q". With less efficient work, the same labor input L(Q") may produce only Q'. To achieve the required output level Q", labor input might be necessary to increase to L(Q")'. In other words, the output will not be on the production curve F(L) beyond L(p'). It will be below the F(L) curve at some point beyond L(p'). Or, it can be viewed as a part of the production curve F(L) which has been shifted down to F(L)'.

In this situation, the effective labor supply is different from the actual one. The loss in production efficiency is the result of the procurement system. The smaller the gap between Q(p') and Q", the smaller the efficiency loss will be. At one extreme, if the price increases to p" and the quota is kept at Q", then the gap between L(Q") and L(p")

becomes zero. The effective labor supply is equal to the actual one, and the same output Q" will be produced by less labor compared with the case of price being set at p'. This is supported by the experience after 1979. When the grain procurement price was largely increased during 1979-84, the output was significantly increased, with less labor input than before.

However, if $Q(p^*) = Q^*$, or $p(Q^*) = p^*$, the procurement system itself is no longer necessary. At least its nature will be changed, say, to a kind of price support system. So, if the current procurement system continues to exist for some reason, there is likely to be a loss in production efficiency.

From the above discussion, it is clear that the procurement system is a major factor contributing to the relatively low labor productivity in China's agriculture. If the production team is close to a true collective, it might be able to provide greater work incentives compared with a private farm. Whether the magnitude of the marginal income is sufficient to stimulate enough labor input depends on the procurement price. On the other hand, production efficiency is also largely determined by procurement policy. Therefore, given technology, the changes in procurement policy will determine the direction of the changes in the labor productivity in China's grain production.

Chapter V

REGIONAL GRAIN TRANSACTIONS AND COMPARATIVE ADVANTAGE

5.1 PROBLEMS IN REGIONAL GRAIN TRANSACTIONS

As mentioned earlier, the low work incentives and the failure to make use of comparative advantage are the two major costs of implementing the grain procurement system. In this chapter, the problems which prevent efficient grain transactions among regions are identified. The magnitude of the potential loss in grain production due to the rigid procurement quota is assessed with a model which takes the sown area ratio of cotton to grain as the measure of specialization, and the return ratio of cotton to grain as the measure of comparative advantage. Because of the imperfection of the data, the results are only illustrative.

With 9.6 million square kilometers, China is the third largest country in the world. Given the variations in climate, topography and soils, one would expect to see substantial diversification in China's agriculture. This would imply significant exchanges of agricultural products among provinces, and between China and foreign countries. However, this does not seem to be the case. Inter-provincial grain shipments only account for about five percent of total

national consumption[12] (The World Bank, 1985). Every province essentially relies on local grain supply. Other crops are grown only when some farm land is left. Therefore, grain production is dominant throughout the entire country.

The domination of grain production in China's agriculture is understandable in that China has to rely on domestic grain production to feed her one billion people, with a certain quantity of import as a necessary supplement. If China were to import 10 to 20 percent of her annual grain consumption, the total world export would have to expand by 20 to 40 percent, or 40 to 80 mmt a year. This is not easy to do. Even if the expansion in grain supply is feasible, the price will go very high in the short run, and China may have tremendous difficulties in finding foreign exchange. Above all, national security is the major concern in this matter. It is believed too dangerous to put a nation's destiny in the hands of foreign grain suppliers. To secure grain supply and to reduce the reliance on imports, China appears ready to pay the cost--unrealized gain in specialization and trade.

But the rationale of grain self-sufficiency for the whole country does not hold for each province. Inter-provincial grain transaction does little harm to national security. On

[12] According to the World Bank, interprovincial grain shipment was 22 mmt in 1982-83. There is no reason to assume that the figure would be substantially different in other years, so interprovincial grain shipment is estimated at about five percent of the total consumption.

the contrary, diversified agriculture benefits the country as a whole and does not impair the policy of grain self-sufficiency as long as China does not have to allocate all arable land to grain production.

However, the theory of comparative advantage was viewed by Chinese leaders as a pseudoscience to defend the exploitation of poor countries by imperialist powers. Therefore it had nothing to do with socialist planned economy. On the other hand, Chinese leaders saw the danger of war in the late 1950's. To reduce the impact of hostilities if they were to occur, many factories in coastal areas were ordered to move inland and sometimes to remote mountain areas. Probably partly because of this misjudgment and partly based on his ideology, Mao went on to argue that no province should be dependent on other provinces for its grain supply. Mao's argument was turned into a formal government policy and carried out through the existing compulsory procurement system.

Throughout the entire 1960's and 70's, grain sown areas accounted for 70-80 percent of the total in all provinces. The state assigned a grain procurement quota as well as a grain sown area plan to each province, right down to each production unit. Only when there was extra land left could peasants grow other crops. The second largest crop was cotton which, as with many other cash crops, was also subject to a procurement quota and a sown area plan. The procurement quota and sown area plan made it impossible for peas-

ants to utilize the comparative advantage of their farm land in growing different crops. They had to meet the quota and plan requirements. The loss of unrealized gain from specialization and regional exchange might be quite significant.

Under the rigid marketing scheme, the significant inequality in grain production, in terms of per capita output, was responsible for the big difference in grain consumption levels, especially among rural areas. As mentioned before, one policy objective of the grain marketing system was to make better use of the limited grain supply, which may imply making consumption levels more or less equal when grain supply was short. However, past practice has prevented this objective from being achieved. As grain prices were kept low, and state subsidies went to consumers rather than producers, no one was willing to ship out grain surpluses. If a province had any grain surplus, it preferred to use that surplus as industrial input to produce something more profitable.

The contradiction between the policy objective and its measure did not draw much attention until the late 1970's. When grain was short almost everywhere, no one would seriously consider shipping grain from less deficit area to more deficit areas, except in some extreme cases. However, this problem became apparent in the late 1970's and early 1980's when grain surplus was relatively significant in some areas. During the course of economic reform, various kinds of pro-

duction responsibility systems and increased purchasing prices stimulated grain production. The national average grain output per capita increased by 24 percent from 316 to 394 kilograms during the 1978-84 period. However, due to regional inequalities, provincial averages ranged from 230 to 550 kilograms in the early 1980's. Because of the inflexibility of procurement quota and subsidy schemes, peasants in some areas were complaining of "difficulties in selling grain" while official figures were showing that 30 million people did not have enough to eat.

It is no doubt that insufficient storage, transport and other marketing infrastructure facilities were one major factor contributing to the "difficulties in selling grain". However, as the situation continued for years, it is likely that the subsidy scheme was directly responsible for this rather irrational phenomenon. As the grain purchasing price was much higher than the retail price, grain marketing was unprofitable and state grain agencies lost their interest in marketing grain beyond quota obligation. The situation became worse when the surplus grain was shipped to other provinces. The subsidies from the central government went to consumers in importing provinces but the exporting provinces had to invest in marketing facilities at their own expense in order to handle the extra quantity of grain, and there would be no economic return to the investment.

Therefore, while the formal policy was to encourage grain production, it has been discouraged in surplus areas where grain was more likely to have comparative advantage over other crops. The situation would not change the situation too much by subsidizing producers rather than consumers, as long as grain marketing was unprofitable and grain could be used to produce something profitable, local and provincial governments would be reluctant to expand their grain exports. They would prefer to see that grain surplus becoming industrial profit in which they had shares. In this case, grain production would be restricted by local demand, no matter how the country as a whole would benefit from specialization and regional exchange.

But, when the grain purchasing price is set to extract agricultural surplus, grain marketing can hardly become a profitable business. The procurement quota, consequently, is determined in political process, partly based on past records and partly subject to central-provincial bargaining powers. The utilization of comparative advantage in various crops is hardly possible under the rigid procurement system, although the theory has been recognized as valid and discussed openly since the late 1970's.

5.2 IMPLICATION FOR CHINA'S AGRICULTURE

The classical theory of comparative advantage suggests that labor productivity differential determine a country's specialization in production and the direction of trade.[13] Although the Ricardian form of the theory assumes constant marginal product(or constant marginal cost) and equal wage rate in a country, which may not hold in the real world, its basic concept is sound in a wide range of cases after properly modifying assumptions.

Originally the theory was used to explain the specialization of production and the direction of trade between two countries. The principle has been applied to analyze the relative shares of two or more countries' exports, which are associated with production specialization, to the rest of the world.

For example, MacDougall applied the theory to analyze the export shares of the U.S. and Britain (MacDougall, 1951). Noticing the difference in wage rates among industries in both countries, MacDougall expressed the comparative advantage in terms of the difference between the ratio of products per worker and the ratio of corresponding wage rates. He assumed that the U.S. would have comparative advantage in producing good X if the ratio of product X per worker, U.S.

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[13] According to Vanek(1962), to answer the question that what determines the structure, direction and volume of trade, Ricardo "provided an explanation based primarily on relative differences of labor productivity among different countries."

vs. Britain, exceeded the ratio of wage rates in industry X for the two countries. Thus, the U.S. would have a relatively larger share of the world market for X. The case study done by MacDougall supported his hypothesis.

Balassa conducted similar research later(Balassa, 1963). Taking capital cost into consideration, Balassa demonstrated that the U.S. and British relative export shares could be explained by the relative unit cost ratio. The lower the ratio of unit cost of product X to Y, the higher would be the relative productivity of industry X over Y and the larger would be the relative share of export of good X compared with good Y.

These two examples suggest that a country's comparative advantage in some production could be expressed in an appropriate term under different circumstances. One step further, it could also be used to analyze regional comparative advantage within a country. In this study, the comparative advantage in China's agriculture is expressed as the relative land productivity, namely, the return ratio of growing cotton over grain. This does not conflict with the modern resource endowments theory of trade. Land is not a homogeneous input in growing different crops and can be viewed as different resource endowments to some extent in cropping. The relative land productivity can be taken as an indicator of the component of resource endowments.

In China the state is by far the largest or sole buyer of major farm products, especially in the case of grain and cotton. The prices are set by the state. Thus the "small country" assumption is applicable as the demands for the two products are fully elastic and no single province can influence the prices. This is true as long as the state does not restrict its purchasing quantities. Obviously the comparative advantage in producing grain or cotton plays its role in resource allocation if each province has the freedom to make its own decision. Then if a province has a comparative advantage in producing cotton, it will produce and sell more cotton than otherwise.

However, under China's circumstances, labor productivity is not an appropriate measure of comparative advantage. It is almost impossible for Chinese peasants to move to other places or to other production sectors. At least in the past they were restricted to farming at their home villages. As arable land is fixed in quantity and already fully in use, the only way for Chinese peasants to increase their income is to improve their land productivity.

Certainly they would produce more of those products for which their land has relatively high productivity. Therefore, it is more appropriate to express the comparative advantage in China's agriculture in terms of land productivity-- the return ratio of various crops. If a province has a relatively high cotton/grain return ratio compared with oth-

er provinces, it would be more specialized in cotton production and would sell more cotton to the state. To overcome the problem of normalizing the sizes of provinces, the ratio of cotton to grain sown areas will be taken as the appropriate measurement of specialization.

These two crops, grain and cotton, are chosen for the following reasons. First, they are the two largest and most important crops in China. The sown areas of grain and cotton together account for about 85 percent of the total. Second, in the past, they were two major agricultural imports, hence their production and above quota deliveries were encouraged by the state.

Therefore, if all provinces were free to make their decisions in their land use, the cotton/grain sown area ratio might be well explained by the return ratio in the same province. However it is not the case in general because of quota requirements. But if some provinces, during some time period, are relatively free to make their decision in this regard, an empirical test against this hypothesis is still feasible, and the numerical result might be used to measure the potential loss or unrealized gain in other places and/or in other time periods. Of course the estimates may not be accurate, but at least they may give us some "order of magnitude" indication of the loss.

5.3 AN EMPIRICAL TEST

As mentioned before, grain and cotton productions in China are subject to state procurement quota system. However, up to 1984 China had imported a large quantity of cotton along with grain for years. Accordingly, the above quota delivery of either cotton or grain was encouraged by the state. Under these circumstances, if the sown area plan was not too rigid in some time period, and if a province could produce and deliver above quota quantities of both grain and cotton, the province might have relative freedom in making its decision in the given time period.

During the 1979-84 time period, the potential benefit from specialization attracted a lot of discussion and some modifications were put into place. For example, the government found it was better off to provide some cotton and sugarcane producers with more rationed grain, part of which was imported. In this way, peasants in those areas could produce more cotton and sugarcane and less grain. The total value of their output was generally increased. The textile and sugar industries got extra materials to expand their production. The government reduced its foreign exchange payment due to the decline in imports. In short, the country as a whole benefited from more specialized production.

Before 1979 the quantitative control over procurement quota and sown area plan was very tight for grain and cotton. The sown area plan was used as the major method to

ensure the fulfillment of procurement quota, especially that for grain, and to prevent peasants from growing other more profitable crops.

During the economic reform, the rigid sown area plan was viewed as one of the major factors contributing to low work incentives. It was relaxed, to some extent, as part of the decentralization process in order to stimulate peasants' work incentives. On the other hand, the importance of economic incentives was stressed. The grain purchasing price was raised while quota quantity was reduced. If peasants sold the same volume of grain to state grain agencies, a larger portion of their delivery would be paid for with a much higher above quota price.

Partly due to the cutting of the grain delivery quota and partly due to the changing environment, those peasants whose grain deliveries were substantially above quota requirements might have some freedom in making their own decisions. If they did not want to sell grain beyond quota requirements, they might be able to grow other more profitable crops. In many areas cotton was the first choice as it could provide peasants with a higher net income. Cotton production did increase quite quickly during the 1979-84 time period, by 84 percent in five years.

So, by the end of 1984, China found that she did not have to import cotton any more. Not only that, huge domestic cot-

ton stocks had built up, equal to a whole year's total production. The production of cotton had to be reduced in some way. For some reasons the government chose not to decrease cotton purchasing price but to cut the procurement quantity in 1985. As above quota delivery was paid for at lower prices or even refused, and as there was almost no free market for cotton, peasants had to adjust their sown areas according to the quota, which led to a 25-30 percent decrease in cotton sown area in 1985 over 1984.

This does not mean that peasants were totally free to make their decision regarding cotton/grain sown areas between 1979 and 1984. The procurement quota was still in effect. However there was some relaxation in quantitative control over sown areas. So it is not unreasonable to assume that if a province had sold above quota grain to the state it would have had some freedom in making its decision regarding other more profitable crops such as cotton, especially when the above quota delivery of cotton was also encouraged by the state.

Actually, this was the case in five major cotton growing provinces, Jiangsu, Shandong, Henan, Hubei, and Anhui, between 1979 and 1984. In the five provinces together, cotton sown areas accounted for about 65 percent of the national total. Grain production increased very quickly in the five provinces during the time period so that they delivered above quota grain to the state. Thus, no matter how limited,

a certain degree of freedom in making production decisions was likely to exist in the five provinces. They were likely to specialize, to some extent, in either cotton or grain depending on the comparative advantage of their land.

In this study, the cotton/grain sown area ratio is taken as the measurement of specialization. The expected return ratio is taken as the indicator of comparative advantage. Then the sown area ratio is assumed to be a function of the expected return ratio. For the sake of simplicity, the expectation of return is set to be equal to the actual one in the previous year, or the price ratio multiplied by last year's yield ratio. And the functional form is assumed to be linear.

To maximize the statistical degrees of freedom, a pooled time series and cross sectional model is defined as follows:

$$A_{ij} = a_1 + a_2 D_2 + a_3 D_3 + a_4 D_4 + a_5 D_5 + bR_{ij-1} + e_{ij} ,$$

where A_{ij} is the sown area ratio in the ith province jth year, R_{ij-1} is the return ratio in ith province j-1th year. D is a dummy variable representing the interprovincial variations. It is equal to one for the ith province and zero for others. A's and b are regression coefficients and e, error term.

If this model is valid, any change in yield or price of either grain or cotton or both, will indicate a change in comparative advantage. As a result, peasants will shift

their land allocation between the two crops and the ratio of sown area will be altered.

Using the return data[14] for 1979-83 and area data for 1980-84, the regression gives the following results:

$$\hat{A}_{ij} = \underset{(1.63)}{0.046} + \underset{(3.08)}{0.048}D_2 - \underset{(-1.28)}{0.020}D_3 + \underset{(0.46)}{0.007}D_4 - \underset{(-2.19)}{0.037}D_5 + \underset{(2.26)}{0.034}R_{ij-1}$$

$$F = 10.40, \qquad R^2 = 0.73.$$

Figures in parentheses are t-ratios.

With a sample size of 25, the critical values for the t statistic to be significant at the five percent level are 2.1 for a two-tailed test, and 1.7 for a one-tailed test, respectively. According to this criterion, the estimated constant and coefficients for some dummy variables are not significant. But the estimated coefficient for return ratio, which is of prime interest, is significant. This result not only supports our hypothesis but also shows the numerical relationship between the two ratios. It can be expected from this result that, on average, if the return ratio of cotton to grain increased by one percent, the sown area ratio of cotton to grain in the same province is likely to increase by 0.034 percent in the following year.

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[14] The data of return and sown area ratios are calculated from the official yield, price, and sown area figures provided by China's Statistical Yearbook, various issues, and are listed in Table C.1 and Table C.2. The dummy variables D_1, D_2, D_3, D_4, and D_5 represent Jiangsu, Shandong, Henan, Hubei, and Anhui, respectively.

The empirical result indicates that even if the five provinces only had limited power in making such decision, they did show the tendency to utilize comparative advantage of their farm land in order to maximize their welfare. The numerical estimates might be used to measure the potential loss, or unrealized gain, in other time periods when the quantitative controls over procurement quota and sown area are more restrictive.

5.4 POTENTIAL LOSS IN GRAIN PRODUCTION

As mentioned before, the state cut cotton procurement quota by a big margin in 1985 over 1984. As a result, cotton sown area decreased by 26 percent, and output, by 33 percent. Cotton sown area and output both declined a further 15 percent in 1986 for the same reason.

Had the cutting of procurement quota been carefully planned according to comparative advantage, the results would have been the same as they were caused by changes in the price ratio, and the above equation would still have held. But this was not the case. When the later two year's data were applied to the regression, the estimated coefficient for return ratio became statistically insignificant:

$$\hat{A} = \underset{}{-0.022} + \underset{(0.90)}{0.027D_2} - \underset{(-0.76)}{0.019D_3} - \underset{(-0.77)}{0.025D_4} - \underset{(-1.82)}{0.046D_5} + \underset{(1.62)}{0.064R_{ij-1}}$$
$$\underset{(-0.39)}{}$$

$$F = 4.65, \qquad R^2 = 0.67.$$

As the quantity of quota was determined by political rather than economic forces, this result was not surprising.

If the decrease in cotton output was necessary because it had exceeded the demand, the government could achieve the same target by correctly choosing the price ratio and letting peasants adjust their sown areas. In this way peasants would be able to maximize their incomes according to the changing situation, and the country as a whole would still be better off due to specialization and greater total output.

This concept can be used to measure the potential loss or the unrealized gain in grain production in the two years, if we assume that the reduced cotton sown area was allocated to grain production. Suppose the cotton procurement quota correctly represented the demand for cotton. There must exist a price ratio at which the expected return ratio would lead to the same total cotton output. Of course the actual output may not be exactly the same as the procurement target. Quota and sown area plan would not guarantee that either. However, when peasants make their decision, the expected output, which is assumed to be the product of sown area multiplied by the previous year's yield, might be forced into being equal to the procurement target by a carefully chosen price ratio.

The actual quantity of cotton procurement quota is unknown. But, if the assumption that peasants allocate their land according to the quota and previous year's yield is approximately correct, the total quantity of procurement target in 1985 is roughly the summation of 1985's sown areas multiplied by 1984's yields.

Following this logic, the total cotton procurement target was estimated at about 3.02 mmt for the above five provinces in 1985. Taking the above five provinces as a whole and ignoring others, a cotton/grain price ratio of 6.16 was found which might have led to the same expected total cotton output. The actual price ratio was 7.73 in the year. If the change in cotton sown area had been entirely absorbed in grain production as assumed, compared with what actually had happened, grain sown areas would have been increased in two provinces but decreased in the other three. The net effects would have been a total increase of 29,700 hectares in grain sown area and 77,000 metric tons in grain output.

By the same approach, the desired price ratio was calculated at 4.2 for 1986. Then the total expected cotton output would have been equal to the supposed procurement target of 2.33 mmt. If peasants had adjusted their production in the manner described above, grain sown area would have been increased by a further 29,600 hectares in the five provinces as a whole. The net increase in grain output would have been a further 78,700 metric tons(See Appendix C for details.).

The losses estimated in this way are quite small compared with the total grain output of about 138 mmt in the five provinces. But the real losses are likely to be much higher. First, the five provinces only had very restricted freedom in decision making in this regard. They could not utilize the comparative advantage of their land to any significant extent, even in the 1979-84 time period. Therefore, using that time period as a standard to measure losses inevitably leads to underestimation by a big margin.

Second, the variations in climate, topography and soils are quite significant within any of the five provinces. To use provincial average data is to take a province as a homogeneous production unit, as well as concealing the unrealized gains from specialization within that province. These kind of potential losses are likely to be much greater than the estimates in Appendix C, as the difference in return ratio is largely reduced by using provincial average data.

Third, provincial average yield of cotton was used to calculate the potential shifting of land utilization, and the average yield of grain was used to calculate the potential change in grain production. However, when the reallocation of land was made according to comparative advantage, land with lower cotton yield and higher grain yield would be released from cotton production first. Therefore, the quantity of land reallocation is likely to be greater than what calculated according to average yield. And the yield of

grain on this land is likely to be higher than the average. So the real increase in grain output is likely to be much higher.

Lacking appropriate comparisons and the data for smaller areas, any attempt in this direction will lead to somewhat misleading results. The calculations in this study can only be used as an indicator of a big loss, but it would be inappropriate to consider these as solid numerical estimates of the real loss.

Under current financial arrangements, the central government shares with provincial governments the revenues collected in each province. The largest source of such revenue is the profit and tax collected from the industrial sector. As the grain consumed in industrial uses is subsidized by the central government, it is more profitable to use grain locally. In this way, a provincial government could increase its own revenue at the expense of the central government, thus resulting in efficiency losses to the whole economy.

If grain prices had not been kept so low and grain marketing had been a normal and profitable business, maintaining grain locally would have left provincial governments no particular benefit. Beyond human consumption, grain would be exactly the same as any other raw materials. Leaving grain-consuming industries and some consumers to free markets and

fixing subsidies in nominal terms would reduce the losses due to resource misallocation. But as long as the procurement system exists, the losses will continue to be quite large.

Chapter VI

FREE MARKET FOR GRAIN AS AN ALTERNATIVE

6.1 CONFLICT BETWEEN PROCUREMENT SYSTEM AND ITS OBJECTIVES

The grain procurement and rationing system was designed to serve the policy objectives: 1)to extract agricultural surplus; 2)to ensure increasing grain supply; and 3) to distribute grain more efficiently. From the analyses in the previous three chapters, however, this system did not serve the objectives properly. In the long run, it may not be the appropriate policy instrument at all.

As explained before, to distribute grain more efficiently does not mean minimizing distribution cost or maximizing marketing profit. As grain supply is usually short in China, it simply means distributing grain more equally among regions in order to meet basic consumption demand and preventing social and economic disorders. Obviously a compulsory distribution system might be necessary in some extreme cases when equal rationing overrules any economic consideration. Otherwise there might exist other alternatives serving the same objective at less cost.

Currently, grain supply is not that short in China. Average grain output per capita increased by 24 percent during

the 1979-84 period. Though regional inequalities still exist, basic human consumption needs have been roughly met in most areas. Therefore, no matter how important this system was in its early years, its continuation must be reexamined against its cost and the implication of other alternatives. Chapter 5 indicated that there have been significant losses in terms of resource misallocation, due to the rigid procurement system. The problem of inequality in grain consumption could not be solved totally by the system because of the conflicts between the central and provincial governments.

Under the current situation, a free market system, with some kind of government intervention when necessary or desired, may serve the same policy objective at a lower cost. If an increase in the grain inflow to some region is necessary, the central government could achieve that goal through tax reduction, transport or marketing subsidies, or other financial assistance. Those measures, temporary or long term as desired, can be designed to achieve less distortion in resource allocation and less loss in economic efficiency. Furthermore, they are more flexible. The cost of administering such policy measures is likely to be less than the cost of maintaining the whole procurement and rationing system.

The compulsory procurement system, especially the administered low price, is used to extract surplus from the agri-

cultural sector. Its negative effects on grain production are more or less anticipated by policy makers. Therefore, a compulsory delivery quota is used to ensure an increasing supply of grain. However, past experience suggests that the quota system could not ensure increasing grain supply as expected, and the grain purchasing price had to increase several times. The growth rate of grain production was very low without price increases. Chapters 4 and 5 showed that the procurement system was most responsible for the lack of work incentives on collective farms. Under the heavy pressure of the delivery quota, which was enhanced by the compulsory sown area plan, peasants were forced to allocate more resources in grain production beyond their willingness, and the extra input could not bring about expected output.

At present, as the grain purchasing price is still lower than that determined in competitive markets, the losses in production efficiency and in resource misallocation are still likely to exist, and grain output is not likely to reach its highest level possible.

The major merit of the procurement system might be to extract agricultural surplus for industrialization, and all losses might be considered as necessary costs. There is almost no one opposing the idea of rapid economic growth, even at the cost of current consumption to some extent. The question is how fast the growth is sustainable, or how much current consumption people are really willing to give up for the future.

The analysis in Chapter 3 suggests that current consumption has been suppressed too much in most of the past 39 years. The declines in work incentives and in economic efficiency have more than offset the expected effect of larger portion of national income being invested. As a result, the growth rate of the whole economy could not reach its potential. The compulsory procurement system had a twofold negative effect on the low growth rate. First, it slowed down the growth of the grain sector itself, which was a major component of agricultural economy. Second, the suppressed supply of foodstuffs was directly responsible for the decline in workers' morale, and led to low work incentives and low economic efficiency.

The experience of the 1979-85 period shows that the whole economy would have been able to increase faster if the consumer goods sector had been less suppressed. During that period the grain price was raised by 80 percent, which means less extraction of funds from the grain sector. One might have expected slower growth in the whole economy as the producer goods sector got a relatively smaller share of national income compared with before. But it turned out to be the opposite. In this time period, China invested about 30 percent of her total national income on average. The actual investment/savings rate was still higher than that in most other countries. But the declining trend in economic growth stopped. In fact, the annual growth rate of national income

increased from 6 to 8.9 percent. Therefore, it seemed that the same policy objectives could have been achieved better with less restriction on current consumption.

However, even if restricting consumption implies extracting agricultural surplus, it is not necessary to take the form of procurement system. Taxation is another alternative. Mr. Sun,[15] a distinguished Chinese economist, advocated substituting taxation for procurement system, in favour of economic efficiency. In this way, he argued, there would have been much less distortion in resource allocation, both in the whole economy and in the grain sector itself. Grain producers could have had much greater incentives, and the efficiency in grain production could have been largely improved.

In the early 1950's, agriculture's share of the total national income was more than 50 percent, and grain production was dominant in agriculture. But this situation has changed over time. Today agriculture's share accounts for about 35 percent of the total national income. Although grain production is still dominant in terms of sown area, its importance as a revenue source has largely decreased. In 1986, the value of total agricultural output accounted

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[15] Mr. Sun Yefang once was in charge of State Statistics Bureau and State Price Bureau. He was criticized as the "largest revisionist in China" in 1964 and put in jail during the "Cultural Revolution". After his release in the late 1970's Mr. Sun was soon recognized as one of the most outstanding economists in China. He was honoured as a model member of the Communist Party by the Party Central Committee after his death.

for about 53 percent of total rural gross revenue. Others came from township and village industry, construction, transport and service sectors. Among the value of total agricultural output, only 45 percent came from growing crops, and the rest were from forestry, animal husbandry, fishery and sideline productions. As grain sown area accounted for 77 percent of the total, and as grain production is least profitable, the total revenue from grain production was likely to be less than 35 percent of the value of total agricultural output, and less than 18 percent of the total revenue in rural areas(China's Statistical Yearbook, 1987).

The continuing use of the grain procurement system as the major method to extract agricultural surplus is putting the most financial burden on a sector which only provides 18 percent of the total rural revenue. Besides the consideration of fairness, it inevitably leads to serious distortions in resource allocation, and imposes heavy pressures on grain production, which, in turn, will lead to low incentives and low economic efficiency in the whole economy.

On the other hand, a general tax scheme may spread the financial burden among all rural sectors, resulting in much less distortion in resource allocation and much lower pressures on any single sector. Because the costs of calculating personal incomes and enforcing tax collecting will be excessively high, it is very difficult, if not impossible, to

collect personal income tax from 800 million rural residents. Therefore, raising funds through marketing rather than tax scheme may have certain merits in developing countries where a large portion of total population involves in semi-selfsufficient economies. In today's China, however, raising funds through grain marketing alone leads to severe distortion in resource allocation and results in food shortage, and introducing the same marketing schemes to other farm products is not appropriate since the economic reform aims at the establishment of a relatively free market. Nevertheless alternatives exist, one of which is to collect income tax from small industrial service enterprises in rural areas, and to impose a lump sum tax on farm land. In this case, the tax rates may differ according to the type of business and the type of crop. When the grain sector is put in a proper position as a revenue generator, the rigid procurement system will no longer be necessary. Taxation can serve the same policy objectives much better, in terms of less cost, and free markets may largely improve work incentives and resource allocation.

6.2 FREE MARKET FOR GRAIN IN CHINA

The agricultural economy in China is basically self-sufficient, especially in the case of grain production and consumption. With less than 0.3 acres of farmland per rural capita, on average, Chinese peasants can only sell 25 percent of their grain output to other sectors. Most Chinese

peasants are grain producers and their products are for their own consumption, with surpluses sold. Grain production has never been a commercial business in general.

Because of the self-sufficiency nature, and the restrictions imposed by the underdevelopment of transportation, communication, and other marketing facilities, there was no national grain market in China. However, several regional grain marketing centres were formed where grain surplus was relatively large, transportation was more convenient and demand was large. The Wuxi "Rice Market" has been the largest one since the 18th century. The quantity traded in this largest market was estimated at under 0.4 mmt in the 1920's and 30's, and the total interprovincial grain shipment at that time was estimated at about 5.3 mmt for the whole country, which accounted for 4.5 percent of total grain output (D. Xu, 1983). This figure clearly showed the self-sufficiency nature in China's grain sector.

Before 1953, grain markets were dominated by private merchants in China's long history. Some kind of government purchasing existed from time to time, but it never became a major force in the market and government agencies acted as private merchants in the market. From 1953 to 1979, private grain marketing was made illegal. But the enforcement of the law was not completely successful and it probably could never be carried out completely.

Even the government itself participated in local free markets in those years. For political considerations, the government had to fix grain procurement quotas for a certain time length but the rationing demand increased with urban population and their incomes, as well as with industries where grain was used as input. The government grain departments had to buy additional grain from local grain markets or directly from peasants. When they bought grain in free markets they paid the market price. But when they bought grain directly from peasants, a "negotiated price" was paid. In many cases this price was not subject to negotiation but set by the government at a level higher than the quota price. Nevertheless the price and quantity would be influenced by the local market situation.

On the other hand, when the grain departments sold extra grain to non-farm residents in addition to their normal rationing, or to industries in addition to their original supply plans, a higher "negotiated price", which was also set by the state, would be applied to cover the extra cost involved. Thus, as this kind of grain trade increased over time, special government agencies were established under the grain departments to deal with it in the 1970's. They were usually called "grain and edible oil negotiated trading company". These companies traded grain, edible oil and oilseeds in local free markets as well as with their counterparts in other areas. In this way they were actually doing their

business outside state procurement and rationing channels, like public owned ordinary commercial enterprises.

China has experienced economic reform since 1979. As a result, private grain marketing has been formally legalized and many restrictions on grain trade have been eased. Long distance grain transportation and marketing are now permitted by private merchants and cooperatives. On the one hand grain production increased dramatically in the early 1980's, and so did the grain surplus in the peasants' hands. On the other hand, demand for feed grain and industrial uses also increased dramatically. Grain marketing outside the state procurement and rationing channel has been very active recently, with those "negotiated trading companies" being the largest participants in the free markets.

As part of the new policy, the grain departments' direct role in grain distribution through the procurement and rationing system is to be reduced in order to improve economic efficiency, and to reduce the burden of grain subsidies on government budget (It was about 20 percent of total budget revenue in the early 1980's.). As mentioned before, some rural residents now are no longer subject to rationing. They have to buy grain from free markets, including from those "negotiated trading companies". At the same time, more and more industrial uses of grain have been excluded from grain department's supply plans. Those industries, such as food manufacturing and restaurants, enzyme products, solvent

products, beer, beancurd, textile, and so on have turned to local free markets as well as to those "negotiated trading companies" to get their supplies.

The quantity traded in local free markets has increased very quickly. In 1978 peasants sold 1.2 mmt of grain to non-rural residents. The amount increased to 6.3 mmt in 1986. Considering the grain traded among peasants themselves, the total quantity may be well above 10 mmt in these local markets(China's Statistical Yearbook, 1987). A more significant change is the quantity of grain traded by state agencies or enterprises outside the procurement and rationing channel. It was nil before 1978, but increased to 2.5 mmt in 1979 and 19 mmt in 1986. These figures were for processed grain. If converted to unprocessed form, they would be 3.1 and 23.2 mmt respectively. Most of the trade was done by those "negotiated trading companies".

Responding to the increased demand, many regional grain marketing centres, such as the Wuxi Rice Market, have resumed. The government-run, or public owned, "negotiated trading companies" are by far the largest participants in these regional grain marketing centres. As mentioned above, the quantity handled by them was 23.2 mmt, compared with 6.3 mmt sold by peasants directly to non-rural residents. And, that amount, 23.2 mmt, accounted for about 20 percent of total government procurement in the same year.

Therefore, it can be concluded that public enterprises today dominate the free markets for grain, and their importance in grain marketing is increasing. Compared with individual peasants or private enterprises, they have better information, more and better storage and handling facilities, and easier accesses to transport and financial services. They also have good connection with each other. Among all those markets, the ten largest "negotiated trading companies" have connected with each other through a telex system. If grain free marketing is to be developed further as has been announced by the government, they might constitute a wholesale network upon which a national marketing centre might be formed. Therefore, they seem to have a stronger position in the future. They may actually become the physical substitution to the procurement and rationing system if current policy is to be carried out further.

6.3 ECONOMIC SIGNIFICANCE AND POTENTIAL FUTURE OF FREE MARKET

The reintroduction of the free markets for grain is a partial recognition of the failure of the existing procurement and rationing system. Since 1979, free markets have contributed to the rapid growth in grain production and to the improved grain distribution in China. The price peasants received in these markets was about 30 percent higher than that paid by state procurement agencies. This higher marginal income has given producers greater incentives to increase their grain production.

On the other hand, the price difference among regions stimulated interregional grain shipment, which has improved the grain distribution system. The relatively scarce grain supply may be used better where it is valued most. And the resulting specialization in agricultural production may improve resource allocation, which may lead to gains to the whole society. The grain sector may benefit from the specialization in particular. As grain production is likely to be relatively concentrated in areas where it has comparative advantage over other crops, yield is likely to increase. And as marginal income of growing grain increases, total grain sown areas may increase, at least may not decrease as otherwise. So the output is likely to increase if the role of free markets becomes more significant.

In practice, the role of free markets is restricted by the procurement system. Under current "contracted purchasing" scheme, peasants still have a legal obligation to sell a certain quantity of grain to state agencies first. Only surplus after fulfilling the quota requirement can be sold in free markets. The quantity of grain supplied in free markets is restricted by purchasing quota and the rapid expansion of the markets since 1979 has been basically due to the cutting of procurement quotas. In 1986, after reserves for seed, feed and own consumption, peasants had to sell 75-80 percent of the remaining grain to state procurement agencies. As the quantity was so restricted, free markets for

grain were basically of local nature. Their positive effects on grain production and resource allocation were limited (The effects of restriction on demand side will be explained later.).

Nevertheless, free markets have shown a positive effect on grain production and resource allocation. More importantly, it actually provides an alternative to policy makers. It is quite clear that a free market system may stimulate grain production much better than the procurement system. It is also clear that a free market system may distribute grain better and lead to additional gains from specialization and interregional trade. But it cannot be used to extract agricultural surplus, at least not directly.

However, extracting agricultural surplus itself is not the ultimate aim. The final objective is to raise investment funds and to speed up economic growth. When grain was the major sector in the economy and heavy tax was not acceptable, the procurement system might have had some reasons to exist. Today as the share of revenue from the grain sector has sharply declined, imposing such financial burden on this sector alone can hardly be justified. The resulting shortage in food supply has significantly influenced economic efficiency in all other sectors, which has led to less revenue to be generated from the whole economy. Therefore, the free market system, although it may not provide investment funds directly as the procurement system does, may result in

greater revenue to be generated in the whole society. And the government will be able to raise larger investment funds from other sectors.

The development of the free market now is facing a critical point. In the past decade, private grain marketing was reintroduced and developed. But private enterprises, and even the public owned "negotiated trading companies", could not compete with state grain departments. The quantity of procurement was guaranteed. If the current "contracted purchase" is still in effect, there will not be much room for free markets to expand. As a result, the negative effects of the existing system will still exist, which may not be attractive at this stage.

The government may cut "contracted purchasing" quota further and let procurement agencies buy grain partly from free markets to meet rationing demand. In this way, the portion of the "contracted purchase" may decrease over time, and urban human consumption will still be subsidized. The government will face greater budget burden. Even if the government does not subsidize at all, urban residents may still be able to pay a price lower than the market one if grain departments are directed to pool the "contracted" and market purchasing costs, and to charge the average cost in urban retailing.

In this case, free markets may not change too much. The quantity will increase over time. But most of the increase will be purchased by grain departments. As long as urban residents pay low prices to grain departments, private enterprises and the "negotiated trading companies" cannot compete with grain departments in urban retailing markets.

However, there will be a greater opportunity for peasants to adjust their resource allocation, and greater incentives for them to increase grain production. Therefore, the unrealized gains from resource misallocation and from low work incentives will be reduced. And the relatively rich supply of foodstuffs will improve work incentives in all other sectors as well. The smaller the quota quantity is, the greater the gains of economic efficiency will be. At the extreme, quota is abolished and urban residents pay market price, state grain departments will disappear or become commercial enterprise like the "negotiated trading companies". Then, grain markets will be unified and economic gains will be the largest.

There is one major problem if the change occurs too soon: inflation. Inflation was unknown to the Chinese before 1979 except during the crisis of 1959-62. Then the annual increase in the urban living expense index climbed to 10 percent in 1985, and jumped to about 20 percent in 1988. The government is struggling with the two-digit inflation and has to postpone the long overdue wage-price reform. As the

food bill accounts for half of the living expenses, any significant increase in grain retail price will inevitably add tremendous fuel to the fire.

Therefore, fundamental changes in the grain marketing system, namely, to totally free grain purchase and retail prices, cannot be expected in the near future. The pace of grain market reform will depend on the general course of economic reform. At present, it will depend on the process of wage-price reform in particular. Meantime, the quantity of quota may be cut bit by bit and the quota price may be raised further over time. The potential economic gains may materialize gradually.

On the rationing side, the government may choose from two approaches. On the one hand the government may decide to raise retail price gradually to the market level. Then state grain departments may actually become commercial enterprises and finally may compete with private enterprises and the "negotiated trading companies" at market places. On the other hand, if the government chooses to gradually cut the rationing amount and let urban residents buy grain in free markets, private enterprises and the "negotiated trading companies" may expand their market shares over time and finally occupy the whole market. But it may not necessarily be so. If, at the same time, grain departments are directed to provide over-rationing grain at market price to urban residents, they may play a dual role in the market until

rationing finally expire. After then, they will function as commercial enterprises.

State grain departments actually possess grain purchasing, handling, storage, retailing, and even transport facilities. Therefore, if they gradually become commercial enterprises, the disturbance and cost in the transitional period might be smaller than otherwise. And the coming competition among state grain departments, "negotiated trading companies", and private enterprises may benefit consumers and the further development of the whole grain marketing system.

Chapter VII

SUMMARY AND CONCLUSION

7.1 SUMMARY OF THE STUDY

As mentioned at the beginning of this study, the Chinese government has been focusing on rapid economic development since the founding of the People's Republic. In most of the past four decades, the development strategy essentially relied on heavy physical investment at the cost of current consumption. A compulsory grain procurement and rationing system was designed to restrict rural consumption and to extract agricultural surplus for development purposes. Lack of incentives in the grain sector due to low administered prices was anticipated by the government. But the delivery quota was considered sufficient to bring about a more or less satisfactory growth in grain production, and the rationing system was considered efficient to distribute the relatively short grain supply. Therefore, the increasing demand for grain could be met, and the rapid economic growth could be supported by the grain procurement and rationing system.

However, after more than three decades of implementation, the Chinese government is now considering abolishing the procurement system. As rapid economic growth is still the

top priority, the intention to abolish the procurement system indicates that the system may not be the appropriate instrument to achieve the policy goal. And, in the long run, the performance of the procurement system may contradict its policy objectives. As the procurement system was an integral part of the past development strategy, the intention to abolish the system suggests that the past development strategy itself is also questionable.

This study attempted to assess whether the past development strategy, which relied on physical investment, could achieve the policy objective of rapid economic growth in the long run, and to analyze the role and performance of the grain procurement system in the implementation of such strategy. This study also attempted to identify the costs of adopting the procurement system, in terms of low work incentives and resource misallocation. Furthermore, this study attempted to analyze the significance of reintroduction of the free market mechanism into the existing grain marketing system, and to assess the potential changes in Chinese grain markets in the near future.

It was hypothesized in this study that a long-standing restriction on consumption may lead to low morale and low economic efficiency. The trade-off between physical investment and economic efficiency may result in the failure of the past development strategy. It was also hypothesized in this study that the procurement system may be the major fac-

tor responsible for the low work incentives and low productivity in the grain sector, and the major factor resulting in resource misallocation. Therefore, the free market, along with a general tax scheme, may serve the same policy objectives at lower costs.

It was found in this study that the past development strategy could not bring about what policy makers had expected from it. When consumption had been more severely restricted before 1979, the growth had been lower and decreasing instead of being higher and increasing as anticipated. When consumption was less restricted during 1979-85, the growth was higher. As grain supply was a major component of consumption, the extent to which grain production was suppressed had an important impact on the growth of the whole economy, as well as on the growth of the grain sector itself.

It was also found in this study that, while collective farming did not necessarily lead to low work incentives, the procurement system was bound to reduce work incentives on both collective and private farms. And the nature of quota-forced labor and other inputs resulted in a downward shift of the grain production curve, which indicated an efficiency loss in grain production due to the procurement system.

Furthermore, it was found in this study that the procurement system prevented peasants from making use of com-

parative advantage of their farm land in growing different crops. On the contrary, optimal pricing might be able to stimulate regional specialization in the agricultural sector, resulting in more efficient resource allocation and greater total output.

Theoretically, the free market does not suppress grain production, and does not distort resource allocation. Compared with the procurement system, the free market may result in higher growth in the grain sector, and more efficient production in agriculture as a whole. The increased supply of grain and other farm products may improve economic efficiency in other sectors, leading to higher growth of the entire economy. The only shortcoming of the free market, compared with the procurement system, is that the agricultural surplus can not be extracted through this approach.

Presumably, allocating a relatively large share of national income into investment is still crucial to economic growth, and sacrificing current consumption to future growth is still desirable to some extent. Even so, imposing such a burden on the grain sector is not necessary nor efficient. A general tax scheme may be used to collect more funds from broader and better sources. Under the free market system, the grain sector may not provide as many funds as it did under the procurement system. But the increased grain supply may result in more funds being generated in other sectors due to improved work incentives and improved economic efficiency.

7.2 CONCLUSION AND POLICY RECOMMENDATION

The 1979-85 experience suggests that sacrificing current consumption, within a certain range, is still acceptable to the Chinese people. The savings/investment accounted for more than 30 percent of the national income during the period. The savings/investment rate was among the highest in the world, and was likely to have gone beyond the extent to which individuals would have chosen voluntarily. However, the growth rates were also among the highest in the world: 10.4 percent for total output, 8.9 percent for national income, and 9.8 for consumer goods. And there was no evidence of declining efficiency in this time period. It indicates that, as long as the increase of consumption is satisfactory to some extent, allocating a relatively larger share of national income into investment may bring about rapid economic growth. Under the current situation, the optimal choice is likely to be the scenario of balanced growth, as suggested by the 1979-85 experience.

However, the grain procurement system is not the best nor the necessary approach to raise investment funds. When the grain sector dominated Chinese agriculture in the 1950's, the adoption of the procurement system might have been reasonable. Today, as grain production provides less than 18 percent of the total rural revenue, and as grain supply has such an important impact on economic efficiency, it is unwise to extract funds from the grain sector through such a procurement system.

The costs of implementing the procurement system are quite high. As analyzed in Chapter 4, the procurement system was the major factor contributing to the low work incentives on collective farms. It may also have caused a downward shift of the grain production curve. This efficiency loss is still likely to exist under current private farming, or the "full responsibility system", as long as the procurement system is still in effect. The analysis in Chapter 5 demonstrated that the loss in resource allocation due to the procurement system was quite significant, and the potential gain in regional specialization and exchange could be achieved through optimal pricing, or through a free market system.

More importantly, the procurement system inevitably suppressed grain production. As illustrated in Chapter 3, in turn, the slow growth in grain supply led to the steady decline of economic efficiency in the whole economy before 1979. A reduction of the pressure improved grain supply during 1979-85. As a result, the growth of the economy was faster than before. It suggests that the abolishing of the procurement system is likely to improve economic efficiency, and to push the growth further.

Therefore, it is concluded in this study that the grain procurement and rationing system may not serve its policy objectives properly. On the contrary, the free market may stimulate grain production better, distribute grain more

efficiently, encourage regional specialization at a larger scale, and improve the efficiency of the economy as a whole. The desired investment funds may be raised through a general tax scheme which may provide a larger revenue base and lead to less distortion in resource allocation.

This approach has apparent advantages over the existing procurement and rationing system. However it may not be appropriate to totally free grain price immediately due to the current two-digit inflation. The Chinese Statistics Bureau has reported that the real income of 40 percent urban population in 1987 was lower than in 1986 because of inflation. As a result, the gain in economic efficiency in the past decade may be lost again if the trend continues. However, although the stimulated increase in grain supply may ease the pressure of food shortage and bring down inflation rate, the chain reactions of a sudden increase in grain prices may result in inflation being out of control if grain prices are to be freed in one night. The designing and implementing of an appropriate tax scheme also needs time. Therefore, it is recommended in this study that the procurement and rationing system should be abolished gradually, depending on the progress in controlling inflation.

It is also recommended in this study that state grain agencies should be turned into commercial enterprises in this process. On the procurement side, the quantity of delivery quota may be cut gradually to zero, and the "con-

tracted purchasing" price may be raised gradually to the market level. On the rationing side, the quantity of monthly ration may gradually be brought down to zero, and the price for rationed grain may gradually be increased to a market based one. Finally, state grain agencies may become commercial enterprises and compete with private merchants in the market.

It is believed here that the competition among private merchants, the "negotiated trading companies", and state grain agencies will improve the efficiency of grain marketing. Therefore, if state grain agencies gradually reduce the quantity of grain distributed through procurement and rationing channels, there would be a better opportunity for private enterprises and the "negotiated trading companies" to expand their operation in the transitional period. After the transitional period, state grain agencies will not monopolize grain markets, and consumers will benefit both through and after the transitional period.

7.3 LIMITATIONS OF THE STUDY

A growth model is developed in this study to assess the role of the grain procurement system in the economic development. This model is supposed to be applicable to developing countries where capital scarcity is the major constraint in economic growth. A convenient assumption, as in most growth models, is the fixed output/capital ratio. However, it is

found in this study that this may not be the case. At least, there may exist a negative relationship between output/capital ratio and the growth of consumer goods when the growth of consumer goods is lower than a certain point. But this study could not test the mathematical form of the relationship. The attempt to establish such a relationship is beyond the scope of this study, and requires data which are not available at present.

This study attempts to demonstrate that the procurement system is primarily responsible for the lack of work incentives on collective farms, and that it may lead to a downward shift of the grain production curve. An implicit assumption here is that there exist economies of scale beyond family farming, and that there is no reason to assume different supervision costs for different production organizations. The argument made by some authors, for instance Lin, is that the cost of supervision prevents efficient labor input and hence leads to low work incentives. As this argument can be applied to any kind of production organization except the family farm, the implicit assumption seems to be that there exists no economy of scale in agriculture. Lack of data makes it impossible to test the two alternative assumptions with appropriate production functions, upon which policy recommendations may differ. Furthermore, an appropriate production function may be used to measure the downward shift of the grain production curve and to assess the cost imposed by the procurement system.

Restricted by data, provincial figures are used in this study to measure the loss in resource allocation due to the procurement system. It more or less violates the assumption on the peasants' relative freedom in decision making. Many peasants in Jiangsu, Shandong, Henan, Hubei and Anhui could not choose growing any crop other than grain due to the quota requirement during the 1979-84 time period. If the data could be disaggregated, the test would have been more precise.

7.4 SUGGESTIONS FOR FUTURE RESEARCH

This study is an attempt to discover the role of the grain procurement and rationing system in economic development. It is concluded that the system is not the appropriate policy instrument and should be abolished gradually. Further research in this area may provide quantitative estimations of the potential gain and the cost in the transitional period, and hence make recommendations on the dynamic pace of reforming the grain marketing system.

This study involves three theoretical areas: growth economics, cooperative economics, and comparative advantage(trade theory). Further research in the three areas may be of both academic and practical value. Like the treatment of the agriculture/food sector as a separate one in some structuralist models, a modified Feldman model which links the output/capital ratio to the level and/or growth of con-

sumption may enrich the literature of growth economics, and help policy makers in planned and/or semi-planned economies.

An important branch of cooperative economics is the research on collective farming in a planned economy. As mentioned before, different assumptions on the source of low work incentives and on the difference between actual labor and true effort may be tested with appropriate production models when data are available. The results may benefit the development of cooperative theory as well as policy formation.

Regional development is an important policy objective in many countries. The application of trade theory in this area is very useful. More sophisticated models which include more goods and/or incorporate cost structures of these goods may provide guidance of the directions of regional specialization and exchange.

This study has suggested several areas in which future research may be undertaken. For the particular purpose of this study, and restricted by available data, this study could not push further toward these directions. However, it is believed here that future research in these areas will be fruitful.

Appendix A

A GROWTH MODEL FOR CHINA'S ECONOMY

The growth model presented in Chapter 3 suggests that the pattern of economic development in China is determined by the government decision regarding the allocation of investment funds between producer goods and consumer goods sectors. This model is similar to that built by Feldman, in the assumptions that the whole economy is divided into two sectors, that capital is the only scarce factor, and that output/capital ratio is fixed, and in the basic concept that capital accumulation determines the rate of growth. The difference between the two models is that, while Feldman treated both he savings rate and the investment ratio between two sectors as two independant policy variables, this study only takes the latter as the policy instrument.

Following Marx, the producer goods sector is denoted as Department 1 and consumer goods sector, Department 2. Then, by definition, the total investment, I, is the difference between the net output of Department 1 and the material cost of Department 2. The policy variable r is the proportion of total investment allocated to Department 1($0 < r < 1$). Through carefully choosing the value of r, policy makers can alter the growth pattern of each department and that of the whole economy.

There are three potential objective variables. The first one is the total output W, which is the sum of gross outputs in both departments. The second is W2, the total of consumer goods or gross output in Department 2. And the third is the national income Y, which is the sum of investment I and consumer goods W2, or net products in both departments. The policy makers may want to maximize the growth rate of one of the objective variables.

Given the definitions in Chapter 3, We have

$$W1_t = C1_t + V1_t + S1_t = a_1 K1_{t-1},$$

$$W2_t = C2_t + V2_t + S2_t = a_2 K2_{t-1},$$

$$W_t = W1_t + W2_t = a_1 K1_{t-1} + a_2 K2_{t-1},$$

and

$$b_1 W1_t = a_1 b_1 K1_{t-1} = V1_t + S1_t,$$

$$b_2 W2_t = a_2 b_2 K2_{t-1} = V2_t + S2_t.$$

where a is the output/capital ratio, b is the net/total output ratio, C is the material cost, V is the wage payroll, S is the profit and K is the existing capital stock.

Then, the three potential policy objectives can be written as functions of existing capital stocks, K1 and K2:

$$I_t = V1_t + S1_t - C2_t$$

$$= b_1 W1_t - (1-b_2)\, W2_t$$

$$= a_1 b_1 K1_{t-1} - a_2 (1-b_2)\, K2_{t-1},$$

$$W_t = W1_t + W2_t$$

$$= a_1 K1_{t-1} + a_2 K2_{t-1},$$

$$W2_t = a_2 K2_{t-1},$$

$$Y_t = I_t + W2_t$$

$$= a_1 b_1 K1_{t-1} - a_2(1-b_2)\, K2_{t-1} + a_2 K2_{t-1}$$

$$= a_1 b_1 K1_{t-1} + a_2 b_2 K2_{t-1}.$$

Given that the change in capital stocks equals investment such that

$$dK = I,$$

the changes in investment, total output, consumer goods and national income, and the growth rates of these variables can be derived as follows:

$$\begin{aligned} dI_{t+1} &= d(a_1 b_1 K1_t - a_2(1-b_2)K2_t) \\ &= a_1 b_1 I1_t - a_2(1-b_2)\, I2_t \\ &= (a_1 b_1 r - a_2(1-b_2)(1-r))I_t, \end{aligned}$$

$$gI = \frac{dI_{t+1}}{I_t} = a_1 b_1 r - a_2(1-b_2)(1-r),$$

$$\begin{aligned} dW_{t+1} &= d(a_1 K1_t + a_2 K2_t) \\ &= a_1 I1_t + a_2 I2_t \\ &= (a_1 r + a_2(1-r))I_t \\ &= (a_1 r + a_2(1-r))(a_1 b_1 K1_{t-1} - a_2(1-b_2)K2_{t-1}), \end{aligned}$$

$$gW = \frac{dW_{t+1}}{W_t} = (a_1 r + a_2(1-r))\frac{a_1 b_1 K1_{t-1} - a_2(1-b_2)K2_{t-1}}{a_1 K1_{t-1} + a_2 K2_{t-1}}$$

$$= (a_1 r + a_2(1-r))\left(b_1 - \frac{1 - b_2 + b_1}{\frac{a_1 K1_{t-1}}{a_2 K2_{t-1}} + 1}\right),$$

$$\begin{aligned} dW2_{t+1} &= d(a_2 K2_t) \\ &= a_2 I2_t \\ &= a_2(1-r)I_t \\ &= a_2(1-r)(a_1 b_1 K1_{t-1} - a_2(1-b_2)K2_{t-1}), \end{aligned}$$

$$gW2 = \frac{dW2_{t+1}}{W2_t} = a_2(1-r)\frac{a_1 b_1 K1_{t-1} - a_2(1-b_2)K2_{t-1}}{a_2 K2_{t-1}}$$

$$= a_2(1-r)\left(\frac{a_1 b_1 K1_{t-1}}{a_2 K2_{t-1}} - (1-b_2)\right),$$

$$dY_{t+1} = d(a_1 b_1 K1_t + a_2 b_2 K2_t)$$

$$= a_1 b_1 I1_t + a_2 b_2 I2_t$$

$$= (a_1 b_1 r + a_2 b_2 (1-r))I_t$$

$$= (a_1 b_1 r + a_2 b_2 (1-r))(a_1 b_1 K1_{t-1} - a_2(1-b_2)K2_{t-1}),$$

$$gY = \frac{dY_{t+1}}{Y_t} = (a_1 b_1 r + a_2 b_2 (1-r))\frac{a_1 b_1 K1_{t-1} - a_2(1-b_2)K2_{t-1}}{a_1 b_1 K1_{t-1} + a_2 b_2 K2_{t-1}}$$

$$= (a_1 b_1 r + a_2 b_2 (1-r))\left(1 - \frac{1}{\frac{a_1 b_1 K1_{t-1}}{a_2 K2_{t-1}} + b_2}\right).$$

Here dX is the change in variable X and gX is the growth rate of variable X. Furthermore, if we assume that $a_1 = a_2$ and $b_1 = b_2$, then the above equations can be simplified as follows:

$$gI = abr - a(1-b)(1-r) = a(b+r-1),$$

$$gW = (ar+a(1-r))\left(b - \frac{1}{\frac{aK1_{t-1}}{aK2_{t-1}} + 1}\right)$$

$$= a\left(b - \frac{1}{\frac{K1_{t-1}}{K2_{t-1}} + 1}\right),$$

$$gW2 = a(1-r)\left(\frac{abK1_{t-1}}{aK2_{t-1}} - (1-b)\right)$$

$$= a(1-r)\left(\frac{bK1_{t-1}}{K2_{t-1}} - (1-b)\right),$$

$$gY = (abr + ab(1-r))\left(1 - \frac{1}{\frac{abK1_{t-1}}{aK2_{t-1}} + b}\right)$$

$$= a\left(b - \frac{1}{\frac{K1_{t-1}}{K2_{t-1}} + 1}\right).$$

Therefore, the growth rates of these variables depend on the values of coefficients a's and b's, on the ratio of existing capital stocks of the two departments, and on the policy variable r, which is the proportion of investment in Department 1. The ratio of capital stocks is fixed at any time, and the values of a's and b's are given by technology. They may change with the structure of the economy and may fluctuate with production efficiency. If we assume that a's and b's are constant then the growth rates of the three potential objective variables are determined by policy variable r. By choosing different value of r policy makers can alter the growth pattern of the whole economy. However the evidence found in this study suggests that the values of a's and b's are also influenced by policy variable r. And the effect of the changing values of a's and b's may contradict policy makers' will if the value of r is set too high.

Appendix B

MARGINAL INCOME ON COLLECTIVE FARMS

Israelsen used the marginal income as the measure of work incentives on different farms in his research. In this appendix, the marginal income on collective farms will be derived under different assumptions. The first situation to be examined is that the marginal income is the first order derivative of an individual's income with respect to his/her labor input, without counting the production cost. This is directly adopted from Israelsen's article. According to his definition, an individual's income on a collective farm is the total income of that collective divided by the person's share of labor input:

$$y_i = (l_i / L)\, F(L) \ .$$

The marginal income of that person is the first order derivative of his/her income with respect to his/her labor input:

$$\frac{dy_i}{dl_i} = \frac{l_i}{L} F'(L) + \frac{L - l_i}{L^2} F(L)$$

$$= \frac{l_i}{L} F'(L) + \left(1 - \frac{l_i}{L}\right)\frac{1}{L} F(L)$$

$$= \frac{l_i}{L} MP + \left(1 - \frac{l_i}{L}\right) AP.$$

As $F'(L)$ and $l_i/L\ F(L)$ are marginal and average labor products, respectively, an individual's marginal income on a collective farm is a convex combination of his/her marginal and average labor products. If $AP > MP > 0$, i.e., the collective farm is operating in the optimal range, the marginal income of an individual is greater than his/her marginal value product.

One step further from Israelsen's analysis is adding a fixed production cost. When fixed cost, C, is considered, the total income of a collective farm is the difference between total output and cost:

$$Y = F(L) - C.$$

Then, the income and marginal income of an individual can be derived as follows:

$$y_i = (l_i/L)\ [F(L) - C], \text{ and}$$

$$\frac{dy_i}{dl_i} = \frac{l_i}{L} F'(L) + \frac{L-l_i}{L^2} [F(L) - C]$$

$$= \frac{l_i}{L} F'(L) + (1 - \frac{l_i}{L}) \frac{F(L) - C}{L}$$

$$= \frac{l_i}{L} MP + (1 - \frac{l_i}{L}) NAP,$$

where NAP is net average product per labor hour.

Furthermore, we may want to derive the work incentives on farms such as Chinese People's Commune which is not a pure collective as defined by Israelsen. On a Chinese People's Commune, the distribution of income is partly according to

work and partly according to "need"(or equality). If the proportion of income distributed according to "need" is equal to b, $0 < b < 1$, the income and marginal income of a member on a People's Commune are:

$$y_i = b/n\ [F(L) - C] + (1-b)\ l_i/L\ [F(L) - C],$$

and

$$\frac{dy_i}{dl_i} = \frac{b}{n} F'(L) + (1-b)\{[\frac{l_i}{L} F'(L) + \frac{L-l_i}{L^2} [F(L) - C]\}$$

$$= \frac{b}{n} MP + (1-b)\frac{l_i}{L} MP + (1-b)\frac{L-l_i}{L} NAP.$$

For an average worker, $l_i/L = 1/n$, it can be written as:

$$\frac{dy_i}{dl_i} = \frac{b}{n} MP + (1-b)\frac{1}{n} MP + (1-b)(1 - \frac{1}{n}) NAP$$

$$= \frac{1}{n} MP + (1-b) \frac{n-1}{n} NAP.$$

Thus, whether an individual's marginal income is greater or smaller than his/her marginal product depends on the proportion of distribution according to need and on the ratio of net/total output.

The response of an individual's marginal income to a change in output price, on a collective farm, can be expressed as the first order derivative of the corresponding marginal income with respect to price. When decision making is independent, it is as follows:

$$\frac{d^2 y_i}{dl_i\ dp} = \frac{d[1/n\ MP + (1 - 1/n)\ aAP]}{dp}.$$

As the size of an average production team was 130-140 in the early 1980's(China's Statistical Yearbook), the above equation can be roughly reduced to as follows:

$$\frac{d^2 y_i}{dl_i\, dp} = \frac{d(aAP)}{dp} = \frac{da}{dp} + 1.$$

When the decision making is not independent, m members will make the same decision and the partial derivative of total labor input with respect to the extra working hour contributed by anyone of the m members is not equal to one but m. The expected marginal income, following Cameron, can be derived as follows:

$$\frac{dy_i}{dl_i} = \frac{d\{(l_i/L)[F(L) - C]\}}{dl_i}$$

$$= \frac{(L - ml_i)[F(L) - C]}{L^2} + \frac{l_i}{L}[mF'(L)]$$

$$= \frac{L - ml_i}{L} aAP + \frac{ml_i}{L} MP$$

$$= (1 - \frac{m}{n}) aAP + \frac{m}{n} MP.$$

The response of the expected marginal income to a change in output price can be derived as follows:

$$\frac{d^2 y_i}{dl_i\, dp} = (1 - \frac{m}{n}) \frac{d(aAP)}{dp} + \frac{m}{n} \frac{dMP}{dP}$$

$$= (1 - \frac{m}{n})(\frac{da}{dp} + 1) + \frac{m}{n}$$

$$= (1 - \frac{m}{n}) \frac{da}{dp} + 1.$$

Appendix C

COMPARATIVE ADVANTAGE AND POTENTIAL LOSS

In Chapter 5, the data of cotton/grain return and sown area ratios are used in the regression of

$$A_{ij} = a_1 + a_2 D_2 + a_3 D_3 + a_4 D_4 + a_5 D_5 + bR_{ij-1} + e_{ij} .$$

These data are calculated from the official figures of yields, prices, and sown areas in China's Agricultural Yearbooks. Those calculated ratios are listed in Table C.1 and

TABLE C.1

Cotton/Grain Return Ratio

Province	1979	1980	1981	1982	1983	1984	1985
Jiangsu	1.855	1.566	1.763	1.569	1.805	1.566	1.291
Shandong	0.883	2.279	2.073	1.922	2.058	2.240	1.801
Henan	1.239	2.341	1.763	1.444	2.215	2.015	1.739
Hubei	1.952	1.628	1.501	1.287	1.604	2.275	1.902
Anhui	1.021	1.364	1.297	1.238	1.570	1.695	1.360

Source: Agricultural Yearbook Editing Committee: China's Agricultural Yearbook. (Return ratio = yield ratio * price ratio.)

Table C.2, respectively.

TABLE C.2

Cotton/Grain Sown Area Ratio

Province	1980	1981	1982	1983	1984	1985	1986
Jiangsu	0.099	0.104	0.106	0.105	0.110	0.092	0.076
Shandong	0.087	0.115	0.174	0.192	0.219	0.147	0.120
Henan	0.071	0.071	0.084	0.085	0.129	0.090	0.066
Hubei	0.111	0.112	0.109	0.106	0.102	0.091	0.081
Anhui	0.054	0.055	0.054	0.053	0.054	0.040	0.034

Source: ibid.

The inferred cotton procurement target is calculated as the summation of actual cotton sown areas in the five provinces multiplied by the expected yields, or the actual yields in the previous year. In other words, peasants are assumed to adjust their cotton sown areas according to procurement quota and previous year's yield such that

$$Qc_j = \sum_{i=1}^{n} Ac_{ij} * Yc_{ij-1},$$

where Qc_j is the inferred cotton procurement quota in jth year. Ac_{ij} is the cotton sown area in ith province, jth year. And Yc_{ij-1}, cotton yield in ith province, j-1th year. The inferred cotton procurement quota are shown in Table C.3.

The desired price ratio can be calculated in the following way. Firstly, from the equation

$$A_{ij} = f(R_{ij-1}) = f(Y_{ij-1} * PR_j)$$

given above(PR_j is the price ratio in jth year.), we have

TABLE C.3

Inferred Cotton Procurement Target

Province	Ac85 1000 ha	Yc84 ton/ha	Qc85 1000 ton	Ac86 1000 ha	Yc85 ton/ha	Qc86 1000 ton
Jiangsu	592.3	0.923	546.7	496.7	0.810	402.3
Shandong	1169.7	1.005	1175.5	1010.0	0.915	924.2
Henan	814.3	0.750	610.8	619.6	0.675	418.2
Hubei	465.0	1.125	523.1	413.3	1.065	440.2
Anhui	235.1	0.698	164.1	205.9	0.705	145.2
Total	3276.4	---	3020.2	2745.5	---	2330.1

Source: estimated.

$$A_{ij} = PR_j * f(Y_{ij-1}).$$

Secondly, according to the definition,

$$A_{ij} = Ac_{ij} / Ag_{ij}, \text{ or}$$

$$Ac_{ij} = Ag_{ij} * A_{ij},$$

where A_{ij} is the sown area ratio, and Ac_{ij} and Ag_{ij} are cotton and grain sown areas respectively, cotton sown area can be expressed as a function of price ratio, grain sown area and yield ratio:

$$Ac_{ij} = PR_j * Ag_{ij} * f(Y_{ij-1}).$$

Thirdly, as illustrated above, the inferred cotton procurement quota is the summation of cotton sown areas multiplied by cotton yields in the previous year,

$$Qc_j = \sum_{i=1}^{n} Ac_{ij} * Y_{ij-1}.$$

By substituting, we have

$$Qc_j = \sum_{i=1}^{n} \left(PR_j * Ag_{ij} * f(Y_{ij-1}) * Y_{ij-1} \right)$$
$$= PR_j * \sum_{i=1}^{n} \left(Y_{ij-1} * Ag_{ij} * f(Y_{ij-1}) \right),$$

and

$$PR_j = \frac{\sum_{i=1}^{n} \left(Y_{ij-1} * Ag_{ij} * f(Y_{ij-1}) \right)}{Qc_j} .$$

Given the actual data for yield ratios and grain sown areas, the estimated coefficients of the function

$$A_{ij} = f(Y_{ij-1} * PR_j),$$

in Chapter 5, and the estimated cotton procurement targets in Table C.3, the optimal price ratios are calculated at 6.16 and 4.2 for 1985 and 1986 respectively.

At these price ratios, peasants would have allocated their land between grain and cotton productions differently. Suppose the sum of cotton and grain sown areas was fixed as shown in the Yearbook each year, the inferred cotton sown area, Ac*, the inferred cotton output, Qc*, and the inferred change in grain output Qg* are calculated and listed in Table C.4.

TABLE C.4

Effects of Optimal Pricing

Province	Ac*85 1000 ha	Qc*85 1000 ton	Qg*85 1000 ton	Ac*86 1000 ha	Qc*86 1000 ton	Qg*86 1000 ton
Jiangsu	543.8	501.9	247.8	431.8	365.6	220.6
Shandong	1181.5	1187.4	-45.7	1065.8	975.2	-219.3
Henan	685.1	513.8	415.9	547.7	369.7	215.6
Hubei	543.7	611.7	-336.6	445.3	474.2	-138.7
Anhui	292.6	207.2	-204.6	205.7	145.0	0.5
Total	3246.7	3108.7	77.0	2715.8	2329.7	78.7

Source: estimated.

BIBLIOGRAPHY

Agricultural Yearbook Editing Committee. China's Agricultural Yearbook. Beijing: Agricultural Publishing House, various issues.

An, Xiji. Duiyu Jiejue Dangqian Liangshi Jiage Wenti De Yizhong Shexiang (A tentative Proposal for the Solution to the Recent Problems in Grain Prices). Research Paper, Beijing Agricultural University, 1983.

Balassa, B. "An Empirical Demonstration of Comparative Cost", Review of Economics And Statistics, Vol. 45, Aug. 1963.

Bonin, J. P. "Work Incentives and Uncertainty on a Collective Farm", Journal of Comparative Economics(1), March 1977.

Bonin, J. P. and L. Putterman. Economics of Cooperation and the Labor-Managed Economy. Chur: Harwood Academic Publishers, 1987.

Bradley, M. E. "Incentives and Labor Supply on Soviet Collective Farms", Canadian Journal of Economics(4), Aug. 1971.

Cameron, N. "Incentives and Labour Supply in Co-operative Enterprises", Canadian Journal of Economics(6), Feb. 1973a.

_____. "Incentives and Labor Supply on Soviet Collective Farms: Rejoinder", Canadian Journal of Economics(6), Feb. 1973b.

Carter, C. and F. Zhong. China's Grain Production and Trade. Boulder and London: Westview Press, 1988.

_____. "Regional Comparative Advantage in Chinese Agriculture", paper prepared for the IAAE/CAAE/CAASS International Symposium on Rural Development Strategy, Oct. 1987, Beijing.

Chinese State Statistics Bureau. China's Statistical Yearbook. Beijing: Statistical Publishing House, various issues.

_____. Great Changes in Rural Life in Our Country. Beijing: Statistical Publishing House, 1984.

Chinn, D. L. "Income Distribution in a Chinese Commune", Journal of Comparative Economics(2), Sept. 1978.

_____. "Team Cohesion and Collective-Labor Supply in Chinese Agriculture", Journal of Comparative Economics(3), Dec. 1979.

Crook, F. W. "The Commune System in the People' Republic of China, 1963-1974", in China: A Reassessment of the Economy. Washington D. C.: JEC Papers, US Congress, 1975.

Domar, E. D. Essays in the Theory of Economic Growth. New York: Oxford University Press, 1957.

Donnithorne, A. China's Grain: Output, Procurement, Transfers and Trade. Hong Kong: Chinese University, 1970.

Dutt, G. Rural Communes of China: Organizational Problems. London: Asia Publishing House, 1967.

Israelsen, L. D. "Collectives, Communes, and Incentives", Journal of Comparative Economics(4), June 1980.

Lardy, N. R. Agriculture in China's Modern Economic Development. Cambridge: Cambridge University Press, 1983a.

_____. Agricultural Prices in China, World Bank Staff Working Paper No. 606. Washington D. C.: The World Bank, 1983b.

Lin, J. Y. "The Household Responsibility System in China's Agricultural Reform: A Theoretical and Empirical Study", Economic Development and Culture Change, Vol. 36, No. 3, April 1988.

MacDougall, G. D. A. "British and American Exports: a Study Suggested by the Theory of Comparative Costs", Economic Journal, Vol. 61, Dec. 1951.

Marx, K. Capital, Volume II. Introduced by E. Mandel and translated by D. Fernbach. New York: Vintage Book, 1981.

Perkins, D. H. "Reforming China's Economic System", Journal of Economic Literature, Vol. 26, June 1988.

Perkins, D. H. and S. Yusuf. Rural Development in China. Baltimore: The John Hopkins University Press, 1984

Putterman, L. "Extrinsic Versus Intrinsic Problems of Agricultural Cooperation: Anti-incentivism in Tanzania and China", Journal of Development Studies(2), Jan., 1985.

Robinson, J. "Chinese Agricultural Communes", in C. K. Wilber, ed., The political Economy of Development and Underdevelopment. New York: Random House, 1973.

Sen. A. (editor) Growth Economics. Harmondworth: Penguin Books Ltd, 1971.

Taylor, L. Macro Models for Developing Countries. New York: McGraw-Hill Book Company, 1979.

Tyrchniewicz, E.W., D. Honeyman and F. Zhong. "Developing Transport and Infrastructure Facilities For China's Agriculture", paper prepared for the IAAE/CAAE/CAASS International Symposium on Rural Development Strategy, Oct. 1987, Beijing.

Vanek, J. International Trade: Theory and Economic Policy. Homewood, Illinois: Irwin Inc., 1962.

Walker, K. R. Food Grain Procurement and Consumption in China. Cambridge: Cambridge University Press, 1984.

The World Bank. China: Long-Term Development Issues and Options. Washington D. C.: The World Bank, 1985.

Xu, Daofu. Zhongguo Jindai Nongye Shengchan He Maoyi Tongji Ziliao. (Statistical Data of Agricultural Production and Trade in Modern China.) Shanghai: Shanghai People's Publishing House, 1983.

_____. Zhongguo Liangshi Shigao.(China's Grain History.) Unpublished research work, Nanjing Agricultural University.