

**COLLECTIVIZATION AND CHINA'S AGRICULTURAL CRISIS IN
1959-1961**

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**Working Paper No. 579
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January 1990**

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Revised: December 1989

ABSTRACT

The agricultural crisis in 1959-1961, after the initial success of the collectivization movement, resulted in 30 million extra deaths in China. A game-theory hypothesis is proposed as the main cause of this catastrophe. It is argued that, due to the difficulty in supervising agricultural work, the success of an agricultural collective depends on a self-enforcing contract, in which each one promises to discipline himself. A self-enforcing contract, however, can only be sustained in a repeated game. In the fall of 1958, the collectivization was changed from a voluntary movement to a compulsory movement. The nature of the collectivization was thus changed from a repeated game to a one-time game. As a result, the self-enforcing contract could not be sustained and agricultural productivity collapsed. The empirical evidence is consistent with this hypothesis.

I. Introduction

China's agricultural collectivization movement in the 1950s is one of the topics most discussed among students of Chinese economy. Collectivization started in 1952 with a very impressive success: Agricultural output increased continuously from 1952 to 1958. The movement encountered no active resistance from the peasantry and was carried out relatively smoothly. Many economists at that time thought that the collectivization movement in China had avoided the devastating consequences associated with the Soviet Union's collectivization in 1929¹ and that China provided a model of agricultural development for underdeveloped, densely populated economies (Robinson, 1964). As a result, strong sentiment in favor of learning from China's experiences developed in many countries (Eckstein 1966, p. 35; p.259).² Nevertheless, this sentiment soon vanished. Suddenly in 1959, agricultural production plunged dramatically for three successive years. The grain output dropped 15 percent in 1959 and reached only about 70 percent of the 1958 level in 1960 and 1961. A careful study of the newly released demographic data leads to the conclusion that this crisis resulted in about 30 million excess deaths and about 33 million lost or postponed births in 1958-61 (Ashton *et al* 1984).³ This disaster is, undoubtedly, the worst catastrophe in human history.

The reasons for the sudden collapse of agricultural production after the initial success of the collectivization campaign are not well understood because of the statistical blackout in China.⁴ The commonly accepted hypotheses are 1) three successive years of bad weather; 2) bad policies and bad management in the collectives; and 3) incentive problems due to the unwieldy size of collectives (Perkins and Yusuf 1984, p. 79; Marshall 1985, p. 66; Eckstein 1966, p. 37, 1977, p. 59; Wu 1966, p. 151; Chinn 1980; Aston *et al* 1984).⁵ In this paper I

shall show that the above hypotheses are inconsistent with the empirical evidence and propose that the collapse in 1959-1961 was mainly caused by the change of collectivization from a voluntary to a compulsory movement in the fall of 1958. This switch in the form of organization, from a game-theory point of view, changed the nature of a collective from a repeated game to a one-time game. The production collapsed because the success of an agricultural collective ultimately depends on a self-enforcing agreement, in which each member promises to discipline himself. A self-enforcing agreement, however, is not sustainable in a one-time game.

This paper is organized as follows. Section II briefly reviews the collectivization movement and the related agricultural development strategy in China. The competing hypotheses and the method of testing the relative validity of these hypotheses are discussed in Section III. Section IV contrasts these hypotheses with the empirical evidence. Some concluding remarks are provided in Section V.

II. Review of the Collectivization Movement and Agricultural Development

The Chinese economy inherited by the socialist government in 1949 was a war-torn economy in which 89.4 percent of population lived in rural areas and industry accounting for only 12.6 percent of national income (State Statistical Bureau 1987, p.50, 89). With the intention of quickly building up national power, the government adopted a Stalinist heavy-industry-oriented development strategy in 1952, once the economy had recovered from the destruction of the war.⁶ This development strategy resulted in a rapid growth in the demand for food and other agricultural products.⁷ Since scarce foreign reserves were reserved mainly for importing capital goods, the increasing demand for agricultural products had to

be satisfied by domestic production. Because agricultural stagnation and poor harvests would have an almost immediate and direct impact on industrial expansion,⁸ collectivization was promoted as a strategy for the simultaneous development of agriculture and industry. The dual core of this agricultural development strategy was the mass mobilization of rural labor to work on labor-intensive investment projects such as irrigation, flood control, and land reclamation, and the increase of unit yields through such traditional methods and inputs as closer planting, more careful weeding, and using more organic fertilizers.⁹

The independent family farm was the traditional form of institution in rural China for thousands of years before the communist takeover in 1949. The farmland was not only small but also fragmented. In the wake of the revolution, nearly half of the land in rural China was owned by landlords and leased to peasants for cultivation. Rent was often as high as 50 percent of the output of the main crops. Starting in the 1940s a land reform program was implemented in areas under the Communist Party's control, and, under this program, land was confiscated from landlords without compensation and was distributed to tenants. The land reform program continued after the success of the revolution and was completed in 1952.

From Table I, we see that experiments with various forms of cooperatives began even before the completion of the land reform program. Of the three major forms of cooperatives up to 1955, the most common one was the "mutual-aid team" in which 4 or 5 neighboring households pooled their labor, farm tools and draft animals together for peak seasons on a temporary or permanent basis. In this way, resource ownership was not altered and crop decisions remained the responsibility of the individual household. The second form was the "elementary cooperative"

in which 20 to 30 neighboring households combined their assets in a unified scheme. The net income of a cooperative was shared in two ways: dividend payments for land, draft animals, and farm tools, and remuneration for work performed. The land, draft animals and farm tools were still owned by individual member households. The third form was the collective farm, or the "advanced cooperative," in which all means of production were collectivized. Remuneration in a collective was based solely on labor contribution and took the form of work points. The income of a household depended on the amount of work points earned by the family members and on the average value of a work point. The latter in turn depended on the net income of the collective farm. The size of an advanced cooperative initially consisted of about 30 households, and later evolved to consist of all the households - from 150 to 200 - in a village.

The official approach to collectivization was initially cautious and gradualist. Peasants were encouraged and even actively induced to join the various forms of cooperative on a voluntary basis. However, the proponents of collectivization won the debate within the Party in the summer of 1955. While there were only 500 advanced cooperatives at the end of 1955, 753,000 advanced cooperative farms with 119 million member households had been established by the winter of 1957 (see Table I).

This collectivization was surprisingly successful in its initial stages. It encountered no active resistance from the peasantry and was carried out relatively smoothly (Eckstein 1975, p. 251). Although population increased 14.8 percent between 1952 and 1958, the gross value of agriculture measured at the prices of 1952 increased 27.8 percent and grain output increased 21.9 percent in the same period (see Table II). This experience greatly encouraged the leadership within the Communist Party and led them to take a bolder approach.

The main rationale for collectivization was rooted in the notion that mobilizing rural surplus labor would increase rural capital formation and, hence, increase production. However, although a collective farm of 150 households provided a basis for mobilizing labor for work projects within the collective, the collective farm did not solve the problem of mobilizing labor for large projects, such as irrigation canals, dams, or the like. These kinds of projects would in general require the simultaneous participation of laborers from several dozens of collective farms. The obvious solution for a large scale labor mobilization was to pool 20 or 30 collective farms of 150 households into a larger unit.¹⁰ For this reason, a new policy was imposed in 1958 as part of the Great Leap Forward in industry. From the end of August to the beginning of November 1958, that is within only three months, 753,000 collective farms were amalgamated into 24,000 communes, consisting of 120 million households, or over 99 percent of total rural households in China in 1958. The average size of a commune was about 5,000 households, 10,000 workers and 10,000 acres.¹¹ Remuneration in a commune was based mainly on the subsistence needs and only partly on the work performed by a peasant. Working on private plots and trading at rural fairs, which existed in the other form of cooperatives, were prohibited. As planned billions of man-days of labor were thus mobilized. The communal movement, nevertheless, resulted in the profound agricultural crisis that occurred between 1959 and 1961. The gross output of agriculture fell 14 percent in 1959, 12 percent in 1960, and another 2.5 percent in 1961; and most devastatingly, grain output plunged by 15 percent in 1959, by another 16 percent in 1960, and remained at the same low level for another year (see Table II). Unlike many other serious famines which were caused by what Sen (1981) termed an "entitlement" to food, the estimated 30 million excess deaths in this crisis were the direct result of the crop

failures (Ashton *et al* 1984).

The commune system was not abolished after this crisis; however, its functions were reduced to administration and coordination. Starting in 1962, resource ownership, responsibility for production management, and accounting for purposes of income distribution were delegated to the small production team of 20-30 households. This new institution, in essence, was a hybrid of the elementary cooperative and the advanced cooperative of the 1950s. Remuneration, based on work points earned by each member, resembled the compensation scheme of the advanced cooperative, but the size and production management were similar to the elementary cooperative. After 1962, some experiments in improving the evaluation of work points were made; nevertheless, the production team system was maintained as the basic farming institution until the household-based farming system reform was instituted in 1979.¹² By the end of 1983, 94.4 percent of the farm households in China had adopted the new household-based farming system, which is now called the household responsibility system (China Agriculture Yearbook 1984, p.69).

A more realistic approach towards agricultural development was also adopted after the crisis. Rural trade fairs were reopened in the fall of 1959 and private plots were restored in the summer of 1960 (Perkins 1966, p. 91). The state procurement prices paid to farmers were raised by an average of 28 percent in 1961 (State Statistical Bureau 1988, p. 777). Meanwhile, the heavy-industry-oriented development strategy was replaced by the "agriculture first" strategy.¹³ The purpose of industry was now set to support the development of agriculture. The introduction of modern agricultural technology and input were thus accelerated. For example, the utilization of chemical fertilizers increased dramatically after 1962,¹⁴ and accompanying the growth of chemical fertilizer

consumption was the promotion of modern high-yield fertilizer-responsive crops: the new dwarf varieties of rice and wheat, introduced in early 1960s, basically had replaced all the traditional varieties by the late 1970s.¹⁵ Similarly, modern varieties of corn, cotton, and other crops were introduced and promoted in the 60s and 70s.¹⁶ The irrigated acreage also increased gradually after 1962. Most additional irrigated acreage came from engine-powered irrigation instead of the traditional gravity system.¹⁷

The pace of mechanization showed a parallel acceleration after 1962, and especially during the 1970s. Mechanization had been used as one of the rationales for the collective campaign in the 1950s, and the idea survived the agricultural crisis. In the late 70s, the complete mechanization of farm operation was once again promoted as the goal of agricultural modernization, which the planners hoped to achieve by 1985. Although tractors were often used as substitutes for trucks in rural areas (Perkins and Yusuf 1984, p. 60), mechanization made the expansion of multiple cropping possible,¹⁸ and that part of labor force liberated from mechanization could always be used to increase the intensity of field management. Hence, this mechanization may be assumed to have also contributed positively to the growth of agriculture in the past two decades.

In short, the agricultural development strategy before the adoption of the household-based farming system reform in 1979 can be summarized as follows: Collectivization was initially a voluntary movement but was imposed in the fall of 1958. Before the agricultural crisis of 1959-1961, collectivization was utilized primarily as a vehicle to mobilize a labor force for constructing labor-intensive projects and for increasing traditional input in agricultural production. After the crisis, more emphasis was placed on modern technology and input.

III. Hypotheses

The customarily proposed hypotheses for the sudden collapse of agriculture after the initial success of the collectivization movement are as follows: three successive years of bad weather, bad policies and bad management, and the incentive issue related to the unwieldy size of a commune.

The bad weather hypothesis was used, originally, as the official excuse for the calamity (Central Committee, Communist Party of China 1981). Although the probability of three successive years of bad weather hitting every part of a large country like China was unlikely, this explanation was not impossible due to the susceptibility of agriculture to climatic changes. However, if this were in fact the main cause for the collapse of agricultural production, when the weather had returned to normal, agricultural productivity should have soon recovered its level before the spell of bad weather.¹⁹

The hypothesis of bad policies implemented by central and local authorities during the communal movement and bad management within communes is, on the surface, plausible. In fact, local cadres were ill equipped to handle the complicated administrative task of so large a farm entity as a commune. Serious, but good-intentioned, mistakes in production plans, misallocation of resources and mishandling of collective property could indeed lead to considerable disruption in production.²⁰ Added to these difficulties was the communal kitchen program which provided free meals to communal members and resulted in over-consumption at the initial stage of the movement. Furthermore, despite a 15 percent decline in grain output in 1959, the state compulsory grain procurement quota increased 14.7 percent in that year.²¹ Due to these mistakes, food availability in rural areas dropped dramatically during the crisis. However, most

problems were soon recognized, and several emergency documents were issued by the central government to rectify these problems (Agricultural Cooperativization in China, 1987b). By the end of 1961 most of these policies had been reversed: the mobilization of labor for irrigation projects was abandoned, production decisions were decentralized to those production teams with an average size of 20-30 households, income distribution basically reverted to the system prevailing in the advanced cooperative stage, communal kitchens were abolished, and, finally, the state compulsory grain procurement quota were lowered to the level prior to the crisis. In short, bad policies and management did definitely contribute to the severity of this disaster. However, if these were the main causes of the crisis, then after the policy reversal in 1962, as I stated in the case of the bad weather hypothesis, agricultural productivity should have soon recovered to the level before the communal movement.

Among the several traditional hypotheses, the incentive issue in the commune appears to be the most convincing cause for the sudden collapse of agriculture. This argument is formulated by Perkins and Yusuf (1984, p. 79) as follows:

The incentive problem was ... severe on at least two grounds. In a large unit there was little connection between an individual's effort and the value of each work point. The number of work points earned could still be related to effort expended, but the value of each point depended on the net output of the entire unit of 4,000 to 5,000 families. Even if an individual's effort were completely unproductive, the value of his work points would decline by only 0.01 percent. There was a premium on effective supervision, therefore, to prevent loafing on the job because internal motivation

based on material gain was not a sufficient discipline. By the same token, however, there was no close supervision by fellow villagers because they too saw little connection between the work of other village members and the value of the work point. Reducing the basic accounting unit improved matters significantly on both counts. At a minimum, villagers had both the ability and incentive to make sure each did his or her share of the work.

Perkins and Yusuf's argument, however, is correct only if the supervision in a commune does not exist. If the supervision is perfect, the incentives to work actually will be higher in a commune than on a household farm.²² Certainly, since agricultural production cannot be concentrated under one roof, and since it involves the continuous shift from one type of task to another, and since, crucially, it depends on the quick discreet decisions by individual workers about the adjustments necessary to operation in response to slight changes in the humidity, temperature and other climatic conditions, close supervision is too costly to be feasible. Therefore, the supervision in an agricultural collective tends to be very crude and approaches a situation of no supervision. If, due to the commune's size, the incentive issue were the main cause of the disaster, then as in the two previous cases, productivity should have soon recovered to the level prior to the communal movement when the production team was made the basic unit of production management and accounting. After all, the remuneration scheme in the production team was similar to that of the advanced cooperative, and the size of a production team was only about the size of an elementary cooperative.

As I have stated, the above arguments are plausible explanations for the catastrophe. However, as I shall show, the main cause for the initial success

and the sudden collapse of this movement is more likely to be found in the change of the nature of the collectivization from a voluntary movement to a compulsory movement in the fall of 1958.

To begin with, the collectivization movement was guided by the state from its very beginning. In the early stage, nonetheless, the principle of voluntarism was stressed and well respected. The authorities actively persuaded farmers to participate in the various forms of cooperative. A peasant, however, had the right to decide whether or not to join a cooperative. After he had joined a cooperative, he could still withdraw his membership and his own assets from the cooperative if he decided to do so. Up to the end of 1957, there was a continuous flow of directives issued from the state to remind local authorities not to violate the basic principle of voluntarism in the movement.²³ The best proof that the collectivization movement before the establishment of communes adhered to the principle of voluntarism is the numerous reports that peasants in many areas withdrew from cooperatives and quite a number of cooperatives disintegrated as a result.²⁴ The initial success of the collectivization movement, however, greatly encouraged Mao and his followers. A bolder approach was adopted and cadres who insisted on gradualism were criticized. Significantly, in the summer of 1958 Mao personally promoted the people's commune as the institutional innovation for quickly realizing communism in rural China in the summer of 1958. Thus zealous cadres created communes all-over China by zealous cadres in a matter of three months. Membership in the commune became mandatory, and the compulsory nature of this collectivization remained after the crisis. In the 16 years between 1962 and 1978, no evidence indicates that any farmer was ever allowed to withdraw freely from a production team nor that any production team had ever collapsed because of losses of

members. The right to withdraw was a crucial component of voluntarism, and this right was not restored until the beginning of the individual household-based farming system reform in 1979.

From the game-theory point of view, the change from the principle of voluntarism to compulsoriness in the collectivization movement has a significant impact on the incentive structure of the collective. When the organization of a collective is based on the principle of voluntarism, it is a repeated game. At the end of each production round, the members of a collective can decide whether they want to participate in the collective in the next round. If one finds that he is better off being a member of the collective, he will retain his membership. Otherwise, he will withdraw from the collective. Due to the fact that in China a household's landholding is highly fragmented and the size is often too small to raise a draft animal by that household alone,²⁵ certain gains can be obtained by pooling the land and farm tools of several households.²⁶ The gain from the economies of scale, nevertheless, is overshadowed by the incentive issue arising from the difficulties of supervision in agricultural production. To make a collective an efficient institution, some effective substitute for supervision is required. A self-enforcing agreement among collective members in which each one promises to provide as much effort as on his own household farm is an effective alternative when supervision is too costly.²⁷ Certainly, because of the heterogeneity in personal preferences, abilities, and endowments, a member may determine that he will be better off by reneging on the agreement. That is, he breaks his promise and does not contribute as much to production as he is proposed to initially. When this is the case, the other members in the collective have to decide whether to stay in the collective and allow this member continuously to be derelict toward the agreement, or to withdraw from the

collective and resume household farming. If they find that the losses due to this member's default are larger than the gains from the economies of scale, the collective will disintegrate. However, the possibility of the collective's collapse obliges the would-be shirker to rethink his position: should he break his promise and let the collective collapse, or should he honor his commitment and prevent the disintegration of the collective? If he shirks in the current round, he is definitely better off at the end of this round. But in case the collective collapses, he loses the gains from the economies of scale from the second round on. If the discounted present value of future losses is larger than the one-time gains in this round, he will honor the agreement. Therefore, it is the threat of a collective's collapse that greatly reduces the incidence of shirking. This implicit threat also guarantees that the production in a voluntarily formed collective will be at least as good as the sum of production of a group of households working separately.²⁸ Even at the worst, the collective collapses, household production will remain at the same level before the formation of the collective.²⁹

However, when a collective is imposed and withdrawal is prohibited, the nature of the collective is changed to that of a one-time game. It becomes impossible to use withdrawal either as a way to protect oneself or as a means to check the possibility of shirking by the other members. Consequently, the self-enforcing agreement cannot be sustained in a "one-time-game" collective (Telser, 1980). Supervision becomes crucial in establishing work incentives and productivity levels in the collective. If supervision is effective and rewards are closely related to each individual's effort contribution in production, work incentives will be high. Conversely, if supervision is ineffective and rewards are not closely related to each individual's effort contribution in production,

the incentives will be low. Since supervision in agricultural production is extremely difficult and too costly, the incentives to work in a compulsorily formed agricultural collective must be low. A peasant will not work as hard as he does on his household farm (Lin 1988). Therefore the productivity level of a collective will be lower than the level reached on the individual household farm. The collective is besieged by the "Prisoner's Dilemma."

From the game-theory point of view, the initial success of the collectivization movement in 1952-1958 can be attributed to the voluntary nature of the movement during that period, and the sudden collapse of agricultural production in 1959-1961 was mainly a result of the change from a voluntary movement to a mandatory movement in the fall of 1958. Bad weather, bad policy and management, and the size of communes definitely all contributed to the severity of the catastrophe, however, they were only secondary reasons for this crisis. If the game-theory hypothesis is valid, then agricultural productivity in the production team period after 1962 will be found to be lower than the level reached during the individual household farm period before 1952 and the voluntary cooperative movement period of 1952-1958. This is because the production team was a compulsory collective. It follows then that both the incentive to work and productivity will be lower in the production team system than in the individual household farms and in the voluntarily formed collective.³⁰

From the above discussion we find that there exists an easy way to evaluate the hypotheses to establish the main cause for the precipitous slump in agricultural production. If the conventional hypotheses are valid, regardless of whether the collapse is explained by this argument or that, or even by a combination of any or all three arguments, it would nonetheless remain true that

after the production team system was instituted and the loss of labor force and draft animals were rectified, agricultural productivity should have recovered to the level before the disaster of 1958. On the other hand, if the game-theory hypothesis is valid, the productivity level reached during the production team system period should be lower than the productivity level reached during both the individual household farm period and the voluntary cooperative period.³¹

IV. The Agricultural Productivity

To examine the validity of the above competing hypotheses, a study of the changes in total factor productivity during the crisis and for a long period before and after the crisis is required. This presents certain problems. Up to 1958, the Chinese government periodically published agricultural statistics. However, after the crisis, official data on agriculture exist only as widely scattered fragments. A partial resumption of data release began in 1979.³² Because enormous efforts are required to piece the scattered fragments together for the period 1958-1979, few attempts have ever been undertaken to study systematically the year to year changes in agricultural productivity before 1979 except for the pioneer work of Anthony Tang (1984).³³

Tang's study covers the period of 1952-1980. Most of his work was completed before the partial release of historical data in 1980. Column 3, Table III reports the total factor productivity index as estimated by Tang. The reported index series have already incorporated the new released series on total value of agricultural output and on selective inputs available to Tang in 1980. The methodology adopted by Tang is the Solow (1957) and Dennison (1967) type of growth accounting, which uses factor shares as weights to compile individual input series into a total input series, and then divides the aggregate output

series by the total input series to obtain the total factor productivity index. The gross value of agricultural output is calculated from grains, cash crops and livestock. Inputs included labor, land, capital, and current inputs. The weights used are .50 for labor, .25 for land, .10 for capital, and .15 for current inputs, which Tang adopted after consulting a number of national agricultural growth accounting studies.

Tang's work was extended by Wen (1989) to cover the years up to 1988. In addition to this extension, Wen also replaced many of the time series Tang derived from the scatter fragments with official data made available to the public in the years after the publication of Tang's book. The series on the gross value of agricultural output and on inputs compiled by Wen are found in Appendix Table A1. The total factor productivity index estimated by Wen is reported in column 4, Table III. By comparison, we find that Tang's estimates show the same pattern of changes in total factor productivity before and after the compulsory collectivization in 1958 as that of Wen's estimates, although there is a gap of 15 percentage points between these two estimates for most of the years in 1970s.³⁴ The following discussions will focus on Wen's estimates because Wen's study mainly uses official data.³⁵

Before further analysis, however, it should be mentioned that there are two critiques of Tang's, and therefore also of Wen's, estimates. The first critique questions the factor shares that Tang uses to integrate the individual input index into the total input index. The second critique attacks the method of integration of various inputs into the total input. Tang uses a weighted arithmetic mean of the four input indices to compile his total input index. An alternative method, proposed by Chow (1985, p. 86), is to use a weighted geometric mean. It is thus necessary to examine how robust Wen's estimates are

with respect to the changes in factor shares and method of aggregation before any conclusion can be drawn from Wen's estimates.

To see how changes in factor shares affect Wen's results, two alternative sets of share parameters are utilized. One set is proposed by Wiens (1982) (.35 for labor, .36 for land, .09 for capital, and .20 for current input); other is the estimates of Hayami and Ruttan (1985, p. 151) (.45 for labor, .10 for land, .30 for capital, and .15 for fertilizer). The total factor productivity indexes estimated with these two alternative sets of factor shares are reported in Columns 5 and 6, Table III. The total factor productivity index calculated by the method of weighted geometric mean is reported in Column 7, Table III. These various estimates of total factor productivity index in Table III show that in terms of absolute magnitude, different factor shares and methods give rise to somewhat different estimations; nevertheless, in terms of the pattern of changes, the results are identical. Since our interest lies in the pattern of productivity changes, the conclusions drawn from Wen's estimates will not be altered by the critique's proposed changes in either the factor share or the aggregation method.

For ease of interpretation, Wen's estimates are plotted in Figure I. From Figure I, we see that the total factor productivity indexes in 1952-1988 can be divided into four periods, namely 1952-1958, 1959-1978, 1979-1983, and 1984-1988. In the first period of 1952-1958, that is to say during the period of voluntary collectivization, the total factor productivity shows a rising trend, although the increments are very small. The total factor productivity declined dramatically in 1959 and 1960, when the compulsory collectivization was first imposed, and throughout the second period, stayed at a level about 20 percent below the total factor productivity reached in the first sub-period. The records

improved dramatically in the third period, the period of decollectivization. By 1983 the total factor productivity had recovered the level in 1952. In the last period, the post household responsibility system reform period, the indices of total factor productivity were about 30 percent higher than the level in 1952. Despite of the introduction of many forms of modern technology and input after the agricultural crisis, the productivity lingered at a level far below the level reached in the pre-crisis period and did not recover the pre-crisis level until the compulsory collective system was replaced by the individual household responsibility system in 1983. This pattern of productivity change is consistent with the prediction of the game-theory hypothesis.³⁶ Therefore, we can conclude from the evidence that the change from a voluntary collectivization to a compulsory collectivization in the fall of 1958 was the main cause of the catastrophe in 1959-1961 and the conventional hypotheses are only secondary explanations.³⁷

V. Concluding Remarks

In the developing countries, collectivization has been promoted as a strategy for the development of agriculture. However, the pattern of collectivization not only in China but also in Soviet Union and other countries shows that the initial success of this movement is followed by severe difficulties and a long period of stagnation in agriculture.³⁸ This paper attempts to explain this phenomenon. The main arguments are as follows. Since effective supervision in agricultural production is too costly, the success of an agricultural collective depends inescapably on an tacit agreement of self-discipline established by the collective members. However, a self-enforcing agreement can be sustained only if the members of the collective have the right

to quit the collective when the other members do not honor their agreement. At the initial stage of a collectivization movement, the principle of voluntarism, in general, is well respected. Consequently, the self-enforcing agreements in most collectives can be sustained and the overall agriculture performance is improved. However, there is a built-in danger in the initial success of a collectivization movement. Due to the differences in their time preferences, abilities, and other endowments, some members of a collective may take advantage of the low supervision in the collective and attempt to evade the responsibilities stipulated in their self-enforcing agreement. Consequently, the disintegration of some collectives is inevitable, even though the overall performance of the movement is successful. The collapse of some collectives is like a safety-valve for the collectivization movement. It makes a potential violator of the self-enforcing agreement realize that honoring the agreement is to his advantage. Encouraged by the initial success, however, zealous political leaders of a collectivization movement may interpret differently the withdrawal of some individual members from the collectives. These individuals are viewed as the enemies of the movement. To prevent the further collapse of other collectives, compulsory measures are taken. The collectivization is thus changed from a voluntary to a compulsory movement, and the safety-valve is removed. If this change in the nature of the collectivization movement happens gradually, agricultural performance declines gradually. If this change happens swiftly, a devastating agricultural crisis, like the one in Soviet Union between 1929-1932 and the one in China between 1959-1961, follows immediately.

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Footnotes

*I am indebted to Bruce Stone, S. Lee Travers and an exceptionally helpful referee for comments and advice, and Francis A. Kretschmer for exposition improvement. This paper was prepared for the International Conference on "Methods of Planning and Policy Analysis for Mixed Economies" held at the Indira Gandhi Institute of Development Research, Bombay, on January 5-7, 1989. The financial support of the Institute for Contemporary Studies for the research and the Ford Foundation for travel to the Conference is gratefully acknowledged.

1. Soviet grain and meat production in 1928, on the eve of collectivization, had recovered from the destruction of the war and had exceeded or reached its highest levels before the World War I. However, the production collapsed suddenly after the collectivization in 1929. It took another 23 years, without counting the years of World War II, to reach the level before World War I (Jin Fei *et al* 1985, Chap. 6). Collectivization was estimated to have resulted in an excess mortality of five million during the inter-census period from December 17, 1926 to January 17, 1939 (Lorimer 1946, pp. 133-37, quoted in Eckstein 1975, p. 251).

2. Two official Indian delegations were sent to China in 1957. One was primarily concerned with problems of agricultural production, and the other with agrarian reforms.

3. Other studies estimate that excess deaths ranged from 23 million (Aird 1982) to 27 million (Coale 1984).

4. When the historical data on the demographic trend was first released in the late 1970s, many scholars outside China reacted with disbelief. They wondered

how a human tragedy of such enormous scale could occur in modern times without its existence becoming widely known (Ashton *et al* 1984).

5.The first two are also the official explanations for this disaster in China (Communist Party of China, 1981).

6.Wu (1965) argues that the same strategy would have been adopted even if the Communist Party had not been in power. He shows that the symptoms of "take-off" had been exhibited in a number of ways under the National government's rule in the 1930s. T.N. Srinivasan (1984) also argues that the dominant views among the development economists in the early 1950s were supportive of a heavy-industry-oriented strategy for a developing country.

7.The demand came from several sources: First, the urban population increased dramatically from 57.65 million in 1949, to 71.63 million in 1952, and to 99.49 million in 1957 (State Statistical Bureau 1987, p. 89). Second, since over 70 percent of China's exports had been agricultural and processed agricultural products up to the mid-70s, the country's capacity to import capital goods for industrialization depended on the growth of agriculture (Almanac of China's Foreign Economic Relations and Trade, 1986, p.954). Third, agriculture was the main source of raw material for many industries, such as textiles and food-processing.

8.This argument is supported by the fact that the heavy-industry-oriented-development strategy had to give way temporarily to the "agriculture-first-strategy" in 1962 after the failure of harvests caused by the collectivization movement in 1959-1961.

9. Of course, the reasons for collectivization were numerous. The desire of the Communist Party to consolidate its control over the country-side, to eliminate income disparity in rural areas, and to enable the government to increase the rate of extraction of agricultural surplus are the most often mentioned.

10. In addition to the construction of irrigation projects, mechanization was used as another rationale for increasing the size of a collective. In the document "Opinions Concerning the Mechanization of Agriculture" approved and issued by the Politburo in April, 1958, it was argued that for the purpose of mechanization, the size of the collectives should be increased. The document also set the goal of achieving total mechanization or semi-mechanization in agriculture within 5 years (Agricultural Cooperativization in China 1987 b, p.5).

11. The term "people's commune" first appeared in July, 1958, in the article "A Totally New Society and a Totally New Man" carried in the Party's theoretical journal, Hongqi (Red Flag), by Chen Boda, a personal secretary of Mao. The first commune, Weixing People's Commune, was established in the same month in Henan Province. By the end of September, 112 million households were organized into communes, and, by the beginning of November, 120 million households were communized (Agricultural Cooperativization in China 1987 b, pp. 6-7).

12. For a theoretical discussion of the household-based farming system reform and empirical testings of the theoretical model, see Lin (1987 and 1988).

13. In January 1961 the Ninth Plenum of the Eighth CCP Central Committee formulated four guidelines for economic recovery -- "adjustment," "consolidation," "enrichment," and "elevation." These guidelines reversed the

order of sectoral priorities of heavy industry, light industry, and agriculture (Tsao 1987, p. 25).

14. The chemical fertilizers consumed in 1962, measured in physical quantity, was 3.1 million ton. The consumption increased at an annual rate of 16.5 percent, and reached 43.7 million ton in 1978 (Ministry of Agriculture, planning Bureau 1989, pp. 340-1).

15. Beginning in 1976, China started to replace the dwarf varieties of rice with hybrid rice. By 1986, hybrid rice accounted for 28 percent of rice acreage in China (Ministry of Agriculture, Planning Bureau 1989, p. 350). The development and commercial production of hybrid rice in 1976 was claimed to be one of the most significant technical achievements in rice breeding in the 1970s (Barker and Herdt 1985, p.61).

16. In 1979, the figures for area given over improved varieties amounted to 80 percent for rice, 85 percent for wheat, 60 percent for soybean, 65 percent for corn, 55 percent for sorghum, 75 percent for cotton, 70 percent for peanut, and 45 percent for oil-crops (Ministry of Agriculture, Planning Bureau 1989, pp. 348-50).

17. The irrigated acreage increased from 30.5 million hectare in 1962 to 44.4 million in 1987. The gravity system acreage declined from 24.4 million hectare to 19.6 million hectare, while engine-powered irrigation acreage expanded from 6.1 million hectare to 24.8 million hectare during the same period (State Statistical Bureau 1988, p. 233).

18. The multiple cropping index increased from 136.3 in 1962 to 151.0 in 1978 (State Statistical Bureau, 1980, p. 43).

19. Over the past few decades, bad weather is local authorities' favorite excuse for poor agricultural performance caused by mistakes in their policy and management in the past decades. Although increasingly more areas were irrigated, the areas reported to have been hit by floods and droughts also show an increase (Ministry of Agriculture, planning Bureau 1989, pp.354-7). My hypothesis that bad weather is used as an easy excuse is supported by the attached figure. This figure plots the ratio of areas hit by droughts to areas hit by floods from 1949-1986 (data for 1966-1969 are not available). This figure shows clearly that increasing areas were reportedly hit by droughts. This contradicts the fact that more acreage was irrigated each year during this period, and that irrigation's main function is to prevent droughts. However, the story of a flood is harder to fabricate than the story of a drought, because the fact of a flood is easier to prove. Therefore, when agricultural production fell, the easiest way for the local authorities to shrug off their responsibility was to put the blame on a drought.

20. Many farmers were assigned to engage in the production of steel in backyard furnaces for the Great Leap Forward in 1958. Consequently, the harvest in some areas was neglected. Because of an over-optimism about grain production in 1958, the sown acreage of grain was reduced 9 percent in 1959, a drop from 127.6 million hectare in 1958 to 116 million hectare in 1959. The area grown to grain increased 5.5 percent in 1960, nonetheless, this was more than offset by a 20.4 percent drop in unit yield in the same year (Ministry of Agriculture, planning Bureau 1989, p. 146).

21. In the years before and after the crisis, the state grain procurement quota was maintained at a level lower than 30 percent of the gross output. The quantity sold to the state, however, increased from 58.8 million ton (29.4 percent of total output) in 1958 to 67.4 million ton (39.7 percent of total output) in 1959. Although the procurement quota was reduced to 51.1 million ton in 1960, it still consisted of 35.6 percent of the gross output. The procurement quota was not reduced to 27.4 percent of gross output until 1961 (Ministry of Agriculture, Planning Bureau 1989, p. 410).

22. This is due to the fact that, if supervision were perfect in a commune, the returns to a peasant's additional unit of effort contribution would have two components: first, he would get a share of the marginal output arising from the additional effort; second, he would get a larger share of the total output, since now his share of effort in the total effort had increased and thus resulted in a larger share of the total work points. The former is insufficient by itself to cause him to offer as much effort in the commune as on his household farm, but the latter outweighs this as long as the average product per unit of effort is greater than the marginal product of effort in the commune. Since the relevant region of production is, in general, located where the average product is greater than the marginal product, a peasant had the incentive to contribute more effort in a commune than on a household farm if the supervision in the commune were perfect. For a formal model, see Lin (1988).

23. There are too many documents to quote. For a succinct summary of these documents, see Agricultural Cooperativization in China (1987 a) in Zhongguo nongye hezuoshi zilizo (Historical Material of Agricultural Cooperativization in China), 1 (1987): 19-35. Zhongguo nongye hezuoshi zilizo is a bimonthly

journal, established in 1986, for the purpose of collecting materials about the cooperative movement in China as a preparation for a book to be entitled The Agricultural Cooperativization in Modern China. This journal is a rich source of data and reports concerning the real situations rather than the myths before and after collectivization in the 1950s.

24. To mention just a few examples, a document issued in December, 1956, by the Rural Department of the Central Committee of the Communist Party acknowledged that, after the fall of 1956, about 1 percent of the households nationwide withdrew from the cooperatives, and in some areas, the rate was as high as 5 percent. In Guangdong Province alone, 70,000 households withdrew and 120 advanced cooperatives collapsed. This phenomenon continued until 1957. A report from Zhejiang Province showed that, in Xianju County, of the total number of 302 advanced cooperatives, 116 collapsed totally and 55 collapsed partially in May 1957. The households participating in the cooperatives dropped from 91 percent to 19 percent afterwards. Similar figures were also reported in other provinces (Ye 1987).

25. Since the operational size of a household farm in many parts of China was too small to maintain a draft animal by one household alone, draft animals were often jointly owned by several households after the adoption of the household-based farming system. See the empirical evidence collected by Feder *et al* (1988).

26. Chinn (1980) provides a case study of two villages in north China showing that substantial gains could be obtained from voluntary cooperation.

27. A self-enforcing agreement does not require a third party to enforce the agreement, to determine whether there have been violations, or to impose

penalties. When the costs of third party intervention are too high, a self-enforcing agreement is an effective substitute for third party intervention and guarantees the continuing of the transaction. However, a self-enforcing agreement is sustainable only if the game is repeated. For further discussion of self-enforcing agreements, see Telser (1980).

28. This statement assumes that one's income is the only objective for joining a collective and that reorganization is cost free. If a collective also provides services like risk-sharing and if reorganization is costly, the productivity of a collective is allowed to be somewhat lower than the sum of the household farms. Moreover, if moral suasion is used in forming a collective, a member will also accept a somewhat lower income in the collective for fear of social opprobrium.

29. In a seminal paper, Johnson (1950) argues similarly for the case of sharecropping. He finds that, to check the possibility of shirking, in general a share tenancy is arranged in the form of a renewable short-term lease. If a share tenant shirks, he will not be able to renew the lease. Because it is costly to relocate, a tenant will incur a loss in a case of contract termination. Therefore, the possibility of contract discontinuation induces a share tenant to provide at least the same level of effort as a fixed rent tenant.

30. Chinn (1980) also noticed that overall productivity would decline if the membership in a collective was mandatory. Nevertheless, he attributes the failure of the collectivization movement to the elimination of dividend payments in the advanced cooperatives. He is right in saying that because household endowments are different, some well-endowed household might be hurt by the elimination of dividend payments. However, if the income distribution scheme were the main cause

of the crisis, the crisis should have happened in 1956 or 1957, since advanced cooperatives had become the dominant form of cooperatives at the end of 1956. In fact, in 1957 the elimination of dividend payments resulted only in an increasing incidence of withdrawal from the cooperative but not the collapse of agricultural production. Moreover, even if the dividend payment were resumed while membership in the collective remained mandatory, the crisis could still not have been prevented. Inasmuch as time preferences for each member are different, some members would have shirked. Thus the "Prisoner's Dilemma" was unavoidable. Hence, the main cause for the crisis is still found in the change in the nature of organization instead of in the change of the income distribution scheme.

31. Because of the introduction of many modern technologies and inputs after 1962, this test is actually biased against the game-theory hypothesis.

32. Although the data are scattered, students of Chinese economy agree that the quality of the official statistical data in China is very respectable compared to the quality of the data in other countries with the same level of national income, and scholars willing to immerse themselves in the intricacies of recovering and piecing together the fragments are able to utilize the data meaningfully (Perkins 1966, Rawski 1979 and Eckstein 1980).

33. It takes more than 40 pages in Tang's study just to document the sources of data.

34. These gaps arise from Tang's overestimation of the value of outputs and his underestimation of current inputs.

35. As commented by Perkins and Yusuf (1984, p. 31), "Serious Scholars, however, no longer attempt to substitute their own estimates for those [data] officially released by the government."

36. One alternative hypothesis proposed by Lardy (1983) is also consistent with the pattern of productivity change. Lardy argues that the increases in total factor productivity in the first and third sub-periods can be attributed to the gains in regional comparative advantage and that the stagnation of productivity in the third sub-period can be attributed to the losses of regional comparative advantage arising from the local food self-sufficiency policy. This hypothesis is plausible but it is unlikely that it is the major cause for the pattern of productivity change in 1952-1988. Lardy rightly points out that the policy of local self-sufficiency forced an area to deviate from the crop pattern dictated by regional comparative advantage. There are definitely some losses in productivity due to this deviation. However, the question of magnitude remains. In the literature of international trade, it has been found that the loss arising from trade restrictions in general is lower than one percent of GNP (World Bank 1987, p.90). As in the case of international trade, the loss associated with local self-sufficiency is not outrageous. In a separate paper, Lin (1989) estimates that the 9 percent increase in non-grain crops in 1978-1984 -- due to the removal of self-sufficiency policy during this period -- resulted in only about a one percent increase in total factor productivity. Therefore, it is safe to conclude that gains and losses of regional comparative advantage can only explain a small portion of the changes in total factor productivity in 1952-1988 and much of the decline in total factor productivity in the third sub-period needs to be explained by reasons other than the loss of regional comparative

advantage. It is estimated by McMillan *et al* (1989) that the change from the production team system to the household responsibility system between 1978 and 1984 increased total factor productivity by 32 percent. This estimate indirectly confirms that the collapse in 1959-1961 and the stagnation in the third sub-period was caused by the reasons described in the game-theory hypothesis.

37. The game-theory hypothesis also solves the puzzle posed by Putterman (1985) about the bewildering trends of increased productivity in the transition both from the household system to the collective system during the mid-1950s and from the collective system to the household system during the early 1980s.

38. The same pattern was observed in the Soviet Union, China, Tanzania, and Peru. Among these countries, the devastating impact was most dramatic in the Soviet Union and China.

Table I
The Collectivization Movement in China, 1950-1958

	1950	1951	1952	1953	1954	1955	1956	1957	1958
<u>Mutual Team:</u>									
Teams (1,000)	2,724	4,675	8,026	7,450	9,931	7,147	850		
Households per Team	4.2	4.5	5.7	6.1	6.9	8.4	12.2		
<u>Elementary Co-op:</u>									
Co-ops (1,000)	0.018	0.129	4	15	114	633	216	36	
Households per Co-op	10.4	12.3	15.7	18.1	20	26.7	48.2	44.5	
<u>Advanced Co-op:</u>									
Co-ops (1,000)	0.001	0.001	0.01	0.15	0.2	0.5	540	753	
Households per Co-op	32	30	184	137.3	58.6	75.8	198.9	158.6	
<u>Commune:</u>									
Commune									24,000
Households Per Commune									5,000

Source: Luo (1985, p.59) and Agricultural Cooperativization in China (1987 b, pp. 6-7).

Table II

Population, Agricultural Output, and Grain Output in China

Year (1)	Population (million) (2)	Agri. Output* (1952=100) (3)	Grain Output (million ton) (4)
1952	574.8	100.0	163.9
1953	588.0	103.1	166.9
1954	602.7	106.6	169.5
1955	614.7	114.7	184.0
1956	628.3	120.5	192.8
1957	646.5	124.8	195.1
1958	659.9	127.8	200.0
1959	672.1	110.4	170.0
1960	662.1	96.4	143.5
1961	658.6	94.1	147.5
1962	673.0	99.9	160.0
1963	691.7	111.5	170.0
1964	705.0	126.7	187.5
1965	725.4	137.1	194.6
1966	745.2	149.0	214.0
1967	763.7	151.3	217.8
1968	785.3	147.6	209.1
1969	806.7	149.2	211.0
1970	829.9	166.4	240.0
1971	852.3	171.4	250.2
1972	871.8	169.6	240.5
1973	892.1	183.8	265.0
1974	908.6	190.1	275.3
1975	924.2	196.0	284.5
1976	937.2	195.3	286.3
1977	949.7	194.3	282.8
1978	962.6	210.2	304.8
1979	975.4	226.0	332.1
1980	987.1	229.2	320.5
1981	1,000.7	244.0	325.0
1982	1,015.4	271.5	354.5
1983	1,025.0	292.6	387.3
1984	1,034.8	328.5	407.3
1985	1,045.3	339.7	379.1
1986	1,057.2	351.2	391.5

Source: Ministry of Agriculture, Planning Bureau (1989, pp. 6-8, pp. 112-3, pp. 147-9).

Note: * The output value of village-run industry is not included.

Table III: Indices of Total Factor Productivity

Period	Year	Tang	Wen	Wiens	Hayami-Ruttan	Chow
(1)	(2)	(3)	(4)	(5)	(6)	(6)
I	52.0	100	100.0	100.0	100.0	100.0
	53.0	100	99.6	99.5	98.7	100.0
	54.0	100	99.0	98.4	97.3	99.0
	55.0	104	103.8	103.0	103.2	104.0
	56.0	102	104.1	101.7	104.3	105.0
	57.0	103	102.4	100.3	98.5	102.9
	58.0	102	104.7	97.0	100.7	109.0
II	59.0	85	94.3	89.1	91.0	94.9
	60.0	74	78.4	73.4	78.6	79.7
	61.0	76	78.0	76.3	78.9	74.9
	62.0	78	80.0	79.6	79.3	76.4
	63.0	83	83.0	82.0	80.2	80.2
	64.0	89	85.9	83.7	82.2	85.0
	65.0	92	86.8	83.7	82.2	87.6
	66.0	95	85.4	81.2	80.2	89.4
	67.0	94	87.8	84.6	82.2	90.2
	68.0	90	87.2	85.2	81.7	88.4
	69.0	87	83.0	80.4	78.2	85.8
	70.0	93	82.0	77.7	76.5	89.2
	71.0	91	76.5	72.0	70.2	84.8
	72.0	88	72.2	67.3	65.8	82.2
73.0	91	76.6	71.4	69.4	87.1	
74.0	92	78.0	72.9	70.2	88.9	
75.0	92	75.8	70.1	67.4	88.9	
76.0	91	75.8	70.4	66.9	88.0	
77.0	89	74.2	68.7	64.8	87.1	
78.0	92	77.6	71.1	67.2	94.1	
III	79.0	96	80.5	73.6	68.8	99.7
	80.0	91	83.4	76.2	71.1	103.7
	81.0	-	87.4	80.1	74.4	108.9
	82.0	-	93.7	85.9	79.6	108.9
	83.0	-	104.5	96.9	87.7	117.6
IV	84.0	-	122.7	115.2	100.6	127.0
	85.0	-	129.3	122.7	104.3	144.8
	86.0	-	129.7	122.8	103.1	150.6
	87.0	-	132.6	125.0	105.1	153.6
	88.0	-	132.6	124.7	104.6	159.8

Footnote To Table III.

- (1) Period I: Voluntary collectivization; Period II: Compulsory collectivization; Period III: Decollectivization; and Period IV: Post household responsibility system reform.
 - (3) Taken from Tang (1984) pp. 95-97.
 - (4) Taken from Wen (1989) p. 123.
 - (5) Calculated with the factor shares (labor=.35, land=.36, capital=.09, current input=.20) proposed by Wiens (1982).
 - (6) Calculated with the factor shares (labor=.45, land=.1, capital=.3, current inputs=.15) in Hayami-Ruttan (1985, p.151).
 - (7) Used the method of weighted geometric mean proposed by Chow (1985).
- (5) - (7) use the output and input series in Appendix Table I to do the calculation.

Appendix

Table A1: Indices of Gross Value of Agricultural Output
and Main Inputs

Year	Gross Val. of Agri.	Labor	Land	Capital	Current Input
52	100.0	100.0	100.0	100.0	100.0
53	103.1	102.5	101.6	106.8	107.7
54	106.6	104.8	103.8	113.4	120.3
55	114.7	107.4	105.7	109.5	129.6
56	120.5	107.1	109.9	108.6	158.6
57	124.8	111.5	109.5	133.6	169.6
58	127.8	89.4	106.1	126.1	254.7
59	110.4	94.0	102.2	121.3	216.3
60	96.4	98.3	105.6	101.6	249.0
61	94.1	114.0	102.7	98.2	188.1
62	99.9	122.9	101.6	112.5	178.6
63	111.5	126.8	101.8	131.1	216.0
64	126.7	131.7	103.3	144.3	275.2
65	137.1	135.1	103.4	155.3	326.7
66	149.0	140.3	105.1	170.8	405.6
67	151.3	145.3	104.5	173.4	374.2
68	147.6	150.5	102.5	171.8	340.8
69	149.2	156.6	103.2	171.6	390.8
70	166.4	160.6	104.4	190.9	516.6
71	165.3	164.0	105.6	217.4	573.0
72	163.7	163.3	106.7	231.6	634.8
73	177.2	166.6	107.2	241.4	647.9
74	183.4	168.7	107.4	254.2	655.5
75	189.2	170.1	108.0	277.6	733.4
76	188.4	170.0	108.4	289.5	715.6
77	187.5	169.4	108.4	306.5	735.6
78	202.7	163.8	109.0	325.7	796.5
79	218.1	165.7	106.0	350.9	843.0
80	230.0	168.5	105.0	358.5	863.2
81	243.7	172.3	104.3	364.2	868.3
82	271.1	178.5	103.9	378.3	909.1
83	292.3	180.2	103.6	391.4	829.7
84	327.9	178.6	103.7	416.1	736.5
85	339.3	180.1	102.7	437.2	686.4
86	351.0	180.8	102.8	471.6	715.9
87	371.4	183.2	103.1	489.1	759.1
88	383.3	185.8	103.0	509.8	796.7

Source: Wen (1989, p. 123).

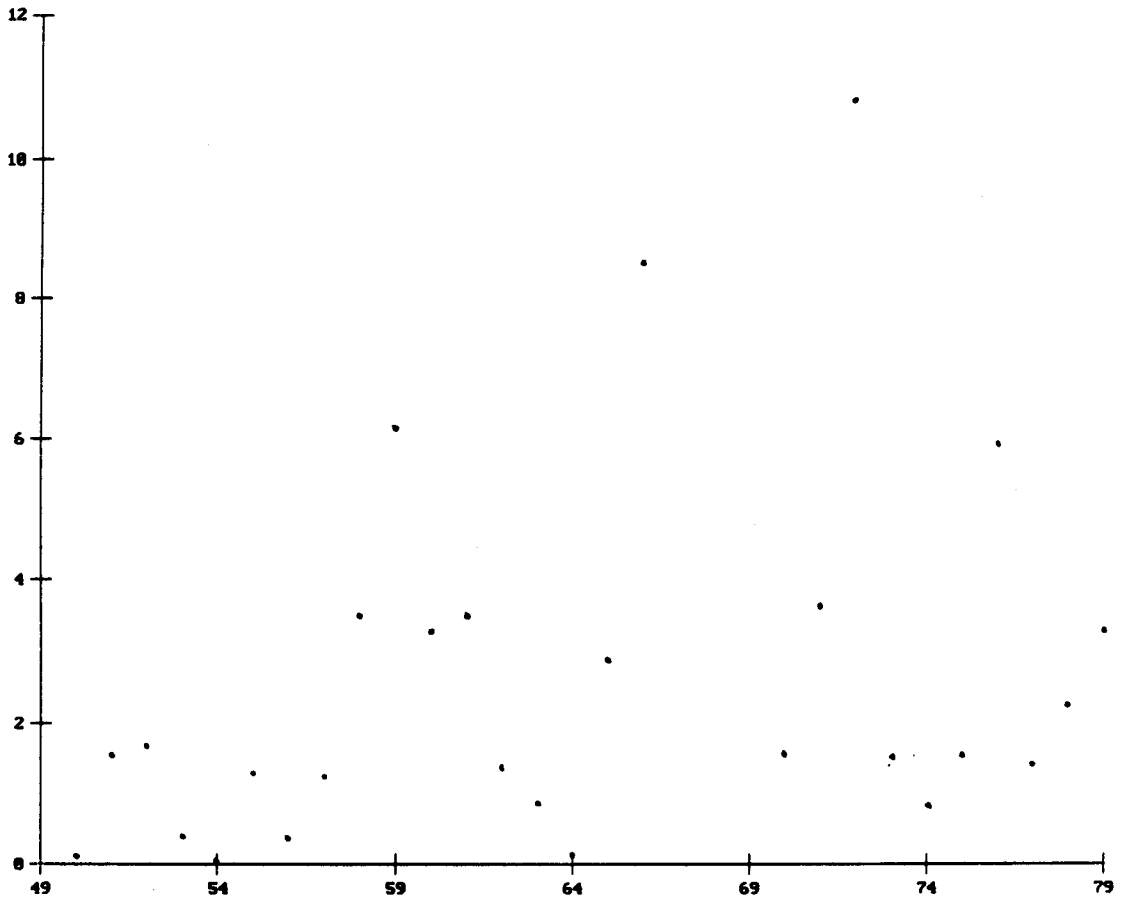


Figure: The Ratio of Drought-Hit Area to Flood-Hit Area, 1949-1979.
 (Figure attached to Footnote 19)

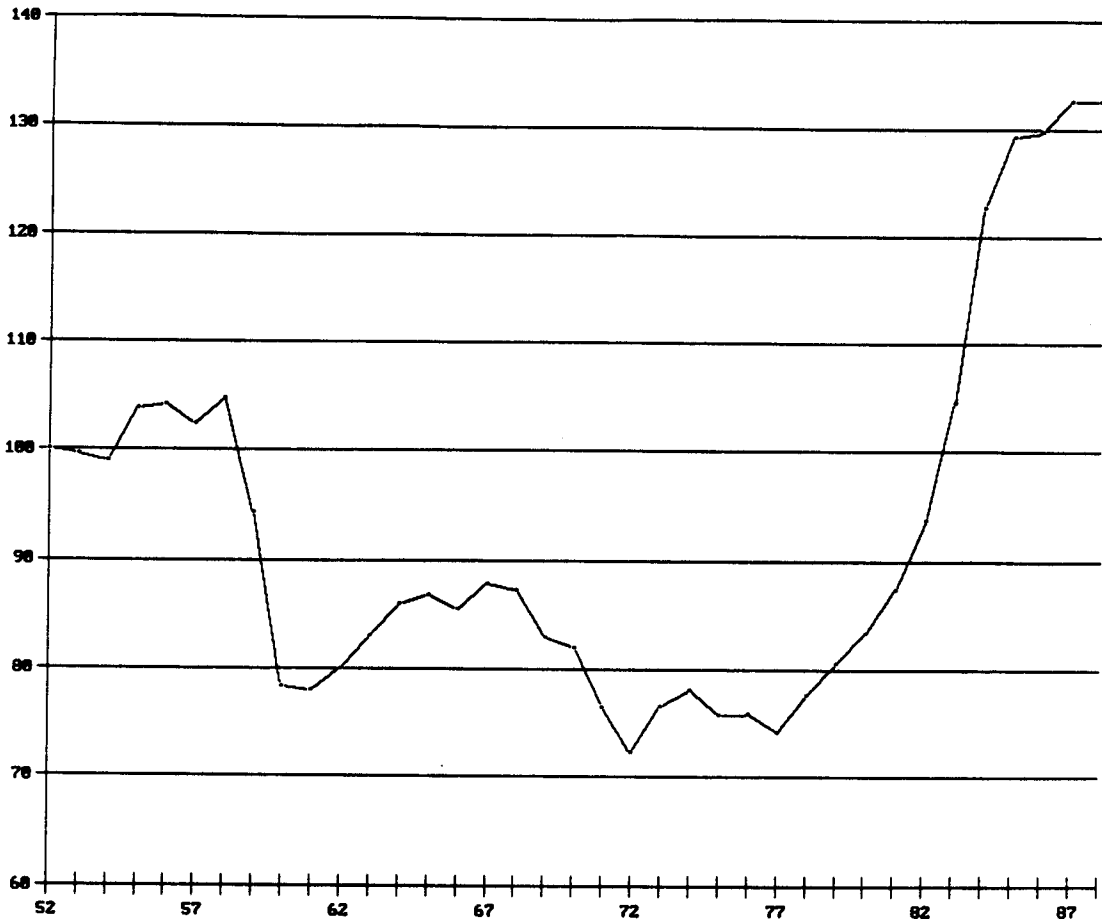


Figure I: Total Factor Productivity Index, 1952-1988