PART THREE

THE DETERMINATION OF THE RATE OF RENT ON AGRICULTURAL LAND

The rich class operate less land than they own, while the other classses work more land than they own. As a class, the poor rent the largest proportion of rice field, and the landless the next largest. By estimating by individual households, however, it is found that those in the middle class rent more than any of the other classes.. . . .

(T)hose who rent land are not necessarily landless or even poor people; the rich rent land too. This is because tenants can enjoy a profit even if they operate their rented land by hired labor. . . . This fact should be borne in mind when we come to the discussion of the problems of tenancy in interior China — problems which should be understood as different from those in coastal China, which have been studied heretofore. In coastal China, tenancy is inevitably a system of exploitation of the peasants, while in the interior this is not necessarily true.

Fei Hsiao-Tung and Chang Chih-I. 1949, p. 221, 77.
Earthbound China: A Study of Rural Economy in Yunnan.
London: Routledge & Kegan Paul. Field study 1939.

PART THREE THE DETERMINATION OF THE ABSOLUTE RATE OF RENT

Chapter 8 The First-Stage Solution of the Rate of Rent: The Leisure of the Rich versus the Hunger of the Poor

8.0 Introduction: Overview of Part Three

The important element that has been missing so far from the analysis of the agricultural economy has been the rate of rent, or profits to the owner, on land farmed by others. We have seen the overall pattern of how the inequality of the landownership distribution leads to the extent of land farmed by others, and forms of land/labor relationships, under varying conditions of productivity and population density (Datasets 5.4.8, 5.5.3). We know that rented land in particular is accompanied by a large flow of product out of the agricultural sector (Dataset 6.2.2). And over the whole spectrum of geographical conditions for China, rental of land is the predominant form of land/labor relationship. So the rate of rent is central to a deeper analysis.

There is only a limited amount of information on the portion of the crop paid in rent that can be squeezed out of the Buck survey, which, uncertain as the measure is, is still a very valuable indication, especially since the Buck survey assiduously totalled up all production in kilograms of grain-equivalent. With this empirical guideline and on the basis of the models and findings that have gone before in this thesis, it has been possible to construct a coherent theory for the determination of the rate of rent (Note about efforts and past manuscripts). This paper takes a large step towards filling in the lacuna of empirical study of rents and extraction in agricultural societies, and presents theory which is a considerable innovation over previous consideration of rents.

The subject is determination of the absolute rate of rent, i.e. the outcome of relative monopoly of ownership — that is, serious maldistribution of land as specified in the landownership distribution. It is not the differential rate of rent as is usually derived theoretically on the basis of differential land quality, distance to market, or equalization of returns to agricultural capital and industrial capital. The solution is not what has been generally assumed from Ricardian and Marxian premises that the worker retains only subsistence, i.e. rent must equal the surplus over subsistence.

This is a complex quantitative model that will take some time to explain. The landownership distribution is central to the solution of the rate of rent, and the measures that interact to yield the solution are derived from it. Indeed subtle variations in the landownership distribution affect the outcome. The effects of geographical variation in the model are particularly counter-intuitive, and yet they seem to parallel the empirical pattern.

Due to the complexity of the theoretical formulation and the paucity of empirical data, Part Three will be somewhat different in structure from Parts One and Two. In Parts One and Two a relatively brief model, explicated as a just-so story, was followed by chapters demonstrating and describing at length the workings-out of the model in empirical material. There was often more descriptive material than was necessary for the bare model. But here we are dealing with a "black box" for which we have little clue as to the process, a hidden machine for which we can see only the inputs and then the abbreviated output. A convoluted process of reasoning is involved in arriving at what I see as the transformations and interactions necessary to produce the output. So the model, while mostly contained in the initial Chapter 8, will continue to develop in subsequent chapters together with examination of various aspects of the empirical data.

The first and major part of the solution involves the strategies of the land-short population, in the aggregate, to achieve subsistence. Depending on the level of productivity, 35-65% of the population does not own enough land to afford subsistence. Their alienation from the means of production, land, defines the demand for renting-in land and sets the land/labor market in motion.

This basic model is set out in Chapter 8. It involves two kinds of maximizations for the land-short population, under different conditions:

1. If product per capita falls short of 350 kg. (about 60% over minimum subsistence at 220 kg. per capita), then there is no way that the land-short population can obtain enough rented land to meet subsistence, but it bids up rents to get as close as possible. Rents somewhat exceed the surplus of renters, and it can only be presumed that they make up the shortfall from subsistence through agricultural labor, services and crafts. So for areas with product per capita under 350 kg., the rate of rent increases with increasing productivity, and always exceeds the surplus.

2. If product per capita exceeds 350 kg., a sizeable fraction of landowners are potential landlords, and the land-short population can obtain more than enough rented land to provide subsistence by offering slightly higher rents. However, the land-short population chooses to bid up rents only to the degree that maximizes the portion of the surplus they retain. As product per capita increases past about 400 kg. per capita, renters retain increasing portions of the surplus, and the rate of rent falls, although total extraction (percent of land rented x rate of rent) still increases slightly.

The solution of the determination of the rate of rent over the full range of levels of productivity is an inverted "V". However, this solution according to the optimization of the interests of the land-short population is not all of the solution; some refinements remain.

Chapter 9 takes on both large issues of theory and an extended consideration of empirical effects in the data. The main investigations are:

- The theoretical rate of extraction under varying conditions, and whether the unevenness of the rate of extraction might cause the agricultural economy to leap between states of higher and lower extraction as population density increases.

- The effect of geographical conditions, i.e. population density and transport impediments. In Chapters 5 and 7 we found that the level of ownership necessary for landlord status increased with population dispersal, apparently due to cost of transport of the surplus. This also causes a shift from landlord/tenant relations to managerial farmer/agricultural laborer relations, which decreases the dependence of the land-short population on rented land for subsistence. The net effect is a decrease in rents in surplus areas, but an increase in rents in deficit areas.

- Why in some areas it is mostly the land-short population that rents in land, while in others medium- and medium-large owners grab and till rented land. The explanation lies in the portion of the surplus retained by renters. If the rate of rent is so high that no surplus is retained by renters, then only those pressed by subsistence needs want rented land; if the surplus retained by renters is high, medium owners also seek to rent land, and rented land may even be the basis for exploitation of hired labor.

But no matter which sector of the population actually gains control of rented land, the rate of rent still seems to be set mainly by the shortfall from subsistence of the land-short. We must assume that the secondary circulation of the surplus in the form of goods and services exchanged within the agricultural economy somewhat evens out the surfeit of medium-size farmers who also rent-in land, and the dearth of smallholders who cannot get tenancy contracts.

The solution for the rate of rent is a calculus of supply and demand between those at the peak of the landownership distribution and those at the bottom lacking enough land for subsistence. Section 9.6 takes up a topic that could have been investigated long ago in Chapter 1: whether the empirical landownership distribution, as far as can be known through the farm size data for China that is the main source of this dissertation's research material, looks like the landownership distribution arrived at through the

computer simulation of partible inheritance carried through in Chapter 1. The computer-generated landownership distribution with 42% displacement from equality served well enough for modelling the land tenure patterns. But since the rate of rent solution is sensitive to small differences in the peak of the distribution, that question is more significant now in Part Three. For example, the characteristic of the landownership distribution produced by higher reproduction and more estate division for the rich under class differentials of reproduction is a proliferation of medium-large size estates. This seems to be reflected in the empirical data for North China, where the landownership distribution is less obscured by rented land.

A further topic for investigation in Section 9.7 is the theoretical effect of increasing concentration of landownership on the rate of rent. The prediction of the model in this is counter-intuitive: if concentration increases, the rate of rent should go down, other things being equal. Total extraction of surplus still escalates a little since the area of rented land expands. The reason for decrease in the rate of rent is that supply of rented land increases slightly more than the subsistence demand of the land-short increases. Land concentration would be expected to proceed largely at the expense of the middle sectors, aside from eroding the minimal ownership of smallholders; otherwise it could not go very far.

Chapter 10 in Section 10.1 summarizes the findings of the whole dissertion, with references to the relevant section and dataset numbers. From this it can be used as an index for the major findings.

The chapter then takes on more speculative vistas in Section 10.2, playing out the implications of the total economics of inequality. We can combine the models of determination of land tenure and determination of the rate of rent to ask what would be the sequence of change if we were to project these models over a long period of time with population steadily increasing both over the gross area and on the cropland. This produces an evolutionary scenario, far removed from studies of "traditional" China, that can be compared with historical studies worldwide. Some intriguing ruminations on the characteristics of feudalism arise from this. Such an exercise of the imagination is perhaps the best reward for persevering through this long dissertation. Section10.3 carries the implications of the evolutionary scenario into discussion of Marxist concepts such as mode of production and class struggle as the motor of history; these implications may be unsettling to some Marxists. At the same time, the findings on the economics of inequality must serve to rebuke free-market enthusiasts.

Section 10.4 looks forward to future research. It lists ways in which the current research could be improved and welcomes other researchers to join in developing in this paradigm from a world perspective.

8.1 Seeking the Absolute Rate of Rent in an Agrarian Society: Subsistence and Surplus

What Marx called the absolute rate of rent is that due to monopoly in the ownership of land, i.e. the right of landowners, upheld by the state, to deny the use of land to others. "Landed property is based on the monopoly by certain persons over definite portions of the globe" (K. Marx 1959, p. 615). This is to be distinguished from the concept of differential rent on land, a rent extracted due to the greater fertility or proximity to markets of the land, relative to that land which is too remote or incapable of producing a surplus over the livelihood of the tiller, which supposedly would incur no rent.

In the classic Marxist analysis of industrial society, laborers completely alienated from the means of production face the owners of capital, forlornly carrying no more than their bare hands and empty stomaches. Moreover, continuing capital accumulation by the owners of capital renders futile any of the workers' efforts to improve their bargaining position through collective action or population limitation. Therefore over the long run workers can retain none of the surplus value they produce; the capitalists allow them no more than that which prolongs their utility, their subsistence and their cost of reproduction. Earlier, Ricardo reached a similar conclusion with regard to agricultural workers: under agricultural capitalism they retain no more than their subsistence. T. Barnes (Barnes 1984, pp. 125-140) reviews the three alternative theories which he sees within this tradition, those of Ricardo, Marx, and Sraffa.

There have been innumerable texts and articles published discussing ideal concepts of differential and absolute rent, often building elaborate economic models from the starting premise that rent must equal the surplus. It has generally been assumed, for example by W. Roseberry, that the same total extraction applies to tenant farmers (Roseberry 1976). Another example is R. Pertev's "A New Model for Sharecropping and Peasant Holdings"(Pertev 1986). Even in studies using empirical material, this premise has gone unchallenged, e.g. Chen Po-ta's A Study of Land Rent in Pre-Liberation China (Chen 1958), a work meant to demonstrate peasant exploitation rather than explore it.

It is surprising, then, and somewhat reassuring, that an article stemming from fieldwork, J. Ghosh, "Differential and Absolute Land Rent", should take a position closer

to that developed in this paper than do most of the rhetorical ruminations on the issue. According to Ghosh, "...Marx was unable satisfactorily to explain the existence or determination of absolute rent" (p. 75). Marx supposed that "Owing to the barrier raised by landed property, the market price must rise to a level at which the land can yield a surplus over the price of production ... this rent forms the excess of value over price of production, or a part of it" (K. Marx, Capital, III, 1954, p 762. Moscow: Progress Publishers). But he was unable to propose a mechanism that would set rent to precisely equal the surplus. Based on his research in North India, Ghosh proposed a different view.

> "It is argued here that peasant rents are determined by the relative bargaining power of landlords and tenants, which in turn is significantly affected, on a macro-economic scale, by the degree of relative population pressure (that is, population relative to available alternatives for employment or livelihood). Some of the essential features of peasant rents are thus: a direct positive relationship with relative population pressure, a negative association with wages and the demand for rural labour, and indirect but positive relationships with movements in rural product prices..." (Ghosh 1985, p. 78)

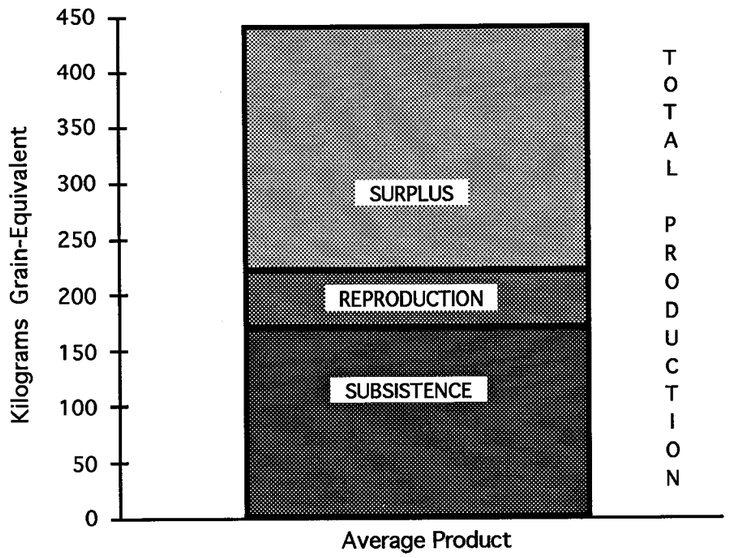
Although it is not so clearly specified or quantified, and many of his further variables deal with issues of a rural society under intrusion by a modern capitalist state, Ghosh's description seems to agree in some aspects with the results of the research presented here.

There are very few surveys of size and scope to allow the kind of analysis that has been carried through here, and thus possibly few opportunities for replicating and confirming it. Even in the case of the Buck survey, it was at first hardly apparent that a rate of rent could be estimated. Probably Indian scholars hold the largest body of comparable data. Still, this analysis and its method of dealing with the aggregation of alienation from the means of production should change the terms of debate and the method of research on historical social formations. It may also throw a new light on small case studies, where the magnitude and dynamics of phenomena could be compared with the model.

To belabor the discussion of surplus somewhat, we might depict surplus in a simple illustration, Dataset 8.1.1, which takes the minimum subsistence as that required by a self-reproducing population, and production as that based on the same. This definition glosses over the question as to whether all adult peasants and tenants are remunerated at a rate allowing both subsistence and the cost of reproduction. We may keep in mind that is entirely likely that some sectors, such as agricultural laborers, in reality do not

obtain the cost of reproduction; and that was the implication of the class differentials of reproduction proposed in Part One. But here we must set a single figure for minimum subsistence to avoid unmanageable complexity.

Dataset 8.1.1 Depiction of Surplus Value



Subsistence

If we are going to analyze surplus, we should review here what is the concrete measure of subsistence. Physiological subsistence requires about 200-240 kilograms of unhusked grain (or its equivalent in other foods) per capita, averaged over a self-reproducing population of men, women, and children (Clark and Haswell 1964), with some slight variation for body size, climate and heavy labor in the life routine of the population. About 10-20% of that weight (about 40% by volume) is lost in hulling and milling, depending on the type of grain and the fineness desired in the product. Compared with modern diets in the developed countries, which include much more oils and animal products, this seems an excessive amount of starches, virtually a kilogram a day for a laboring adult male. It may be noted that this is about the standard for rationing in present-day China. We shall set our standard of subsistence here at 220 kg. per capita grain-equivalent. This does not assume that all of that amount is consumed in grains, but that a standard of subsistence is reached from all food sources; it may even also allow

some slight fraction for agricultural fibers for clothing. This is, however, a very lean standard of subsistence.

Surplus

We may ask next whether the overwhelmingly peasant society that is the subject of study here, China, produced a surplus.

According to figures quoted in K.R. Walker (1984), grain production (including by Chinese definition also soya beans, potatoes and pulses) for the entire population of China in 1936 was estimated at 309-331 kg. per capita, based on total grain production divided by total population. Production in 1952-4 was 277 kg. per capita, and thereafter grew despite many reverses over the following years; in 1978-80 after a vast expansion of population production per capita stood at 327 kg. per capita (Walker's Table 1, p. xiii). According to Walker, there have always been wide differences in level of production from district to district, with a range of 245-402 kg. per head of rural population among 21 provinces (average for the years 1952-57), aside from the newly developed and highly productive provinces of Manchuria, where output reached as high as 905 kg. (p. 5). Walker pegs rural self-sufficiency in socialist China at 275 kg. grain per capita (p. 23).

Compared with other sources, Walker's 1936 estimate seems high. Based on survey statistics by China's National Agricultural Research Bureau, Buck stated that production per capita of farm population was 286 kg. grain over 1929-37 (Buck 1966, p. 10).

These figures on grain production in pre- and post-1949 are provided here as comparative benchmarks. Buck's 1929-33 survey of nearly 17,000 farms, recompiled by land area rather than by farm, yields a range of regional estimates of 218 to 724 kg. grain-equivalent per capita of farm population (Arrigo 1986, p. 320; Dataset 5.4.1). These higher figures doubtlessly reflect that there was a sizeable sector of rural population not resident on farms, and that Buck's survey covered also non-grain agricultural production, though stated in terms of grain. The discussion here will stay close to Buck's survey figures, with the understanding that they include some production other than staples.

It is fortuitous for this research that agricultural production and consumption can be cast in terms of grain, since animal products were a virtually insignificant part of the diet for the Chinese peasantry. Grain and food staples are both the bulk of agricultural

production and the basis of human subsistence. Draft animals are sparsely used and consume only a few percent of the crop. Thus grain and its equivalent in other food staples can be taken as a solid measure of value and exchange, and the survey source has compiled such totals.

It is clear that there was a considerable surplus in some areas. After this grounding in concrete numbers, we can look again to Dataset 8.1.1, which provides a schematic conceptualization of surplus over subsistence. Dataset 8.1.1 assigns total production per capita to be a figure near the middle of the cases seen in China, 440 kg. Then in the case of a tenant farming one unit of land (the average land per capita), he has a surplus amounting to 50% of his production (440-220 / 440). But there is no reason to think that so convenient a figure is the logical rate of rent. For example, a tenant tilling two units of land would create a surplus that is 75% of his production (880-220 / 880). And so on for a tenant cultivating three units.

In sum, even if we had faith that the rent would equal the surplus, we would still find it very difficult to define the surplus from this simplistic starting point, for the following reasons:

1. The surplus of the tenant over subsistence can only be judged relative to his production. His production, in turn, depends on his access to the means of production, i.e. how much rented land he can obtain. This is the paramount difficulty in specifying the surplus.

2. The landownership of renters further determines how much of their subsistence can be supplied from their own land, and how much must be sought from rented land. Their production on rented land in excess of that providing their remaining subsistence needs may be defined as surplus; but how much is surplus cannot be known without knowing the ownership of the renters.

Thinking again on the first point, since some portion of the population can forsake labor for the life of a rentier, those remaining as farmers should have on the average more land to cultivate, and the land-short may desire or be compelled by necessity to cultivate still much more. But this still does not lead us to a measure of the surplus, because the amount of land rented out will depend on the rate of rent, and that is unknown. As a final word, it is not adequate to talk about the average production and average surplus. We need to find some way to measure alienation from land under conditions of gradations of

ownership — some way to figure out how much land renters have, and how much they can get to rent-in. For that we must look again to the landownership distribution.

8.2 The Landownership Distribution: Measuring Alienation from the Means of Production

It may be supposed that absolute rent is not contingent on absolute monopoly, but only on alienation from the means of production for some portion of the population. Partial monopoly is consistent with gradations in landownership and compatible with the existence of a substantial self-sufficient peasantry. In fact, it is unlikely that near-absolute monopoly of landownership, e.g. 2% of the population commanding 95% of the arable land, was prevalent even under European feudalism. Historical accounts describe communities of unenserfed peasants in the forested interstices between manses (Martin 1983), and complex economic developments — tax farming, noble indebtedness — that fractured as well as consolidated estates (Tribe 1981, Duby 1974).

Given minimum subsistence requirements of 220 kg. grain per capita, how much of the population is short of subsistence? How can they survive? These are questions we only began to raise in Chapter 6. But now we will go on to quantify this more substantially, while also moving into the realm of theory.

The pattern of distribution of landownership given in Dataset 8.2.1 (Table) is the central feature of the social structure of an agrarian society. For pre-1949 China it was highly skewed. This degree of skewness, approximated in the following table, was still moderate compared to that of the latter feudalism of 18th century Europe east of the Elbe.

The following approximation of the landownership distribution was arrived at by computer simulation of repeated partible inheritance, as described in Chapter 1. It is the distribution halfway between the two extreme cases simulated: the first, partible inheritance without overreproduction of the rich, which is probably an upper limit of inequality; and the second, partible inheritance with reproduction of the rich equal to their estimated income from land, which is probably the greatest equalization that could result from partible inheritance. The midway point of the two distributions, with 42% displacement from equality, has been found to bear considerable resemblance to the distribution found in the survey data for North China, where there was little rented land to complicate the analysis. As concluded in Chapter 1, the process of partible

inheritance likely led to a profile of landownership that was more-or-less constant, relative to the average, for all areas of China. Specifically,

Dataset 8.2.1 A Percent of Population Owning Percent of Land for a Skewed Landownership Distribution

Deciles		Percent of Population	Percent of Land Owned	Ownership Relative to Average
1	Top	5%	26.1%	5.22
	Next	5%	14.2%	2.84
2		10%	18.9%	1.89
3		10%	12.5%	1.25
4		10%	9.0%	0.90
5		10%	6.6%	0.66
6		10%	4.8%	0.48
7		10%	3.4%	0.34
8		10%	2.4%	0.24
9		10%	1.5%	0.15
10	Bottom	10%	0.6%	0.06

If the larger size of household for richer households is taken into account, this distribution is also comparable to the estimate of J. Esherick, which was developed mainly on the basis of tenancy figures in the large surveys of the National Agricultural Research Bureau, 1918-1937 ("Number Games: A Note on Land Distribution in Prerevolutionary China", p.405 1981 Modern China 7(4):387-412). According to Esherick, for China as a whole about 4% of the households were landlords, and these owned about 39% of the land.

The distribution in Dataset 8.2.1 A, which will be discussed in more detail in Chapter 10, is shown graphically in Dataset 8.2.1 B; this is a histogram in which the ownership of each percentile of the population is represented in order of wealth, from bereft to bountiful. A value of 1 on the vertical scale represents one percent of land owned by one percent of the population. It is precisely the 69th percentile of the population that owns that amount, the average. Those who own more than the average are 31% of the population, and they own 73% of the land. Those who own less than the average are 68% of the population, and they own only 26% of the land. If we were to imagine going back to some pristine state in which everyone dwelt in absolute equality, but then at the point of original sin some minority of the population seized most of the land from the misfortunate majority, this distribution would be the outcome. This is a distribution with 42% displacement from equality.

A set of conventions will be used in this dissertation to describe the distribution of landownership and the relative holdings of segments of the population. They are based on the image of one hundred persons owning in the aggregate 100 units of land. These one hundred undifferentiated "persons" each represent a percentile of population with a normal composition of male and female, old and young. This number encompasses the entire population of the rural sector, and encompasses landlords as well, wherever they may reside. Their subsistence and consumption is as averaged for such a percentile of population. The one hundred units of land each represent one percent of land in the idealized picture; each unit of land is uniform, producing the same amount of agricultural product, and the product of one unit of land is equivalent to the average product per "person". Then land units owned per capita for some segment of the population, e.g. landlords, actually means percent of land owned per percent of population in the segment. And the total number of land units owned by some segment represents the percent of total land. Referring to land as units serves to differentiate population percentages from land percentages.

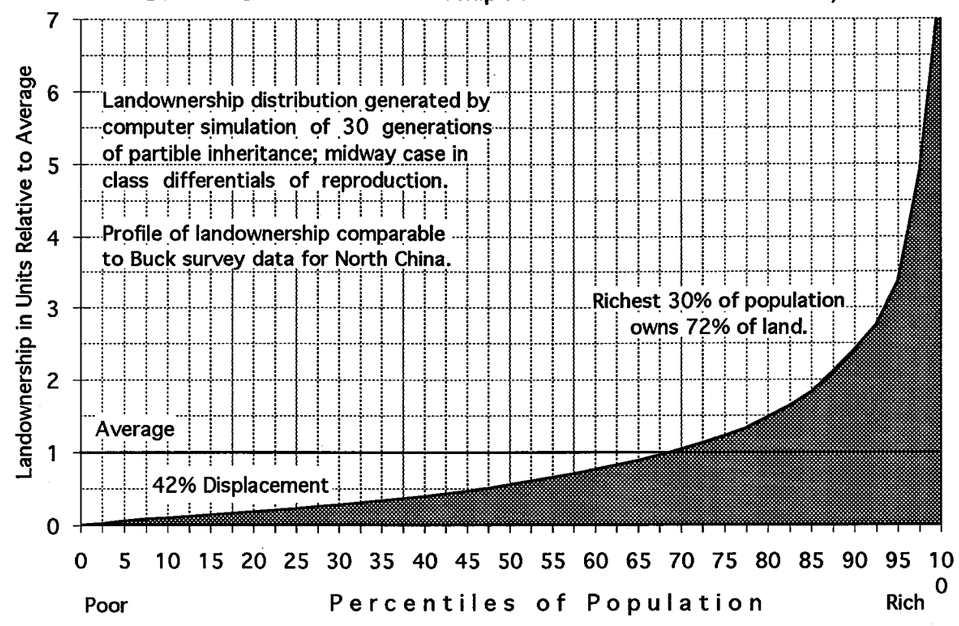
Given merely such a landownership distribution as described in Datasets 8.2.1 A and B and a known level of product per capita, many implications for the social structure follow, and some surprising conclusions can be reached just by pushing a few constructs to their logical conclusions. The first to be examined here is the portion of the population that owns insufficient land to independently meet subsistence.

Shortfall from Subsistence

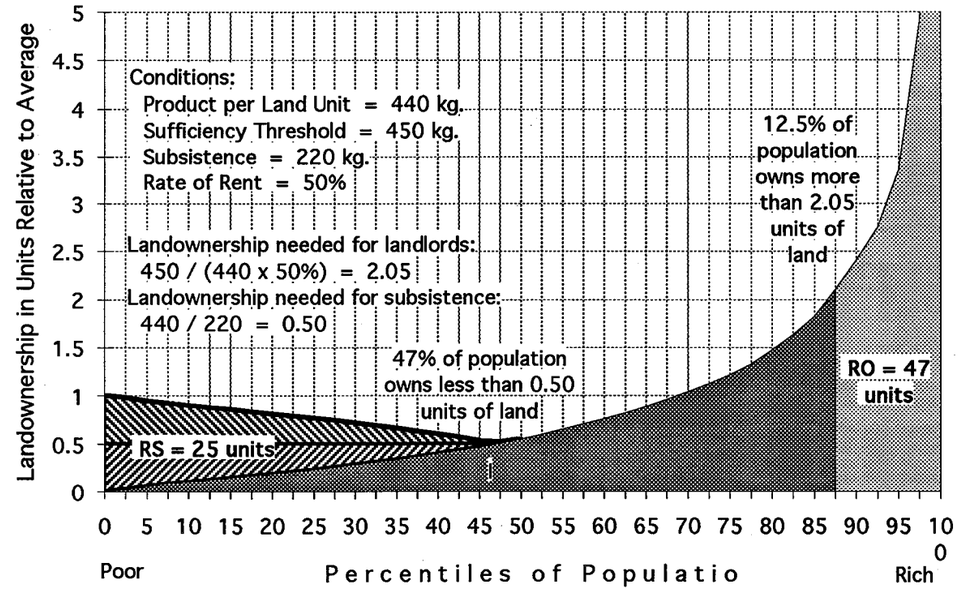
In the following example, average product per capita over the whole population is set at 440 kilograms grain-equivalent, a median figure in the range found in the survey that has been analyzed. Of course such a measure would include some non-staple agricultural production stated in terms of grain. It does not represent consumption contained within the rural sector, because rural production includes flows to towns and cities.

It is taken as a definition that one unit of land is that which produces the average product per capita, 440 kilograms. Then only those who own 0.50 units (220/440) of land or more, at and above the 48th percentile on the given landownership distribution, can meet subsistence through farming their own holdings. We can see immediately as well that 47% of the population cannot achieve subsistence on their own holdings, although average product per capita is double necessary subsistence. While almost all of the

Dataset 8.2.1 B Landownership Distribution Similar to China's, 1930's



Dataset 8.2.2 Method for Determining Supply and Demand for Rented Land



population owns at least a paltry plot, alienation from sufficient means of production is a common condition. That land-short 47% would need to own 23.5% of land (47 x 0.5) in order to meet subsistence, but instead they own only 11%, and fall short by 12.5%.

Two disparate and contentious schools of economic thought are linked in this delineation of the effects of the landownership distribution. Firstly, the alienation from the means of production that is central to a Marxist analysis of exploitation is specified, and gradations in deprivation and small-holding are also depicted, rather than a stark bifurcation of haves and have-nots. Secondly, the stage is set for a dynamic interaction of supply and demand. But unlike neo-classical economics, which would describe demand as the sum of capricious and culturally-determined proclivities acted out in the marketplace, demand first is here defined at its minimum and solidly quantified as the shortfall from subsistence experienced by a large and countable portion of the population, a very emphatic and non-arbitrary demand.

On the other hand, some small fraction of the population holds much more land than it would or could labor on.

The Landownership Distribution: The Supply of Rented land

We are dealing with a society in which the major means of production, land, is finite, and heavily pressed by population. The outcome of private ownership and severe maldistribution is that those who have no rights in land can be forced to surrender a part or even most of their production in return for access to land. That is, a premium can be extracted from the legal rights of ownership, either through hiring labor to farm the land, or by renting out the land to tenants.

It was argued at length in Chapter 7 that there is a threshold of income and well-being at which cultivators prefer freedom from physical labor to further income, and that in an agricultural society this threshold is fairly clearly defined. This idea of avoidance of drudgery was articulated by A.V. Chayanov in regard to the burden of dependants; but here it is applied to land/labor relations. This threshold can be identified as an absolute level of annual income, one providing a level of comfort beyond minimal subsistence. After the empirical investigations in Chapter 7, it was concluded that landownership yielding about 440-500 kilograms per capita, about two to two-and-a-quarter times subsistence, generally provided this threshold of comfort, i.e. the "sufficiency threshold".

This premise of the sufficiency threshold leads to a very different procedure for the solution of the rate of rent than seen in previous solutions of both neo-classical and Marxist economists. It is not the case that there is a pre-ordained class of landlords whose maximization of income or other utility can be reckoned from some set of assumptions. Rather, the class of landlords itself is formed due to an aggregation of choices about income and leisure.

In general, farming with hired labor yields a higher premium to the owner per land unit than can be collected in rents. This point was made in Chapter 7; it is possibly open to question when commercialization is very advanced. But in accordance with the above principle of avoidance of physical labor, if the threshold income can be achieved through rents alone, the landowner will forsake as well the onerous task of direct supervision of reluctant hired labor, and take up the social role of a rentier, perhaps with the added inducements of the mercantile and cultural attractions of the town. This is not to say that maximization of income is not in operation; but that avoidance of labor and the pursuit of alternatives to the rural scene take precedence once a certain level of well-being has been secured.

Whether or not a particular income in rents can be realized from a particular level of landownership depends, of course, on the rate of rent. The higher the rate of rent, the higher the income per unit of land at a particular level of productivity, and the lower the landownership necessary to reach the sufficiency threshold in rents alone. A managerial farmer with land producing 500 kg. per capita for his household might hire a year laborer, but several times more land would be necessary to support a landlord, especially at a low rate of rent.

Continuing the example with productivity at 440 kg. per capita, and setting the sufficiency threshold at 450 kg. per capita, it can be seen that if the rate of rent collected by the landowner were to be equal to the average surplus, 50% of the crop, landlords could collect 220 kg. for every land unit rented to tenants, and those owning 2.05 units of land (450/220) or more could afford to live as rentiers. In the landownership distribution in Datasets 8.2.1 A and B, these are the owners at the 87.5 percentile and above, 12.5% of the population. In the aggregate they own 47% of all land. This percent of land then describes the baseline for the amount of land that is available for rental to tenants at that rate of rent, the "supply" side of the land/labor market.

On the demand side, the land-hungry in this example are 47% of the population, and in the aggregate they would need to consume the full product of 23.5 units of land. That is, 47% of the population x 0.50 units of land (220 kg. for subsistence / 440 kg. product per unit) is necessary to provide subsistence, equalling 23.5 units of land. The land-hungry in the aggregate do already own 11 units of land, and so they are 12.5 units short. Since for rented land they surrender 50% of the crop to the landlord, they must rent in 25 units of land in order to meet subsistence. 25 units of land is the demand at a 50% rate of rent.

Dataset 8.2.2 serves to recapitulate and clarify the quantification of supply and demand: the land demanded by the land-short and the supply that large owners are willing to rent out are both contingent on a certain rate of rent.

The rate of rent given for this example is 50%. But it is apparent in this example that the supply exceeds the demand. Certainly the amount of land rented out must equal the amount of land rented in. It is likely that the market forces of land and labor will settle at a rate of rent somewhat lower than 50%, but what that point of solution should be is not obvious. The point of solution will be sought in the next section.

To repeat the parameters that allow us to achieve quantification of supply and demand, these are:

Distribution of landownership	(index relative to average)
Product per capita of population	(kilograms grain-equivalent)
Sufficiency threshold	(kilograms grain-equivalent)
Subsistence	(kilograms grain-equivalent)

8.3 How Could Rent Equal the Surplus?

Although we cannot yet say what the rate of rent should be, we can try to follow up some possibilities. We can again attempt to seek a solution in which rent equals the surplus, with a more mathematically sophisticated approach. Given a particular landownership distribution, we may presume that there does exist a rate of rent at which tenants retain no surplus, only their subsistence. Therefore we might seek as the absolute rate of rent that rate at which:

The Rate of Rent equals the Surplus, i.e.

the amount of land owners wish to rent out (RO) =
the amount of land the land-short must rent to subsist (RS) [Eq. 1]

We can try to discover such a rate by exploring the outcomes of successively higher rates of rent, using the table in Appendix F. This table lists the landholdings of each percentile of the population under the given landownership distribution, and also tallies them cumulatively both from the poor to the rich end of the spectrum, and from the rich to the poor end, so that it is easy to look up the figures for either the aggregate of land owned by the land-hungry, or the land owned by the leisured wealthy. RO and RS over the range of possible rates of rent for the same example, product per capita at 440 kg., is graphed in Dataset 8.3.1.

The needs of the land-hungry for rented land increase with the rate of rent. In fact, their needs increase rapidly, parallel to 1 / (1 - RR), that is, the inverse of the complement of the rate of rent (RR). So at a 30% rate of rent they need to rent in 17.8 units of land (12.5 / 0.7), but at a 60% rate of rent they need 31.3 units of land (12.5 / 0.4). This is shown in Dataset 8.3.1 with a line of positive and increasing slope, Rent to Subsist (RS).

To go over the use of Appendix F step by step: The amount of landownership needed for subsistence relative to the landownership distribution is (Subsistence)/(Product per Capita). If you find that number in the second column, Land Owned, then you also find the Number of Land-Short Population (Percentile) on the same line in column one, and the total land owned by the land-short population, Cumulative Land Owned (landownership summed from the 1st percentile up) in column three. Column four on

the same line gives the Shortfall at Percentile, the total additional amount of land that, if owned, would allow them to meet subsistence. But they must rent the land, so the Shortfall must be divided by the portion of the crop retained by the renters at the applied rate of rent, in order to arrive at the total amount of land the land-short population must rent-in in order to subsist (RS).

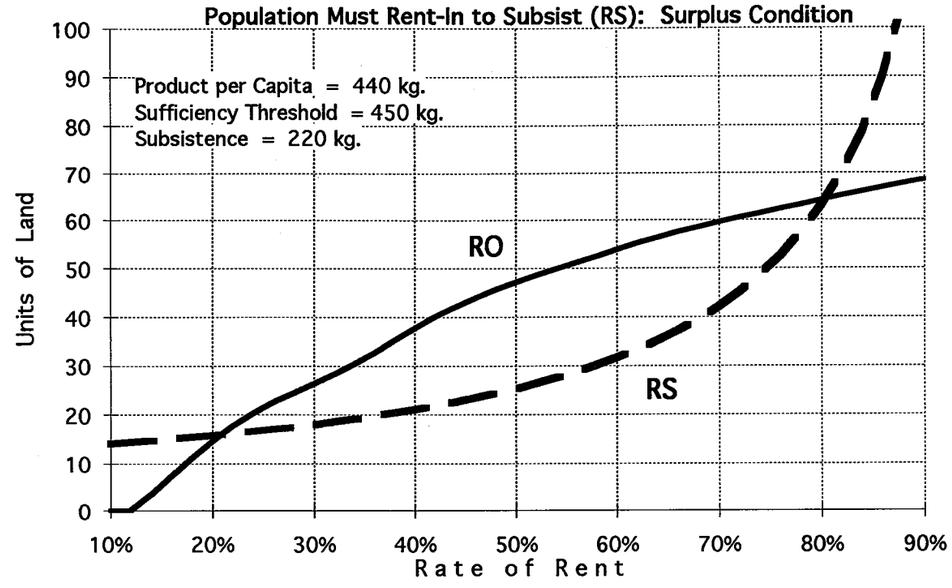
It is a little easier to figure the amount of land rented out. The level of ownership at the minimum income required for landlord status is (Sufficiency Threshold)/(Product per Capita), again divided by the Rate of Rent. That is again to be found in the Land Owned column, but probably on the right-hand side continuation of the listing of percentiles of population in Appendix F, which begins with the 69th percentile, who are landowners owning more than the average. When you have found the line with the desired level of landownership, you have also found the number of landlords one column to the left (100 - Percentile) and the total amount of land they own, one column to the right (Cumulative Land Owned, landownership summed from the 100th percentile down).

Land Rented Out (RO) is a line of positive but decreasing slope. On the part of the large landowners, only a few of this population are really big owners, and these choose the life of rentiers at a comparatively low rate of rent; but after that still higher rates of rent only bring the estates of middle-size owners onto the rental market, and new land available for rental at increasing rates of rent gradually shrinks in incremental size, indirectly reflecting the middle of the landownership distribution. So the estates near the peak of the landownership distribution, the concentration of ownership in the hands of a few fabulously wealthy families, largely governs the shape of RO, and may considerably influence the subsequent equilibrium for the rate of rent as well.

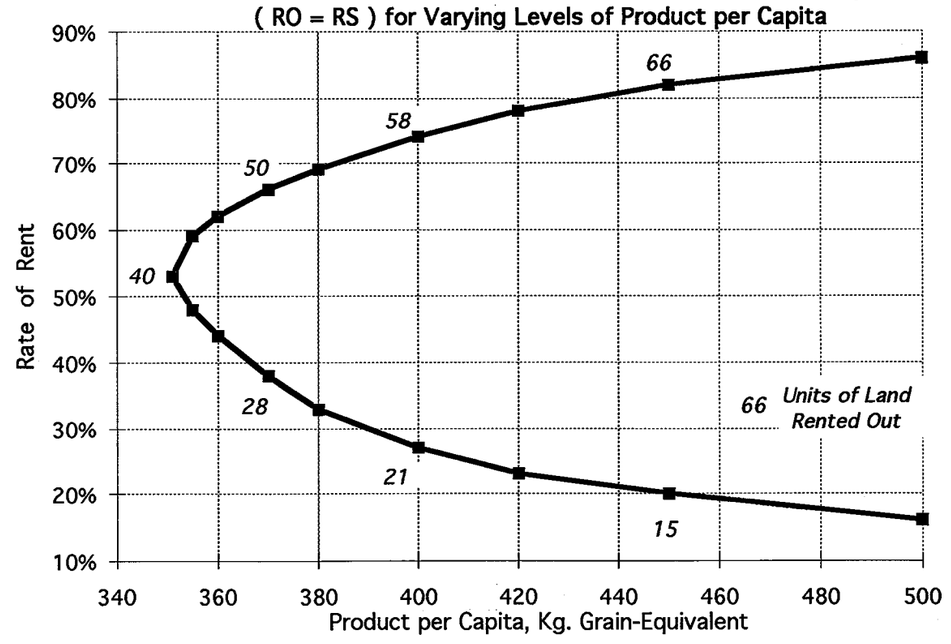
Amazingly, we see in Dataset 8.3.1 that there are two rates of rent at which RO = RS, not one — 21% and 81%. The upper point represents an incredible amount of labor on the part of the tenant, for the same miserable pittance.

If we plot for a wide range of levels of productivity the intersection points at which land that the land-hungry need to rent in (RS) precisely equals the land that landowners are willing to rent out (RO), all based on the same landownership distribution, then Figure 6 results. The intersection points of RS = RO as seen in Dataset 8.3.1, transposed to the perpendicular plane of rate of rent versus product per capita, form a parabola with its apex at close to 350 kg./capita, in Dataset 8.3.2. To the left of this apex there is no

Dataset 8.3.1 Land Rented Out (RO) and Land that Land-Short Population Must Rent-In to Subsist (RS): Surplus Condition



Dataset 8.3.2 Rates of Rent at Which Renters Retain No Surplus (RO = RS) for Varying Levels of Product per Capita



intersection of RO and RS; precisely at 351 kg./capita, there is one; to the right there are two intersections.

To some this might suggest an unstable equilibrium, or maybe an oscillation between the two points, with the outcome determined by a struggle of class forces over the negotiated level of exploitation. It might also be proposed that the higher point represents an untenable and impossible rate of rent, beyond the physical capacity of the tillers, and far over figures usually seen in historical documents and twentieth-century fieldwork — 40 to 50% —, and therefore the lower point must be chosen as the logical solution.

But we will soon see that this is <u>not</u> the logical solution, and the rate of rent does not equal the surplus except under very narrow conditions.

8.4 The Strategies of the Land-Short Population

There are, however, other possibilities. Let us consider the deficit or surplus enjoyed by renters as the rate of rent and the amount of land available to them varies. The demand pool at the very least encompasses all those who own too little land to afford an independent subsistence, in this case those owning less than 0.50 units of land (220 kg. for subsistence / 440 kg. production per unit). To review the figures, the 47% land-hungry own 11 units of land, and need the full production of another 12.5 units to reach subsistence. At a 21% rate of rent, that which is the lower intersection of the RS and RO curves in Dataset 8.3.1, they rent in 15.8 units of land, and barely subsist (15.8 units of land rented x 79% of product kept = 12.5). On the other hand, at a slightly higher rate of rent, say 30%, 26 units of land would be available to them for tenanting. Then the same land-hungry population, tilling this enlarged area, would in the aggregate achieve a higher income (26 units of land x 70% of product kept = produce of 18.2 units of land kept), and begin to enjoy some small margin of prosperity. If we test what income per capita is enjoyed by the renters at each rate of rent, we find that it is definitely in their interest to pay more than the minimum that allows subsistence. In fact, a rent of 47% would appear to provide the maximum income. The summary of this maximization is:

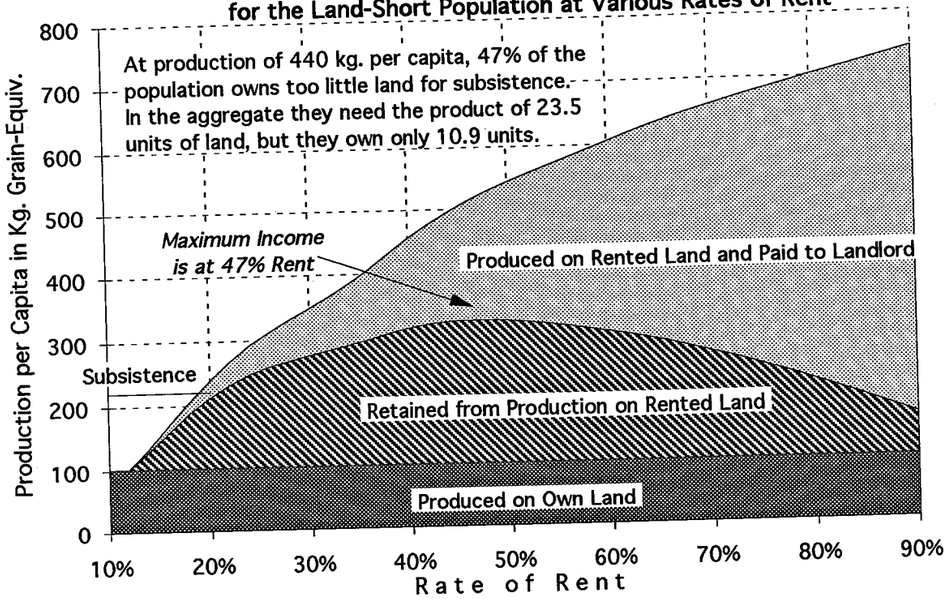
The Rate of Rent is that at which the land-short maximize income:

$$\textbf{MAX}\ \frac{(1\ -\ \text{Rate of Rent})\ \times\ (\text{Land Rented Out})}{\text{Land-Short Population}} \qquad \text{[Eq. 2]}$$

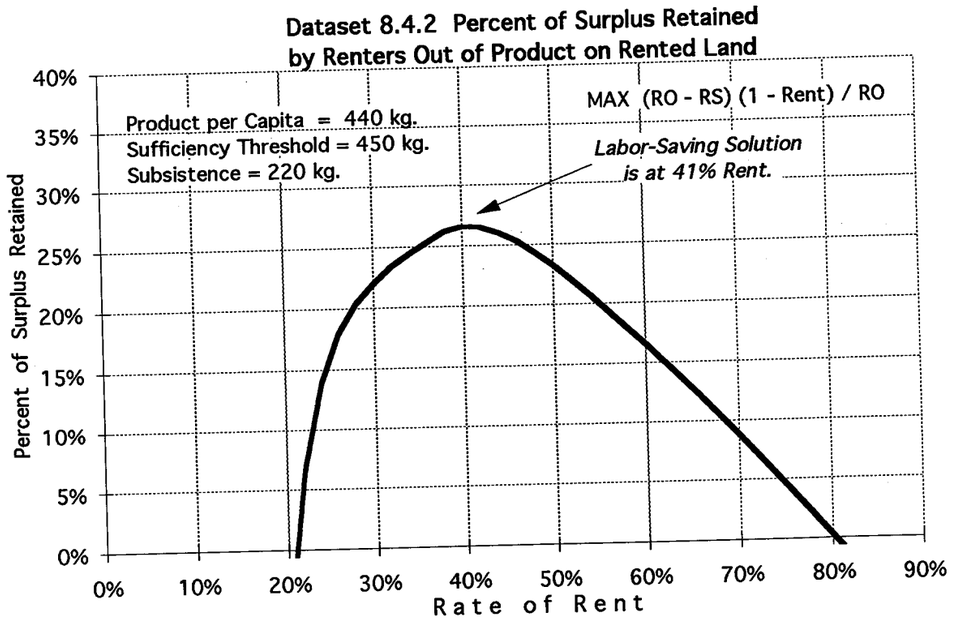
where Land Rented Out (RO) is of course also dependent on the rate of rent. The Land-Short Population does not change with the rate of rent; it depends on the product per capita. However, putting Land-Short Population in the denominator of the equation helps us depict the condition of the average land-short renter.

The absolute production and income, in kg. grain-equivalent, for the average land-short renter at different rates of rent is shown for this example in Dataset 8.4.1. The maximum absolute income that renters can achieve is at 47% rate of rent. Higher or lower than that point of rent, their income is lower.

Dataset 8.4.1 Production and Income per Capita for the Land-Short Population at Various Rates of Rent



Dataset 8.4.2 Percent of Surplus Retained by Renters Out of Product on Rented Land



At 47% rent, the land-hungry renters have access to 44.5 units of rented land, and on average produce 417 kilograms per capita on it; they pay 196 kg. in rent, and keep 221 kilograms, 53% of it, for themselves. Since the land they own provides on the average another 103 kg. of income, the land-hungry would achieve a comfortable income of 324 kg. per capita if they were indeed able to gain control of and till all the rented land available at 47% rent.

On the other hand, at incomes above subsistence the matter of returns received per labor output becomes increasingly relevant. The reluctance to engage in drudgery described by Chayanov must come into play. There are also opportunity costs to allocation of labor and costs of production to be considered. From some information covering farm tools and inputs (J.L. Buck, 1930, Chinese Farm Economy), these are simple and mostly produced on the farm, but some, like the human fertilizer used in the fields, are often insufficient for optimal yield. In this light, a slightly different point of optimization is proposed: the rate of rent at which the renter maximizes the portion of the surplus that is retained.

Referring again to Dataset 8.3.1, the land on which the renters may enjoy a retained surplus over subsistence and payment of rent is described by the area in which available rented land (RO) exceeds the land they must rent to subsist (RS). The amount of the product they retain is dependent on the rate of rent, so it is (1 - RR) (RO - RS). This retained portion must be considered relative to the total amount of land the renters rent, RO, not just the extra land renters obtain (RO - RS), because the renters also do not want to expand the burden of labor for subsistence while enjoying the retained surplus. The full formulation, which I dub "the labor-saving solution", is:

The Rate of Rent is that at which the land-short maximize the portion of the production that they retain over subsistence needs:

$$\text{MAX} \quad \frac{(1 - \text{Rate of Rent})\ (\text{Rented Out} - \text{Rent to Subsist})}{\text{Land-Short Population} \times \text{Rented Out}} \qquad \text{[Eq. 3]}$$

This is the ultimate optimization for the renter, yielding almost the same income with much less labor. As before, the term Land-Short Population does not contribute to the maximization because it is constant at any product per capita. The values for this equation at various rates of rent are shown in Dataset 8.4.2; the maximization in the

case of 440 kg. product per capita is a rent of 41%. At this rent, the land-hungry renters have access to 38.6 units of rented land, and on average produce 361 kilograms per capita on it; they pay 148 kg. in rent, and keep 213 kilograms, 59% of it, for themselves. In other words, they produce 48 kg. less for the landlords, but only suffer a loss of 8 kg. from their own income by settling on a rent of 41% rather than 47%. If there is, wittingly or not, a collective decision, this would be an eminently intelligent one.

This solution equals neither the average surplus, 50%, nor the rates of rent at which renters are stripped of all surplus, 21% and 81%.

To recapitulate the discussion to this point, there is an inexorable logic to the supply and demand for rented land, that both land rented out by landlords and land that the land-hungry must rent to subsist must increase with the rate of rent. But they increase at different rates. The quantification allows the formulation of a point of optimization for the land-short population, a maximization that is crucial for them because they are hard-put to reach subsistence. So far this is of course only a theoretical formulation, but empirical comparison will follow in the next chapter.

To sum up, the rate of rent is set by optimization by the land-short population in terms of the production they retain on rented land, for land rented beyond that necessary for subsistence. More specifically, what is maximized is the portion of retained surplus in total production on rented land. The rate of rent is less than the surplus of the renters. The solution implies peasants' calculations of drudgery and opportunity and production costs, as well as maximization of income.

To return to the specifics of the model, what has been presented so far is a step-by-step solution of the absolute rate of rent for a prototypical case, an illustration of the form of solution, but not yet the full range of solutions. Agricultural productivity and concentration of landownership may vary, and geographical conditions may obstruct the physical removal of the surplus as well. We will work through all of these in the course of Part Three.

The above solution for maximization by the land-short population is only applicable if there is indeed a rate of rent at which there is an excess of supply over demand for subsistence on rented land (i.e. RO is greater than RS at some rate of rent). What happens when there is a deficit will be addressed in the next section.

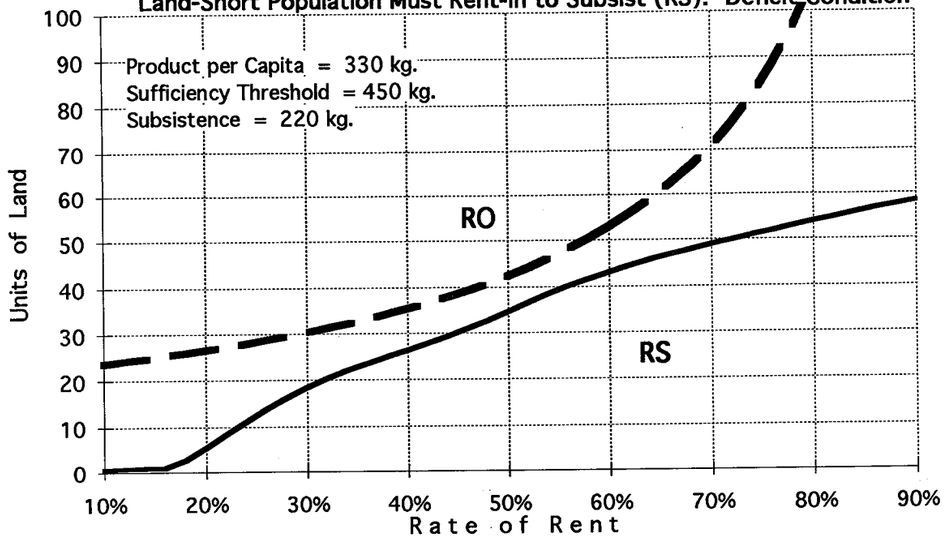
8.5 What if the Land-Short Population Can't Get Enough Rented Land?

Agricultural productivity of land varies immensely according to climate, soil, topographical features, labor input and technology applied. Grain output per land area can easily vary by a factor of 10. But for pre-industrial societies, output per worker probably varies less. Labor can be applied intensively, as in wet rice culture, or extensively, as in swidden agriculture. In the 1930's survey of Chinese farms that is the basis of this research, regional averages for product per capita among the farmers vary from barely subsistence (in fact, seemingly slightly under, at 210 kg. grain/capita) to over three times that level, 750 kg. grain per capita. But if population absent from the rural sector but still eating directly off its product is included in the denominator — landlords, agricultural and craft wage workers, itinerants — is estimated, the high range estimate is about 550 kg./capita. Inclusion of the town and city population, less than 20% of the total, would decrease the measure of product per capita even further.

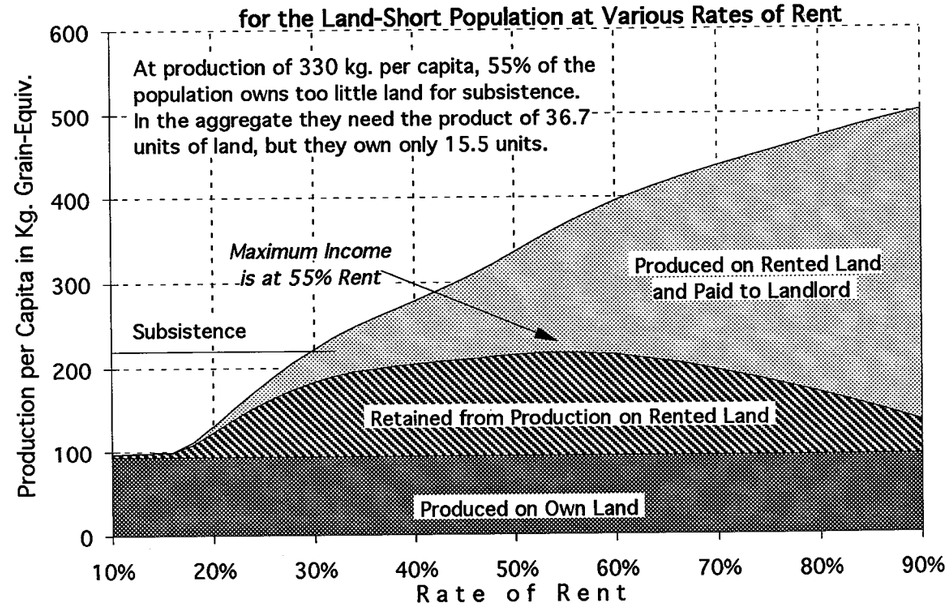
Variation in the product per capita produces some unexpected results in the rate of rent. Here I wish to present a contrasting outcome to the solution in Section 8.4, one that arises from preconditions that appear quite similar. Let us take the case that the landownership distribution, in the relative terms of the percent of population owning percent of land, is identical to that dealt with previously; but product per standard land unit is 330 kg. In this case the surplus is 33% (330-220 / 330) of total production, considerably less than the 50% surplus in the previous example, but still a sizeable margin. With this lower product per land unit and per capita, ownership of two-thirds of a unit of land is necessary for independent subsistence, and a larger portion of the population, now 55%, falls below this point of ownership. And correspondingly, landowners must own more land before they can afford the status of landlords. If for this case we plot as we did before in Dataset 8.3.1 the amount of land that the land-short must rent to subsist (RS), and the amount of land that landowners are willing to rent out (RO), over a wide range of rates of rent, Dataset 8.5.1 results.

This result shows that there is no rate of rent at which needs for rented land can be met, even though average product per capita seems a bountiful 110 kilograms over subsistence of 220 kilograms per capita. But still in terms of absolute income there is a

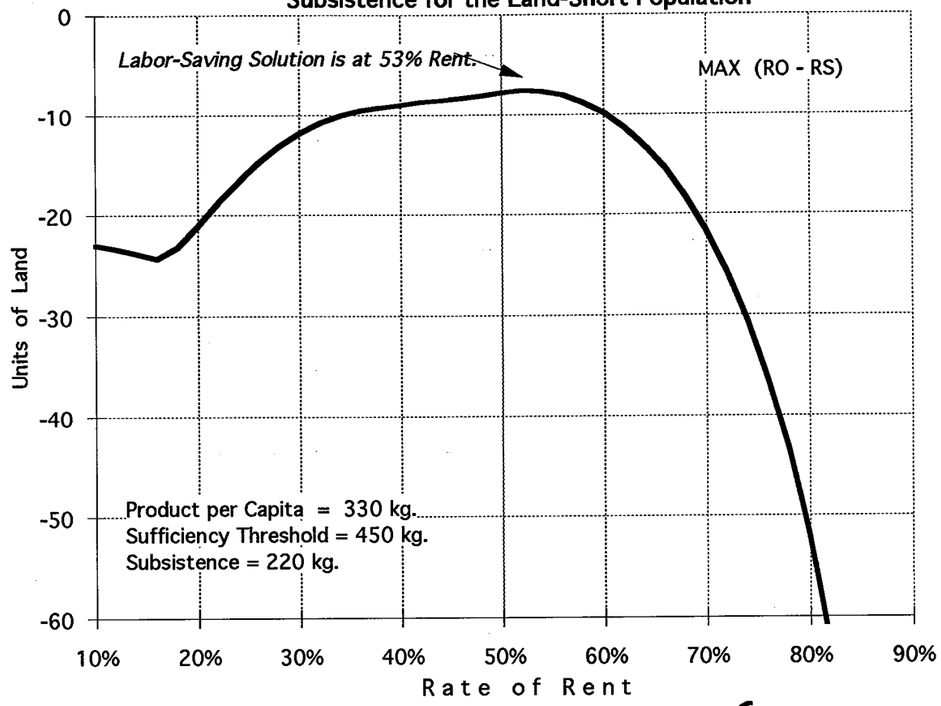
Dataset 8.5.1 Land Rented Out (RO) and Land that Land-Short Population Must Rent-In to Subsist (RS): Deficit Condition

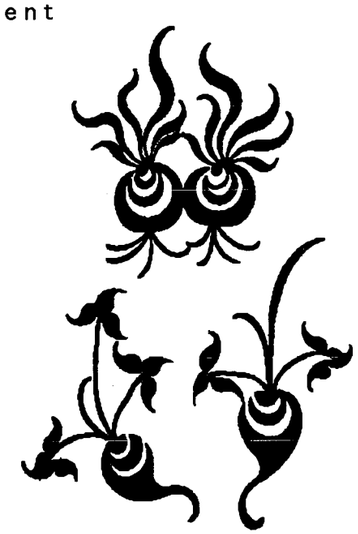


Dataset 8.5.2 Production and Income per Capita for the Land-Short Population at Various Rates of Rent



Dataset 8.5.3 Shortfall of Rented Land from Subsistence for the Land-Short Population





point at which the renters can come closest to subsistence, as shown in Dataset 8.5.2. That point is at a 55% rate of rent.

But even in such conditions of desperation, the renter is not inurred to the pain of drudgery; in fact the heavy burden must evoke a very fine sense of costs and returns to labor. There may be alternative sources of labor wages, i.e. opportunity costs for excessive labor on rented land. The more logical optimization for the deficit condition is:

For RO < RS, the Rate of Rent is that at which the land-short population minimize their shortfall from subsistence:

$$\mathbf{MAX}\ \frac{\text{(Rented Out - Rent to Subsist)}}{\text{Land-Short Population}} \qquad \text{[Eq. 5]}$$

where the maximization is the smallest negative number. As before, the number of the Land-Short Population does not influence the maximization, but lets us view the answer in terms of the average renter.

This optimization is the point at which the shortfall in land obtained to rent-in can be minimized, i.e. the maximum of RO - RS, which is graphed in Dataset 8.5.3. "Maximum" here means the smallest negative number, because RS is greater than RO over the entire range. This maximum falls at a rate of rent of 53%, "the labor-saving solution".

This equation represents some resistance to producing for the benefit of the landlords, for the maximization of absolute income (MAX (1 - Rent) x Land Rented Out) would indicate a rent that is still a little higher, 55%. At a 55% rate of rent 38.84 units of rented land are available. Divided among the land-short, on the average each renter keeps 104.9 kg. and pays 128.2 kg. as rent. In other words, the renters only achieve another half a kilogram of income at the cost of producing over ten kilograms for their exploiters, a clearly undesirable choice. The difference between Eq. 5 and the maximization of income, Eq. 2, can be seen more clearly when the entire range of solutions for the rate of rent has been laid out (compare Datasets 8.6.1 and 8.6.2); the more the renters are in the deficit, the greater the divergence, and the more the relief of the labor-saving solution.

But the labor-saving solution, minimization of the gap from land needed, still leaves the renters in difficult straits. The solution, 53% rate of rent, is very much greater than the average surplus, 33% (110/330 = 33%). At the 53% rate of rent, 37.05 units of land are rented out, and the rent paid on these is equivalent to nearly 60% of the society's total agricultural surplus. This relatively large quantity is transferred from renters to landlords. The land-short, on the average, can only achieve an income of 104.5 kg. per capita from rented land and 94 kg. per capita from their owned land, 15.7 units, for a total income of 199 kg.

If the renters thought they would be so lucky as to pay rent only equal to the surplus, 33%, they would have access to only 20.9 units of rented land, and would have an income from renting of 83.5 kg. per capita, one-fifth less than at the higher rent. They have no choice but to seek the higher income and the higher rent. But certainly these deficit renters pay dearly in labor for a small extra margin of income, little more than twenty kilograms. There is no enjoyment of surplus in this calculus for the deficit condition, only a desperate attempt to survive. The land-short can approach, but not achieve, subsistence as renters. There is a considerable gap from subsistence for a broad segment of the population; the land-hungry must needs also serve as agricultural labor or handicraft producers to close the gap.

In sum, when productivity falls short of 350 kg. per capita, the solution of the rate of rent is that at which renters minimize the gap between the amount of rented land available, and the amount they need to rent in to achieve subsistence. They can minimize but never close this gap. As an aggregate solution, they gain some income from rented land, but the rent they pay exceeds their surplus; that is, it eats into their subsistence, which must be supplemented from other sources.

8.6 The Range of Solutions for the Rate of Rent Under Varying Conditions of Productivity

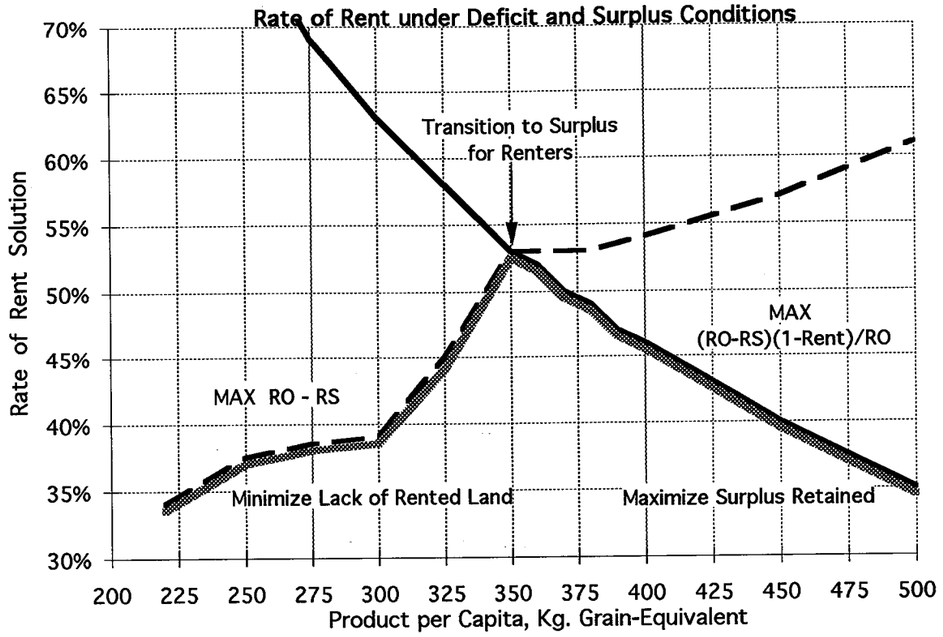
These two cases of solutions for the absolute rate of rent show a disjuncture. There are reasons, as given, for extraction from the renters to either exceed or fall short of their surplus, under the specific conditions of product per capita. The overall relationship between surplus and rate of rent is definitely not positive. There should be even less expectation that the solution for the rate of rent would match the average surplus.

The next constructive question then is what are the solutions over a wider range, and where precisely is the point of disjuncture between the two kinds of maximization. For an intermediate case, 400 kg. product per capita, there are still two rates of rent, 27% and 74%, that produce intersection points for RO and RS, but they lie closer together than for the 440 kg. case.

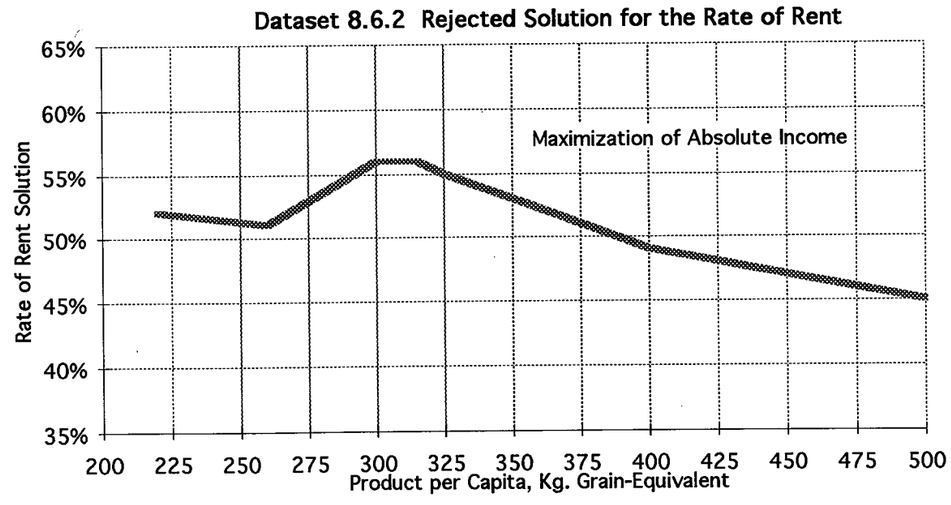
Reviewing Dataset 8.3.2, the parabola of points at which RO = RS, it can be deduced that the higher the product per capita, the more the RO and RS curves overlap, and the farther apart lie the rates of rent at which they intersect. We see that for a society or region with product per capita under 351 kg./capita, there is no rate of rent at which the land-hungry can subsist by renting alone; to the right, at rates of rent within the arms of the parabola, there is more rented land available than the land-hungry need for subsistence. In sum, this figure demonstrates that the rate of rent will precisely equal the surplus of renters under only very limited circumstances.

The renters' optimization solutions for the rate of rent — one for the deficit condition, and one for the surplus condition — are irregular curves lines that intersect at the point of 350 kg. per capita and about 53% rent, as shown in Dataset 8.6.1. That intersection point, the only point at which the rent equals the surplus of renters, marks the transition from deficit to surplus conditions for renters. The lower leg of each line is the applicable solution for the range, i.e. minimize lack of rented land when below subsistence, and maximize surplus retained as a portion of production on rented land when above subsistence. The rate of rent is greater than the surplus of renters in the former circumstance, and less in the latter. This is in effect the outcome of supply and demand, albeit an answer more precise and more concrete than neo-classical formulations of preferences.

Dataset 8.6.1 Renters' Maximization Solutions for the Rate of Rent under Deficit and Surplus Conditions



Dataset 8.6.2 Rejected Solution for the Rate of Rent



The upper leg of each line in Dataset 8.6.1 is not a reasonable solution, and yet each maximization has been drawn in full to emphasize that there is a transition from one logic to another, with very different outcomes of solution. It will be good to keep this difference in the two maximizations in mind as this article proceeds, because the rate of rent and the point of intersection may be influenced by parameters other than product per capita, and sudden transitions in patterns from deficit to surplus conditions will recur both in theoretical formulations and in empirical data. In the examples here the sufficiency threshold has been set at a standard 450 kg. per capita, but of course it has been found in past chapters that the sufficiency threshold varies at least with population density.

There are arguments to be made for various rationales of maximization, such as maximization of absolute income rather than income relative to production, as described in the preceding discussion. The curve representing the maximization of absolute income is shown in Dataset 8.6.2, for comparison with Dataset 8.6.1, where the optimizations are "the labor-saving solutions". Several alternatives, including consideration of what the maximization would be if rented land were spread over more renters than just the land-short population, have been tried out.[97] But the arguments cannot be resolved in the abstract. None of these alternatives match the empirical data as well as the solution in Dataset 8.6.1 that incorporates minimization of drudgery. In the following section the empirical data will be introduced and compared against the model.

It may be noted in passing also that none of the curves for the rate of rent generated from a land/labor market on the landownership distribution bears much resemblance to the average surplus for the production of the whole population, i.e.

$$\text{Average Surplus} = \frac{(\text{Product per Capita} - \text{Subsistence})}{\text{Product per Capita}} \qquad \text{[Eq. 6]}$$

which is a linear solution, the surplus increasing with the product per capita. However, the solution arrived at above for the rate of rent would meet the condition that rent

97 Testing of alternative solutions is described in Arrigo March 1990 manuscript, "The Economics of Social Stratification in an Agrarian Society: Landownership Distribution, Land Tenure, and the Rate of Rent", pp. 31-34.

equals average surplus at a product/capita of close to 405 kg. Then below 405 kg. per capita, rent is higher than the average surplus, and above 405 kg. per capita rent is lower. This prediction might serve as a benchmark for some rough tests on new data.

As for the proposed determination the rate of rent, it is remarkable that the rate of rent as a percentage of the crop actually decreases steadily at higher levels of productivity. Theoretically, not only the rate of rent as a percentage but also the rent as a use value decreases slightly at higher levels of productivity. That is, according to Dataset 8.6.1, rents in grain per land unit would be as follows:

	Kilograms of Grain-Equivalent per Year					
Product per Land Unit	250	300	350	400	450	500
Average Surplus	30	80	130	180	230	280
Rent per Land Unit	95	115	185	185	180	175

The average surplus is given as a comparison to the rent. Product per land unit is of course the same as product per capita.

Refinements to this solution will be presented in the next chapter; after comparisons with the empirical data and more theoretical explorations, it is proposed that the maximization of rents and total extraction on the part of the landlord class does play a subsidiary role in setting the rate of rent.

This is a concise solution, and no doubt satisfying from the perspective of liberal economics — market forces render an equilibrium that is satisfying and acceptable to all parties. The retained surplus is an incentive that spurs the renters towards greater labors, and the landlords benefit without the cost of applying any more coercion than that necessary to maintain the legitimacy of property rights. In fact, such a solution could not see landlordism as a regressive force. Those focussing on social conflict, however, can just as validly retort that the extraction of rent is still clearly predicated on basic inequality in social relations and deprivation of common rights in the earth. Then such a solution is just a marker and measurement of exploitation that is likely to increase as landownership concentration is exacerbated, till the breaking point is reached.

It might be speculated also from this solution that in conditions of very high actual or potential product per capita property rights in land would be relatively insignificant because they would yield only low rents; the direct control of labor would be more central, as in tribal societies. As mentioned previously, the regional averages seen in

the survey source range up to 750 kg. per capita for the farm population. It is very unlikely that average production for a whole population in a pre-industrial society of this type would much exceed that figure, because owner-cultivators would not labor to produce a surplus so far in excess of their needs, and with a landownership distribution of the type believed present here only a very few percent of the population would be land-short at such high levels of production and subject to coerced work on the land of others.

Over most of the range of product per capita, the proposed solution for the rate of rent is within the bounds of 35-50%. In much of the Chinese literature a rent of 50% of the main crop has been described as "customary", and an impression from occasional reading on other areas of the world is that that is the most common figure. But garden and second season crops often provide a significant portion of peasant livelihood, such that the rent is actually less than 50% of total production. The new perspective borne by this application of mathematical rigor must be that an economic dynamic underlies the apparently limited range of the rate of rent, and that in concrete terms of grain and consumption even an apparently constant rate of rent may mean very different physical outcomes in different agricultural environments.

Chapter 9 The Rate of Rent and the Rate of Extraction in Agrarian Society: Structural Leaps, Geographical Reversals

9.0 Introduction

Chapter 8 covered the first stage of the analysis of the determination of the rate of rent on agricultural land, the optimization of the rate of rent from the perspective of the land-short population. This is the major part of the solution, judging by comparison with available empirical data, but there still other refinements that bring the solution somewhat closer to the data. These will be the topic of Chapter 9.

First let us briefly review Chapter 8. The rate of rent we are seeking is the "absolute rate of rent" that Marx ascribed to monopoly or oligopoly ownership of the means of production. The rate of rent is not, as often concluded in analogy to Marxist theories of surplus value, the renter's surplus over subsistence. Rather, it is the outcome of a market equilibrium of supply and demand for rented land. However, this market is not one of disembodied proclivities, "utilities" in neo-classical economics, but one that is delimited by concrete conditions of comfort in freedom from physical labor, and fear of starvation. In this respect, particularly in measuring alienation from the means of production, we can affirm the Marxist formulation.

Supply of rented land is specified by the number of landowners who can achieve a certain income allowing freedom from physical labor. Demand is specified at the minimum by the subsistence needs of those who lack sufficient land. Both supply and demand can be quantified by reference to the landownership distribution and the product of the land. Grain and subsistence staples, rather than money, are the medium of exchange and measurement in this market; they are both the major products of the land and the stuff of subsistence. Minimum subsistence is mostly the physiological necessity for food; it has been estimated at around 220 kilograms of unhusked grain per capita annually for a self-reproducing population. The "sufficiency threshold" falls at landownership yielding about 450 kg. per capita; beyond that point leisure is preferred to labor on the land. The numbers of the land-short are commonly 35-60% of the population, depending on the average product per capita.

There are two possibilities in this land/labor market: one, that supply is in excess, and the other, that demand is in excess. The boundary between these two situations can be quantified, and is approximately at the level of productivity of 350 kg. of grain-equivalent per capita. The rate of rent under each situation is resolved by a different form of maximization, and the solution for the rate of rent is nonlinear and discontinuous across this boundary. To summarize this solution, when demand for rented land exceeds the supply at all rates of rent, the rate of rent settles at that closest to providing the land-short the amount of land they must rent in order to subsist. Under these conditions rent exceeds the surplus of the renters. When supply exceeds demand, the rate of rent is lower than the surplus of the renters, and it is the rate of rent at which the renters maximize their share of the surplus on all the land they rent.

In neither case does the solution equal the maximization of absolute income by renters. Rather, the opportunity cost of labor and the avoidance of drudgery are implicitly contained within these solutions, which fall just slightly short of producing the maximum absolute income from rented land, while incurring considerably less debt to landlords.

In numbers, the rate of rent increases with productivity from about 25% at 220 kg. per capita to a peak of about 55% at 350-400 kg. per capita, and decreases again at higher productivity, down to about 30% at 700 kg. per capita. This has been shown in Dataset 8.6.1, concluding Chapter 8.

This provides a first-stage solution for the rate of rent that will be shown to bear considerable resemblance to empirical data. But in Chapter 9 the parameters will shift as we allow the sufficiency threshold to vary, usually with population density, and consider that some of subsistence for the land-short population may be met from sources other than rented land.

Section 9.1 introduces very large questions, the rate of extraction (rented land x rate of rent) for an agrarian society. It muses on whether the ruling class has means for manipulating conditions to maximize its rate of extraction. This might be done by withholding rented land to affect the supply, for example. In terms of the model, this means raising or lowering the sufficiency threshold. Although this provocative question cannot be answered with the available evidence, the model provides some interesting ways to think about the question.

From this analysis, it seems probable there would be some divergence of the sufficiency threshold not just as expected from population density, but some bending in a direction — sometimes up, sometimes down — that affects both income for the landlord class and the producing class. This bending seems likely to cause the agrarian economy to jump between states rather than shifting smoothly with increasing population density. But the deviation is not so great that it would obviate the generalization about the stability of the sufficiency threshold as a manifestation of the desire for freedom from physical labor. This probable bending provides a second-stage prediction for the rate of rent.

Section 9.2 introduces the empirical rate of rent estimated from the Buck survey, and describes how it was extracted from crop allocation data.

Finally in Section 9.3 we can compare the second-stage prediction against the limited empirical data available from the Buck survey. Considering the roughness of the data, the prediction looks fairly good. But the major divergences themselves seem to have a pattern. For one, the maximum rate of extraction seems to be avoided, if we consider also the estimated sufficiency thresholds from the empirical data. For another, the major divergences can be related to differences in population density.

The effect of population density on the rate of rent follows a convoluted path, as explained in Section 9.4. It is predictable that population density should affect the rate of rent, because, as seen in Chapter 7, population density affects the sufficiency threshold for landlords, and thence the supply of rented land. What is not so readily apparent is that the total amount of land let out to others (both hired labor and tenants) does not vary so much because of the stability of the basic sufficiency threshold, the income at which landowners decline physical labor. Only the minimum income for absentee landlords is very sensitive to population density, and if agricultural wage labor work on the large landholdings that are <u>not</u> rented out partially alleviates the subsistence needs of the land-short, then rents fall. So the landlord/tenant dynamic seems to be both parallel to and partly disengaged from the dynamic of the overall rate of extraction. Section 9.4 works through the effects of population density on the model. For surplus areas, the model confirms the general expectation that rents increase with population density, which is also predicted by the marginal productivity model of rents from the neo-classical school of economics. But surprisingly, for deficit areas rents <u>fall</u> as population density increases, both in the model of the absolute rate of rent and in the limited empirical data.

In Section 9.5 we investigate which part of the population actually gains control of rented land, the land-short or the not-so-land-short. This is a systematic theoretical analysis of what was seen before in Dataset 6.3.4 A and B, land rented in for quintiles of farms ranked by land owned. The rationale for this pattern is clear for the areas where renters retain a surplus on rented land: the lower the rate of rent, the more rented land is coveted and grabbed by those that have the means and also the will to work harder, the medium and medium-large owners. The pattern is the opposite in deficit areas.

But the fact that the land-short population may not actually end up in tenure on rented land does not seem to change the determination of the rate of rent, which is determined by the demand for rented land that their land-hunger presents. That is an aggregate demand, summing up the necessity for subsistence throughout the population. The aggregate demand does not depend directly on the realized income of any particular segment of the populace, or whether the land-short are those who can gain control of rented land.

Section 9.6 uses the data prepared for Section 9.5 for another purpose: to compare the empirical numbers of the land-short population with the numbers that would be predicted from the theoretical landownership distribution, thus to confirm that the landownership distribution with 42% displacement from equality generated by computer simulation in Chapter 1 is indeed applicable to modelling the survey data. Since the rate of rent solution has been found to be sensitive to irregularities of the landownership distribution, it is appropriate that this be investigated further here. Section 9.6 also compares the empirical landownership distribution for North China with the computer-generated distributions in some detail.

Following on the detailed examination of the landownership distribution, Section 9.7 asks how variation in the landownership distribution, namely greater or lesser inequality, affect the rate of rent solution. This can be answered theoretically through the rate of rent model, though there is no empirical data for comparison. The answer is counterintuitive: the rate of rent is lower if the concentration of ownership is higher. This interesting result might change some interpretations of economic history. However, the rate of extraction (rate of rent times extent of rented land) is still slightly higher in total, if the concentration of ownership is higher.

The final section of Chapter 9, Section 9.8, reviews and summarizes, first, the three stages of the solution for the absolute rate of rent, and second, the geographical patterns

of the Chinese agrarian economy in the light of the cumulative analysis of determination of land tenure and rate of rent. It elucidates why tenancy is not just prevalent in richly productive, densely populated areas, but also present at the other end of the scale in remote impoverished areas.

9.1 Is There a Logic to the Total Rate of Extraction in Agrarian Society?

Chapter 8 presented the maximization for renters based on what they would be forced to pay due to alienation from ownership, and what they would be willing to pay based on their own best interests.

But there is an even broader context for the rate of rent. There is political as well as economic power concentrated in the hands of large landowners. Is it possible that the ruling class can also engineer some maximization of its own interests? Several Marxists have quoted to me Marx's statement that for feudal society exploitation is an extra-economic process, i.e. it is carried out by military conquest and physical theft — so it is futile to try to find an economic rationale. Other Marxists such as Brennon have argued that rates of rent and exploitation are the outcome of class struggle, an historical process whose resolution is to be found in the political realm.

These arguments seem to me excessively voluntaristic, as well as indeterminate in outcome. As William McNeil has told us in Pursuit of Power, and Charles Tilly in Coercion, Capital and European States, AD 990-1900, military power both costs money and yields booty. Coercion is itself susceptible to economic analysis; its success turns on a finely-tuned balance of costs and returns. So I am not dissuaded from pursuing the economic logic of the agricultural economy. But it is appropriate to ponder on such huge questions as we begin to look at the rate of rent analysis in a large perspective. That large perspective will gradually come into view in the following further discussion of the model of the absolute rate of rent.

As seen in Dataset 8.6.1, the theoretical solution for the rate of rent according to the maximization of renters' at varying levels of productivity is not irregular merely due to the sudden change of direction at the boundary condition for maximization under deficit or surplus conditions. There are several other irregular bends on the deficit side. It can just barely be seen in Dataset 8.3.1 that there is unevenness even in land rented out at varying rates of rent. And the underlying reason for this is in the landownership distribution.

Although the landownership distribution looks like a smooth curve when it is laid out as a histogram as in Dataset 8.2.1 B, it actually has several subtle inflection points at

which the slope changes. The irregularity is much clearer when the landownership distribution is shown as a frequency distribution. The landownership distribution produced by class differentials of reproduction has an expanded sector of medium-large size ownership, as well as a thinner peak, compared with a landownership distribution produced by partible inheritance but without class differentials of reproduction. This comparison can be seen by looking ahead to Dataset 10.X.XXX in the next chapter. This feature is, by the way, also another point of reference for comparison to empirical data. Landownership distributions influenced by other patterns of inheritance might be expected to have different frequency distributions of farm sizes.

This point about the unevenness of the landownership distribution is introduced here because it affects our consideration of the rate of rent in the context of total extraction from the agricultural sector. The unevenness makes the solution slip suddenly, catch, and even change speed and direction sometimes, like damaged gears on a ten-speed bicycle, as RO (land rented out) moves past RS (land the land-short population must rent-in to subsist). In addition, there is some computational roughness in my model. The landownership distribution used to generate RO and RS was produced by a computer simulation of a random process, and even after averaging several runs and smoothing, there is some residual lumpiness; this probably affects the solution by no more than 1% rate of rent either way, but still detracts from precision. The major reversals come from the landownership distribution itself.

Let us continue our contemplations on whether landowners could seek to "fix" the rate of rent. Political collusion does not seem likely; landowners utilizing tenant labor include a multitude from large to small. The logical economic means, one probably also not amenable to coordination, is to remove land from the supply of rented land, to force up rents; but only the smaller landlords would be able to farm their own land. This would in effect be the same as raising the sufficiency threshold of ownership for rentier status, or increasing the minimum income expected, similar to the effect of an increased cost of transport. But perhaps such an outcome could also come about by the "invisible hand" of economic forces.

Let us consider first a small example of varying levels of the sufficiency threshold, the solution for the rate of rent at product per capita of 375 kg. The sufficiency threshold here is specifically the minimum income expected to be received by landlords in rent payments, not their level of ownership. We might picture this table, read from bottom to top, as representing the outcome of increasing dispersion of population.

Starting at the bottom of the table at a very low threshold of 300 kg., the rate of rent increases rapidly at first and then more slowly from 34.5% to a maximum of 57% at 575 kg. This is also almost to the point at which renters begin to fall short of subsistence — which might be said to indicate that the maximum rent requires hungry renters. At 600 kg. the rate of rent drops precipitously, to 45%; later it again increases, but very gradually. The peak rate is never regained. At the same time that the rate of rent increases with the rent-out threshold, the amount of land rented out decreases, because fewer and fewer landowners can reach the threshold. The decrease begins slowly, but then the amount of land rented out drops off suddenly, not unexpectedly at the same point as the decrease in the rate of rent.

The rate of rent times the amount of land rented out equals the percent of the aggregate product of the society that is transferred from tenant to landowner, what I call the rate of extraction. As may be seen in the fourth column of Dataset 9.1.1, there is a point at which the rate of extraction reaches a maximum, 21.4% at a rent-out threshold of 525 kg. At higher or lower thresholds the extraction does not achieve that level.

Dataset 9.1.1 Theoretical Effect of the Sufficiency Threshold for Renting-Out Land:The Rate of Rent and the Rate of Extraction

Product per Capita = 375 kg., Subsist = 220 kg.
Landownership Distribution with 42% Displacement
Land-Short Population 52%, owning 13.6 units of land

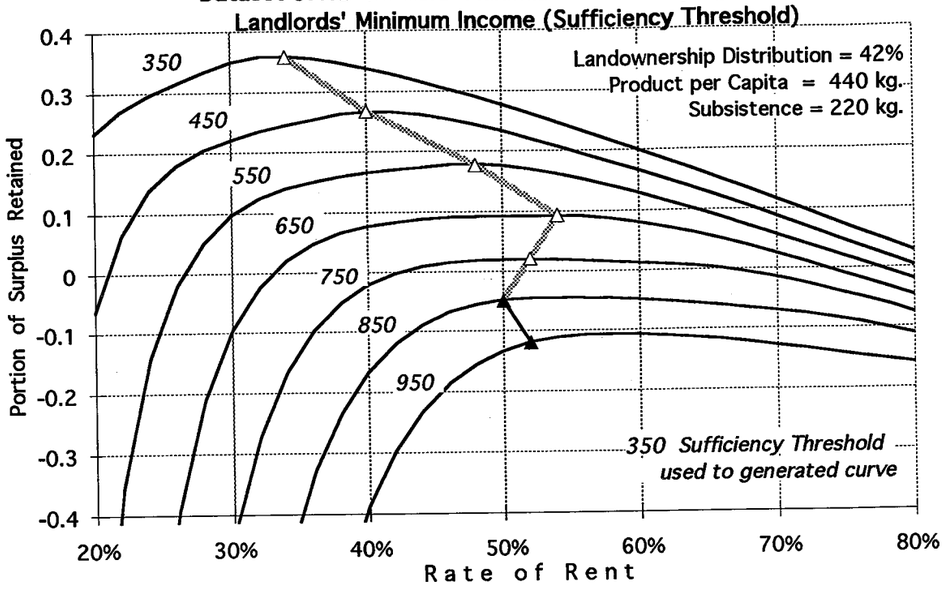
Sufficiency Threshold	Rate of Rent	Rented Land	Rate of Extraction	Income for Land-Short*
800	47.0%	21.9	10.3%	184
750	45.5%	22.9	10.2%	190
700	45.0%	24.3	10.9%	197
650	44.0%	25.9	10.6%	205
600	45.0%	28.7	12.9%	214
575	**55.0%**	37.7	20.7%	223
550	54.0%	39.0	20.1%	230
525	53.0%	40.3	**21.4%**	238
500	51.0%	40.8	20.9%	244
450	47.5%	42.0	20.0%	259
400	43.0%	43.2	18.6%	278
350	39.0%	44.7	17.4%	297
300	34.5%	46.1	15.9%	318

* Including income of 100.2 kg. from owned land, and assuming land-short population obtains all rented land, an assumption which will later be challenged.

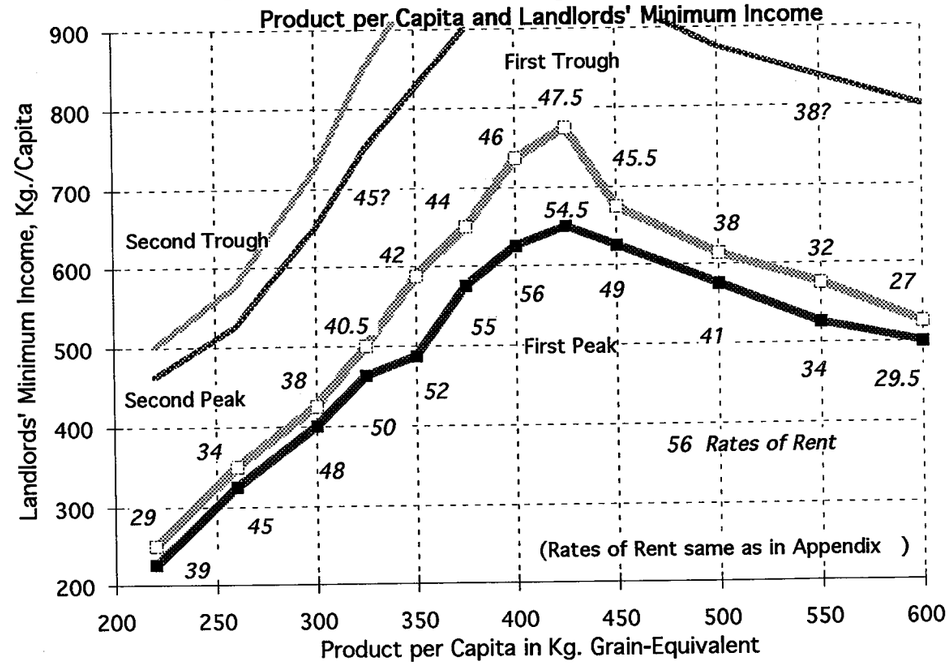
Dataset 9.1.2 shows the same process, graphically, for a case with product per capita of 440 kg. Like Dataset 8.4.2 in the discussion of the maximization of surplus retained by renters, it shows curves for maximization with various sufficiency thesholds. The rate of rent increases as the sufficiency threshold increases, but reverses sharply at about the point where renters fall into deficiency, and then reverses again and continues to march higher later.

We can see that if large landowners raise their income demands and their tolerance for labor and withdraw enough land from the market, the land-short population falls into a deficit condition. Landlords receive the highest rate of rent when the renters are pushed a little ways, but not very far, into deficiency; too far, and the rate of rent plummets 10%. The disadvantage, though, is that either the landlords are engaging in unaccustomed labor, or the land withheld from the market is going untilled. So total rents collected are down even at the highest rate of rent. If we look for the highest total yields for the class of landlords, that is the rate of rent times the extent of land rented out (RR x RO), which is the total rate of extraction in rents from the agricultural sector. That is maximized when the rate of rent is a little below maximum, but renters are just on the brink of subsistence, and retain none of the surplus for themselves. This

Dataset 9.1.2 Renters' Maximization at Varying Levels of Landlords' Minimum Income (Sufficiency Threshold)



Dataset 9.1.3 Peak and Trough Rates of Rent at Varying Product per Capita and Landlords' Minimum Income



is attained in this 375 kg. productivity case when only those landowners owning land yielding at least 525 kg. per capita annually for their families rent out the land.

The maximum rate of extraction looks like a desirable goal for the ruling class. But can the ruling class discipline those who seek leisure with 450 kg. income from rents, and make them labor on their own land instead? In this example at rather low productivity the difference is small, but it may be much greater elsewhere. The desire for freedom from physical labor is not easy to budge.

Before broadening the inquiry, let us make clear that what we are dealing with here should be seen as not absentee landlord/tenant relationships alone, but the full land/labor market of the society. It would be better to use the term "let out" rather than "rent out" land, as in the beginning of Chapter 5, before land/labor relationships were differentiated between those involving hired labor and those involving tenants; except that here in the rate of rent model an all-or-nothing status of leisure is applied, as was used for rentiers in Chapter 5 but not for managerial farmers. The reason for this conceptualization is that if there were managerial farmers who hired labor present in this picture, then the land-short population would have some of its subsistence covered in wages, and this would impinge upon the demand side of the determination of the rate of rent. So for now let the reader conceptualize the the society as having only one land/labor relationship, landlords and tenants, and only one knotty and gargantuan problem of the rate of exploitation in that relationship.

If we calculate the theoretical renters' maximization of the rate of rent for the range of levels of productivity and sufficiency thresholds that are seen in our Chinese data, a very large table is produced. (It takes ten minutes of computer time and five minutes of human time to derive each rate of rent point.) That large table is given in Appendix G; it is based as before on the landownership distribution with 42% displacement. The matrix is drawn in a simpler form in Dataset 9.1.3 for presentation to the reader. The most notable feature is an inverted "V" in relation to increasing product per capita on the horizontal axis, which echoes the first-stage rate of rent solution in Dataset 8.6.1, although it is not the same thing. The inverted V traces the levels of landlords' minimum income (sufficiency threshold) that yield the maximum rates of rent at that level of productivity. The highest rate of rent, 56%, falls at 400 kg. per capita and a sufficiency threshold of 625 kg. The apex of the inverted V is a little to the right, at 425 kg. per capita and sufficiency of 650 kg.

Behind this crest, i.e. at sufficiency thresholds just a little higher, the rate of rent falls suddenly. The trough is ten points lower on the left, deficit leg of the inverted V, but only six to two points lower on the right, surplus leg, and the gap decreases with increasing product per capita. This is not a symmetrical form. Beyond this major feature there seems to be another very gradual rise, which is probably followed by a levelling off or another small drop-off. At the apex of the inverted V rents seem to stay high. The shape is reminiscent of a soft silk scarf thrown on a table, folded and curving, with the angle holding the surface high in the middle of the curve.

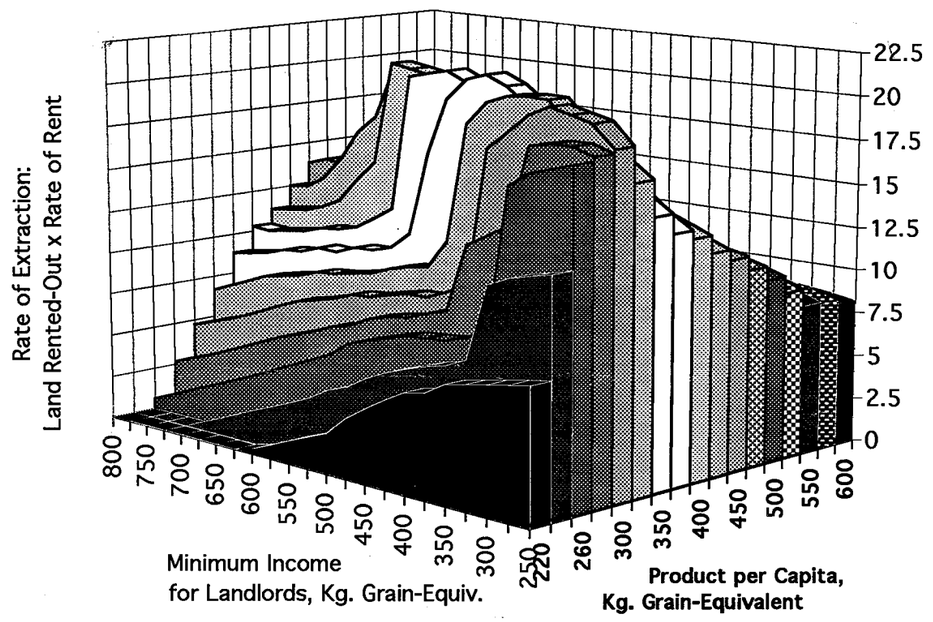
Maximum rates of extraction parallel the maximum rates of rent at slightly lower sufficiency thresholds, and the reversals are more gradual. The total extraction is the rate of rent times the amount of land rented out — or, in more general terms for one land/labor relationship, the rate of exploitation times the amount of land farmed by others. A full table for the rate of extraction is also given in Appendix G.

The Rate of Extraction under a Unitary Land/Labor Relationship

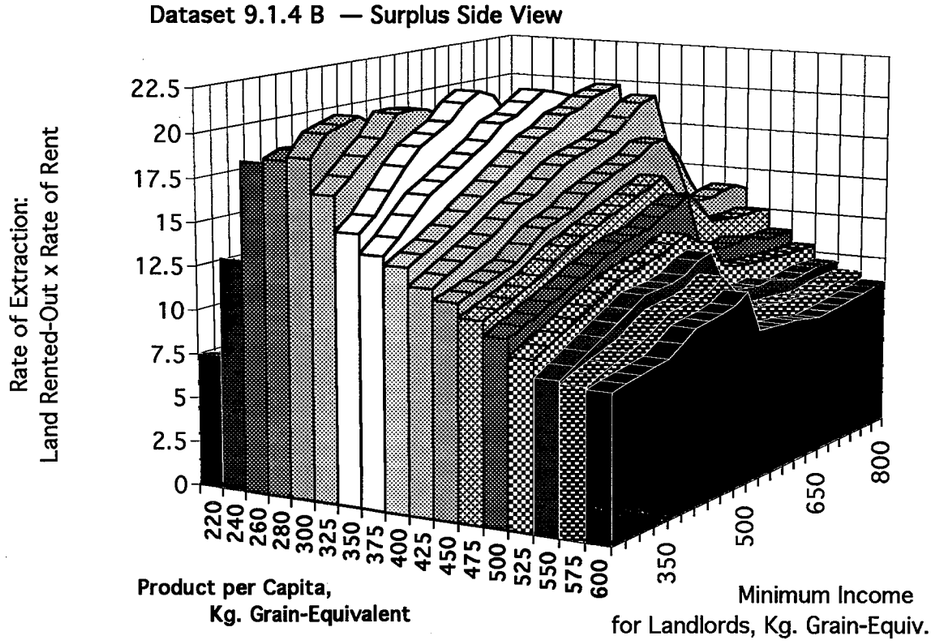
But numerical tables are hard to envision. It is more bracing to see this mathematically-generated form at the colossal scale of the social issue, one which must be the key to the potentials of civilization and state grandeur. In the 3-D graphics of Datasets 9.1.4, A and B, we see a steep, rugged mountain crest rearing above glacier-gouged valleys. The x-axis is product per capita, and the upright slabs of that dimension, like upturned earth strata, can be visually followed through the mass according to gradations of shading. Although it may not be entirely clear in the 3-D perspective of the mapping, the highest elevations are in the 350 and 375 kg. strata, which are distinguished by lack of shading. The y-axis is the minimum income for landlords, a.k.a. sufficiency threshold. Dataset 9.1.4 A is the view from the deficit side, the steep side of the rock outcropping, and B is the view from the surplus side, with a gentler slope dropping off to the right. The height, the z-axis, is the rate of extraction, and it varies mostly within the range of 10-20%. From the product per capita axis, this massif is a wedge-shaped promontory, with a sheer precipice beyond the crest. The wedge is centered on 425 kg. per capita productivity.

This is an imaginary land. It is not at all likely for our agrarian society, China, where population has pressed upon land for at least a thousand years, that owners of land would

Dataset 9.1.4 A Rate of Extraction at Varying Productivity and Landlords' Minimum Income — Deficit Side View



Dataset 9.1.4 B — Surplus Side View



defer the gratification of elite status, and embrace the stains of mud and nightsoil, if they had any choice. For overall land/labor relations, the sufficiency threshold would hardly rise above 550-600 kg. On the other hand, we might envision other societies where the land/labor market exists in other forms, such as vassalage or serfdom, with less population pressure. Product per capita might be so high that it might be very difficult to force labor to work on the land at a high rate of extraction. Perhaps a small feudal nobility would only be able to separate from peasant status by attaining very high income with small tithes from a large domain of subjugated peasantry. Or taxation under zamindars or sultans, without private ownership of land, could be analyzed with some creative application of this framework.

Even though imaginary, the terrain is a necessary outcome of the landownership distribution in our Chinese case, at least in its general outlines, and it has dramatic implications for our thinking on agrarian society. And there are some signs to be seen that it has its counterpart in the real world of survey statistics, as will be seen in Section 9.3. Admittedly, though, there are too few signs to reach more than speculative interpretation. And more speculative thinking must be spun out to reach interpretation.

If we move closer to reality and differentiate land/labor relations between landlord/tenant and managerial farmer/agricultural hired labor, then we have to think about the different rates of profit on each use of labor, and possible interaction between the two. There is undoubtedly some parallel between them, i.e. rates of exploitation in the two forms could not differ too much under the same basic conditions, while they may simultaneously be complementary to some degree, inversely offset from the average rate of exploitation. There might be an unexpected equilibrium between the two. Consider for example that normally we would expect agricultural labor to be subject to more exploitation than tenants. But in deficit areas, where the rate of rent is greater than the surplus over subsistence that the average tenants could attain even if the land-short population got all the rented land, the lot of an agricultural laborer with assured subsistence might be better. At the same rate of exploitation it is almost certain that more landowership is necessary for rentier status, because rentier status is highly associated with town and city residence.

An important source of difference in the social impact of the two forms of land/labor relationship would be in the "secondary circulation" of the surplus, the effect of returning some of the agricultural product to the exploited peasants in exchange for additional non-agricultural labor, personal services, craft production, or even their

sons and daughters (sale of children for labor, adoption or marriage). We saw before in Chapter 6, Dataset 6.2.2, that outflow of the surplus in sale of the crop to middlemen was much more related to rented land than to land farmed by hired labor. The masters of hired labor consume most of their surplus within the agricultural economy. Although rent-collecting landlords also indirectly create labor markets that may provide employment for the sons of peasants, those remittances are no doubt only a fraction of the surplus outflow.

So we can see a reason for different consequences of the two forms of labor relationship. In a strict simplication, we could depict rentier-landlords and tax collectors as the only external beneficiaries of the rate of extraction. Then the 3-D graphs of Datasets 9.1.4 A and B would be specifically applicable to the external collectors. The external collectors might indeed sit at very high levels of minimum acceptable income, much higher than that acceptable for desisting from physical labor in the countryside. To these external collectors, the absolute yields of extraction would no doubt be of much greater significance than the rate of yield as a percent of production. The absolute product surrendered per capita of farm population is a figure that can no doubt be estimated from historical sources for many areas of the world. So I have gone one step further to multiply the rate of extraction by the product per capita, and also divide that by the population minus the estimated number of landlords. The numerical results are given in Appendix G, continuing after the other tables of rate of rent, land rented out, and rate of extraction.

These results are also given in 3-D depiction in Datasets 9.1.5 A and B. The highest level of extraction per capita of farm population is 93 kg., for 425 kg. per capita, but there is a high level of extraction, 70 kg. and more, over a wide range of productivity. The result is still a wedge-shaped promontory, but it is flatter, more like a plateau on top. If seen from the back, it would be clearer that, like a spine extending from the point of the promontory, extraction per peasant remains very high for the 400, 425, and 450 kg. per capita slabs even at high and increasing levels of minimum landlord income. On the central area of this plateau, with product per capita mostly in the range of 325-500 kg. per capita, landlords are 7-10% of the total population, and extraction is mostly in the range of 70-80 kg. per capita of farm population, implying that the exploiting class might enjoy an average income of 630-1060 kg. per capita under these conditions. The gentle slope of the plateau suggests that from the perspective of the ruling class the

conditions of the peasantry might seem rather undifferentiated, with each peasant capable of yielding a fixed tribute.

Conceptualizing the agrarian society on this broad horizon, the socio-political arrangements that are necessary for these levels of production and extraction should also be envisioned. The range of production shown on this imaginary landscape indicates settled agriculture and socio-economic inequality that forces labor far in excess of the needs of the producer. For comparison, according to one field study swidden rice growers utilize at least ten times as much land in shifting rotation, and do not produce more than 400 kg. per capita of unhusked grain. They enjoy a high efficiency of labor and are not subject to exactions of rent or tax. Those who work harder do so as part of the life cycle of increasing and decreasing consumer/worker pressures. If labor is "hired" to help meet peak seasonal labor needs, it is paid about two days food for one day's work, which happens to be a figure in the range of that for hired labor in the Chinese data (M.R. Dove, 1984, pp. 99,101). In summary, it is not likely that more than about 450 kg. per capita would be produced without the pressure of state structures and enforced extraction.

Finally, it must not be forgotten that the imaginary landscape has been generated with several fixed parameters, some of which may be affected indirectly by the varying parameters. Notably, the minimum subsistence drives the demand for rented land, but if subsistence for the land-short population is partially met by agricultural labor, even agricultural labor that is highly exploited in some terms determined internal to the agricultural economy, then that decreased demand for subsistence must impact on the supply/demand negotiation with the external exploiters. This is the conclusion of data analysis to be found in Section 9.4, but the numerical result is too uncertain to be combined into the generation of the rate of extraction. But it seems likely that the whole landscape could be tilted downwards at the back somewhat, so that withholding land from the producers (i.e. a higher sufficiency threshold) would not result in higher rates of rent. Even without a neat wrap-up, it is satisfying to have isolated what seem to be the major parameters in determining the absolute rate of rent.

Two States of Equilibrium for the Agrarian Economy

Let us remember again from the analysis in Chapter 7 that the sufficiency threshold is strongly influenced by geographical conditions; it is higher both for hiring agricultural workers and for renting-out land where it is difficult to collect and ship out the surplus, e.g. where population is dispersed (see Datasets 7.4.6 A & B and 7.4.7). So such impediment to transport is a natural withholding of land from the land/labor market.

The most certain interpretation, while still speculative, is that the whole system of agrarian extraction can settle at one of two states, depending on population density. That is probably population density relative to resources more than absolute population density. We might envision in historical terms that at some point of increasing population density, the relations of production undergo rapid transformation before stabilizing on the other side, and both rentier population and rate of extraction from the countryside take a giant step up. It is not impossible that depopulation would reverse the shift. Of course product per capita and surplus per hectare would be likely to shift along with population density; and the path from one state to another may not always be the same path. But what I picture, in sum, is that the economic dynamics of maximization would pull the system to one state or the other, a lower or higher level of extraction under the particular conditions of product per capita.

By two states I do not mean the differences between the deficit and surplus maximizations, whose ramifications can be seen clearly in a great many aspects of the data, and which will be described in greater detail later. I mean regimes of different rates of surplus extraction, relative to the surplus available. These regimes also would incur difference in predominance in labor relations, hired labor versus tenant labor, due to population density; labor relations can be of either dominance regardless of level of productivity.

A Second-Stage Refinement for the Absolute Rate of Rent, Somewhat Tenative

The escarpments mapped in the 3-D graphs provide a rationale for why the social system might be pulled towards a bifurcation, rather than just falling as it may on positions following directly from population density and productivity. However, there are two possible interpretations for how the graphing of maximization may relate to the

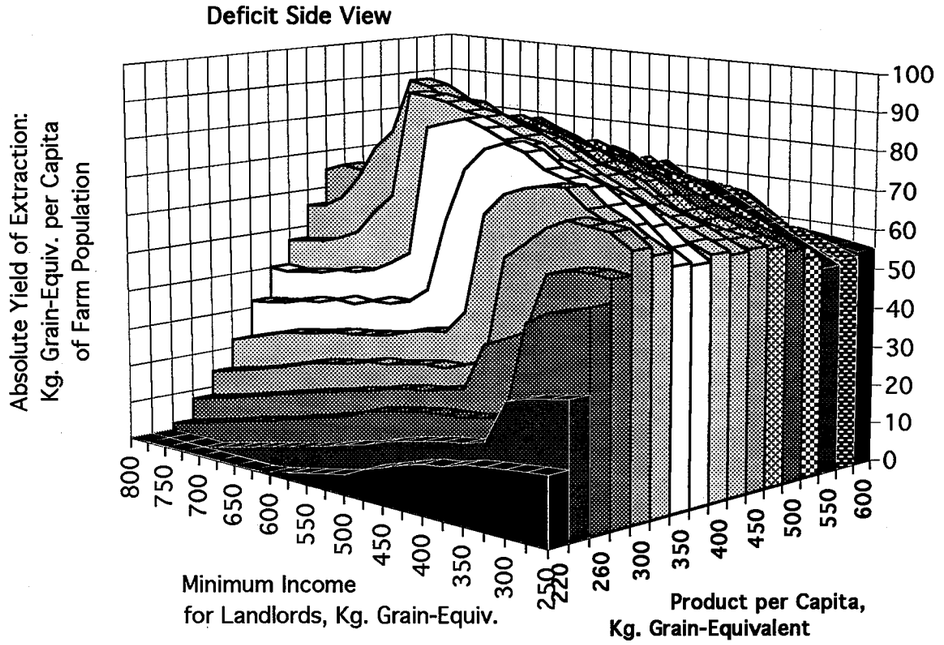
social stasis: either the system is drawn towards the ridge of maximum extraction, and falls on the major ridge at high population density and the secondary ridge at low population density — which might be understood as the power of the ruling class to enforce its interests — ; or the system is drawn towards the low points of extraction, and falls either on the slope in front of the ridge at high population densities and in the depression behind the ridge at low population densities.

My earlier assumption was that the maximization of the landlords, the first case, was the explanation. But looking again at the low rates of rent for the two lowest-product areas, which are only near to those in the deep trough on the deficit side of the mapping, I tend towards the latter explanation. That is, the rate of extraction tends towards minimization, in the interests of the renters, rather than towards maximization, in the interests of the landlords.

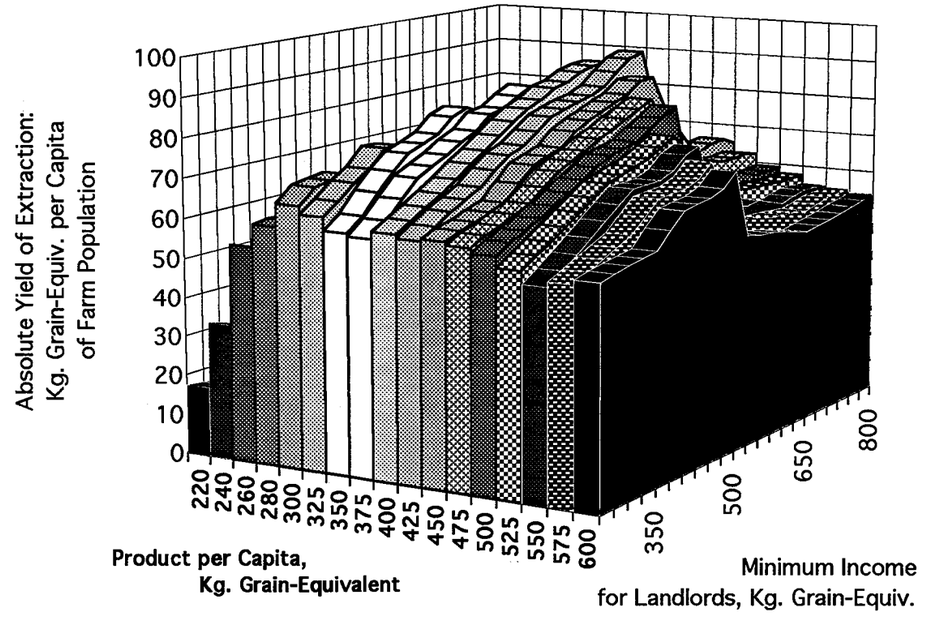
The land-short population on the deficit side of the massif is in dire straits. It tries to get as much rented land as possible to approach its subsistence needs (very little is available at such low productivity, but higher rents still bring out a little more), while stopping short of escalation to high rents. Their desperation recalls the adage that the only thing worse than being exploited is not being exploited. From the imaginary geography of Dataset 9.1.5 A and B, it seems inevitable that on the deficit side the equilibrium of the agrarian economy must hug the bottom of the cliffs, since that provides the point closest to subsistence for the producing population, and the rate of rent must rise as productivity rises. On the surplus side, the right side of the promontory, the terrain is not so rugged, and it would seem that the system could shift more easily between low-extraction and high-extraction states. To be consistent and continuous with the deficit-side solution, the gorge should be followed along to the surplus-side as well.

While admiting the tenativeness of the conclusion, I believe that the major trough of the rate of extraction topography provides the best prediction for the rate of absolute rent in a condition uninfluenced by population density. The prediction will be shown in Dataset 9.3.1 below, with the empirical data superimposed. This prediction is of course a generalization and an abstraction that is only a stepping stone to the analysis of the effect of population density. High population density would be expected to push the rate of extraction up onto the plateau.

Dataset 9.1.5 A Extraction in Grain per Capita of Farm Population, at Varying Productivity and Landlords' Minimum Income — Deficit Side View



Dataset 9.1.5 B — Surplus Side View



So much for exploration of the imaginary landscape of the rate of extraction of the whole agrarian society, an exploration that should give rise to many philosophical musings on the nature of social evolution. Comparison with the empirical data will commence below.

9.2 The Source of the Empirical Data on the Rate of Rent

The survey which is the source of the empirical data in this article is the much-quoted Buck survey of 16,786 farms in 168 localities scattered over the major agricultural regions of China, carried out in 1929-33. The published survey materials contain a wealth of data on farm operations, including crops, labor inputs, and land tenure, and also less thorough but useful information on marketing and population. The present research has gone beyond most treatments of this survey in completely recompiling the locality data, calculating product per capita and per land area, adjusting it for variation in labor input, estimating the distribution of landownership from aggregated farm size groups, etc., incurring over 6,000 data entries. This process is described in detail in Appendix E.

The data has been re-aggregated into the eight regions of agricultural production as distinguished in the original survey according to their major crop patterns. In addition the northeast region (Winter Wheat-Kaoliang Area) was divided into north and south for the rate of rent analysis.[98]

The agricultural rate of rent for each region was estimated by a calculation that is rather rough and prone to distortion. Its source is buried deep in the details of the Buck survey, to wit, a lengthy table in the oversize Statistics volume on allocation of each crop. The main categories of allocation are "human food", "sold", "rent", "seed", "animal feed", and "industry". These seem to promise rich studies of peasant self-sufficiency and market involvement, but so far only "rent" has been deeply analyzed in this research. Allocation of the crop as rent is probably only applicable to those who pay rent in kind, but this is also a point of some uncertainty. The calculation has been performed on the regional summary data from the survey, as follows:

1. Take percent of each crop that is paid in rent, and average through all crops, with weighting for the percent of crop acres occupied by each. Since there are generally

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98 At the time of that analysis (1989-90) I had not yet broken the large Yangtze valley region (Yangtze Rice-Wheat Area) into East and West areas, and so this chapter treats this as one area although Part Two gave data for East and West separately.

no more than five or six main crops which are surrendered as rent in each region, almost universally bulk staples, this average is not particularly problematic.

2. Divide by percent of land that is rented land, times percent of farmers who pay rent in kind. That is, the numerator is a measure of area, but one part of the divisor is a measure of population. This is of course problematic because it is not known what portion of rented land these farmers hold, whether they hold more or less than what is proportionate to their numbers. It is fortunate that in the North, where there is little rented land and so the numbers could more easily go astray, almost 70% of renters pay in kind. Some optimism must be employed to trust that in this large survey random deviations will cancel each other out.

The same calculations were done for locality data of the four North China regions, but it was found that the locality data would often yield implausible results. It appears that over the one-year accounting period of the survey, some renters paid rent more than once over, perhaps making up arrears, while other renters paid nothing. This is quite understandable given the chronic indebtedness of peasants and the uneven production of their farms. So a larger aggregation than the one hundred or so farms sampled in each locality is necessary to even out such vagaries.

Despite these doubts about the estimates of the rate of rent, they are extremely valuable and rare because they are based on an actual accounting of payment of the rent and of all farm production, not the contractual rate of rent. As discussed, contracts deal only with major crops. Moreover, as some studies have shown, quite commonly 25-30% of rent due is not paid, either due to landlord dispensations during crop failures and family tragedies, or to peasant resistance (Fei and Chang 1949, p. 75. Y. Muramatsu, 1959). According to a Land Committee study of 1650 farms scattered throughout Central and East China, an average of 18% of stipulated rents went unpaid (Brandt 1989, pp. 170-171). Finally, it is more useful to know the rent in grain than in cash, since this can be more immediately and reliably related to production and subsistence.

As far as confirmation for the estimated rate of rent goes, the patterns of land tenure and use — percent of land that is rented land, percent of labor performed by hired labor, size and distribution of holdings — allow a judgment on a range of plausibility, when seen though the medium of the model. This can be seen, for example, in Datasets 5.5.4 and 5.5.5 A and B, where land tenure patterns were generated for Winter Wheat-Kaoliang, North, and Yangtze Rice-Wheat Area, West, based on rates of rent estimated at 24% and

30% from the crop allocation data. The actual land tenure pattern closely resembled the theoretical prediction, though further refinements to the modelling could have been made.

Overall, I have fair confidence in the estimates of the rent, say within plus or minus two percentage points, especially for the areas where payment in kind is common. I believe that by the end of this chapter the reader will be amazed that what at one level of analysis appears to be a random deviation is at a further level of analysis found to be the logic of a cross-cutting effect. So although these rates of rent may not be precise, they are important guideposts for the theoretical solution of the determination of the rate of rent.

There are a number of input variables to the model of the determination of the rate of rent that have been used in previous chapters, but here will be further processed to accomodate the total picture of the social hierarchy.

The major adjustment to the product per capita for the farm population given in previous chapters is that an effort has been made to add back in portions of the population that would slip through a survey of farms. It would be desireable to have a separate accounting of agricultural laborers, but in the original survey long-term farm laborers were added into household members, though undoubtedly undercounted. No adjustment has been made here for agricultural laborers and others at the bottom of the social hierarchy, for one because the number of land-short population in the survey seems to mostly fit the theoretical prediction of landownership distribution with 42% displacement from equality (see Dataset 9.6.1).

However, a sizeable adjustment has been made for the estimated number of landlords. That is, in accordance with the assumption of the model that most rentiers do not themselves farm, the percent of land that is rented land has been taken as the basis for estimating the population of landlords, as was explained before in Chapter 7 (and illustrated in Dataset 7.4.4). That is, since the theoretical landownership distribution defines the whole range of ownership of agricultural land, then the populace of landlords can be known from the amount of rented land. For example, if rented land is 37% of the crop land, and the top 8.5% of owners would possess 37% of the land according to the standard landownership distribution generated by repeated partible inheritance, then that is assumed to be the number of the populace to be reincorporated. If product per capita for the farm population were 580 kg., then product per capita for the more

inclusive population is taken to be 531 kg. (580 x 0.915) with the 8.5% landlords added back in. This is a very simple adjustment, and one that could perhaps be improved by recourse to information outside the survey, but for now it has merely been applied consistently to the summary data for all the regions.

The second possible adjustment is a more obvious one. All of the grain produced cannot be consumed, or there will be no crop for the next year. We should take the net product, not the gross, as the basis for production and available subsistence. From the data on crop allocation in the Buck survey, 1-7% of the crop was reserved for seed. Previously for use in Chapter 6 (Note XX), non-labor costs of production were estimated at 9% for North China and 12% for South China on the basis of data in Buck 1931, Chinese Farm Economy. However, removing a certain percentage from product per capita to cover uncertain costs of production does not seem wise at this point, because the sufficiency threshold and other parameters have been gauged relative to ownership of total production. It should be considered then that 220 kg. per capita for minimum subsistence may be marginally adequate, even if seed is deducted, and that if ownership of land producing 450 kg. is the sufficiency threshold for some respite from physical labor, the income from that land is somewhat less than 450 kg.

The previous basic data on product per capita and population density and the adjustments to incorporate the absent population of landlords (as made before in Chapter 7) are given in Dataset 9.2.1 (Table). The estimated rate of rent is listed as well. These are the pieces of a three-dimensional Chinese puzzle that we are trying to assemble.

Dataset 9.2.1 Rate of Rent, Productivity, Population Density, and Minimum Landlord Income (Sufficiency Threshold)

			Min. Landlord Ownership & Income		
	Rented Land	Rate of Rent	Owned Rel. to Average	Owned in Kg./Capita	Income in Rents
Spring Wheat Area	9.5%	28%	5.95	1277	357.6
Winter Wheat-Millet Area	15.2%	25%	4.95	1380	345.1
Winter Wh-Kaoliang, South	13.7%	47%	5.18	1863	875.4
Winter Wh-Kaoliang, North	9.8%	24%	5.89	3469	832.7
Yangtze Rice-Wheat Area	37.2%	30%	2.57	1303	390.8
Rice-Tea Area	48.4%	42%	1.96	777	326.4
Double-Cropping Rice Area	54.9%	53%	1.65	660	349.6
Szechwan Rice Area	57.6%	39%	1.53	897	349.8
Southwestern Rice Area	29.5%	41%	3.03	1715	703.0

	Farm Population Only		Est.	Farmers & Landlords	
	Product /Capita	Persons /Hectare	Absentee Landlords	Product /Capita	Persons /Hectare
Spring Wheat Area	217.6	2.35	1.4%	214.6	2.38
Winter Wheat-Millet Area	285.6	3.92	2.4%	278.7	4.02
Winter Wh-Kaoliang, South	367.6	3.76	2.2%	359.5	3.84
Winter Wh-Kaoliang, North	597.8	2.32	1.4%	589.4	2.35
Yangtze Rice-Wheat Area	577.9	4.26	12.3%	506.8	4.86
Rice-Tea Area	461.8	5.92	14.0%	397.1	6.88
Double-Cropping Rice Area	486.1	6.62	17.5%	401.0	8.02
Szechwan Rice Area	723.8	5.38	19.0%	586.3	6.64
Southwestern Rice Area	605.4	6.99	6.5%	566.0	7.48

Notes: Ownership scale of landlords and number of landlords were estimated from amount of rented land under landownership distribution with 42% displacement from equality, as in Dataset 7.4.5. Rate of rent was estimated from crop allocation data in Buck 1937, Statistics Vol., beginning p. 229, and related tables.

The figures for sufficiency thresholds for renting-out land were derived from empirical data, though at a distance: the minimum scale of ownership for renting-out is known from the amount of rented land, and that is translated into kilograms of ownership through the adjusted product per capita. Then the rate of rent is applied to conclude what minimum level of income is obtained by landlords. Clearly this "empirical" data is some distance from the survey material; it is a view of the empirical focussed through the lens of the model.

The method of this research, especially the analysis of the rate of rent, calls upon a concept of research in the natural sciences: that we are dealing with a "black box" for which some of the inputs and the outputs are known, but the process cannot be directly

observed. It must be deduced from analysis of variations in the inputs and outputs — additionally confounded by the fact that the direction of causation among co-varying factors is much more difficult to establish in the social sciences. In fact mutual influences or over-determination is more to be expected. The process has been to establish the order of magnitude of a few of the many shifting and interacting parameters, and then use these as the anchor for analyzing the others. Gradually a coherent picture emerges, and after those major covariances are marked, more subtle subsidiary interactions can be detected.

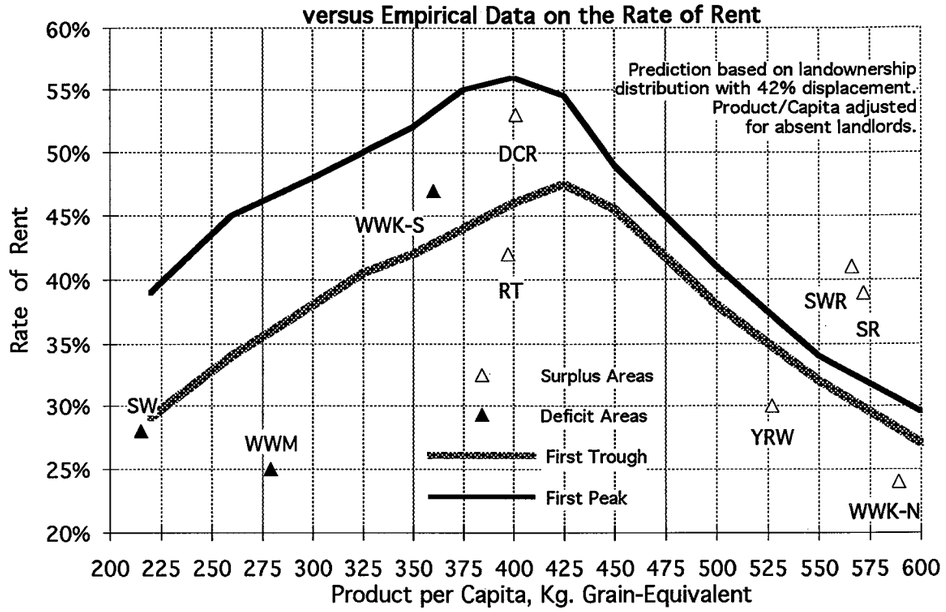
9.3 Comparison of the Theory of the Rate of Rent with Empirical Data

In Dataset 9.3.1 the empirical data points for the rate of rent are superimposed on the theoretical solution for the rate of rent by product per capita. Each data point is labelled with the initials of the area to which it refers. The black triangle markers represent deficit areas; the white triangle markers, surplus areas. This convention will be retained throughout this chapter. In previous chapters black squares represented North areas, and white squares South areas. In the current deficit/surplus distinction, only Winter Wheat-Kaoliang, North, out of the four North areas switches to categorization with the South areas, all of which are surplus.

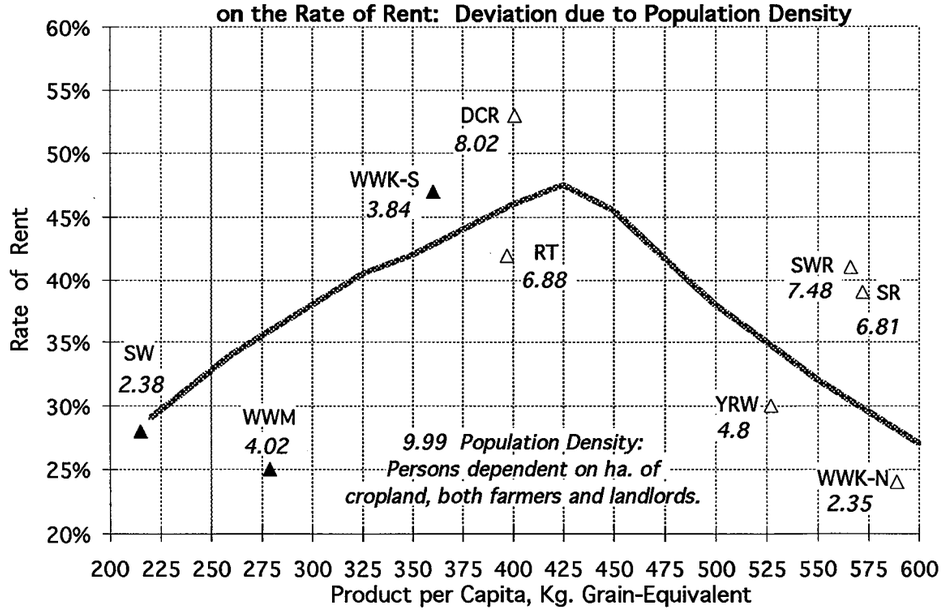
Dataset 9.3.1 shows that there is a rough parallel between the empirical rates of rent and the rates of rent in the folds of the second-stage solution of the rate of rent, considering both renters' maximization and a broad social interaction with the rate of extraction. The first-stage solution by just renter's maximization, given in Dataset 8.6.1, already provided an inverted "V", but the deficit side leg there was much higher, and the peak rents fell at 350 kg. per capita instead of 400-425 kg. per capita, i.e. the tip of the V was too far to the left. So the second stage solution provides a better parallel for the empirical data; and the trough rents are closer than the peak rents, so the trough can be accepted as the central prediction for the absolute rate of rent at a certain level of productivity. But there is still a third stage to come.

The theoretical solution here is of course one-dimensional, without adjustments for possible variation due to population density or differential profits for landowners in use of tenants versus hired labor. In Dataset 9.3.2 the data point mapping is repeated, but the points are also labelled with the adjusted population density (including all population dependent on the land's production, both farmers and landlords). The highest population density is in the center of the chart, at about 400 kg. per capita, with the Double-Cropping Rice Area. For the surplus areas, population density is lower and the rate of rent falls at higher productivities. But the areas above the line of predicted rents also have higher population density than those below the line at about the same level of productivity. There seems to be considerable discontinuity with the deficit areas in this respect. Winter Wheat-Kaoliang, South, the point closest to Double-Cropping Rice, has only half the population density, and the densest deficit area, Winter Wheat-Millet, falls

Dataset 9.3.1 Second-Stage Theoretical Prediction versus Empirical Data on the Rate of Rent



Dataset 9.3.2 Theoretical Prediction versus Empirical Data on the Rate of Rent: Deviation due to Population Density



a long ways below the line of prediction. This might engender a great deal of confusion; but all will be clarified by-and-by. First let us muse on a very large issue before we return to the creaking cogs and nattering numbers of the model.

A major proposition advanced in Section 9.1, just on the basis of the uneven topography of the rate of extraction, was that the agricultural economy would tend to bend towards two states, one with lower rates of extraction at low population density, and one with higher rates of extraction at high population density. The states are distinguished not by population density per se, but by the side of the ridge of the topography on which they fall; the ridge diagonally cut across a wide range of sufficiency thresholds. (This is not as mysterious as it seems, since the discontinuity simply reflects a slight "hump" in the landownership distribution that comes into play at different points depending on the average product per capita.)

In this section I wish to expeditiously present the signs that such a bending may be present in the empirical data. However, I will not deal with the effects of population density per se on the rate of rent and forms of the agrarian economy, which will call for a detailed analysis in Section 9.4.

There are several items of evidence for considering this proposition, items which are not fully consistent, but which are suggestive. First, review Dataset 7.4.7, graphing minimum scale of ownership for renting-out land versus population per hectare. The minimum scale for renting-out land decreases with increasing population density, but the slope is not an even one. Conceivably this could be a completely linear relationship, but instead it is bent towards a sharp dropoff at 4 persons per hectare. This reflects perhaps a changing balance in the conditions of renting-out that is not all directly due to population density. The same kind of sudden transition with population density is seen in some other charts as well, and may tell us more about the physical processes involved, e.g. the apparent limits on effort that can be put into transporting crops to market (Dataset 6.2.3).

Second, in the empirical data plotted in Dataset 9.3.2, all of the surplus-area points, at least, line up either a distance above or a distance below the line of theoretical prediction, and the distance is rather even between upper and lower points. Random error would scatter the points both near and far. As suggested by the population density numbers, the direction of offset is determined by lower or higher population density; but even at that, varying population density without some other gravitational force

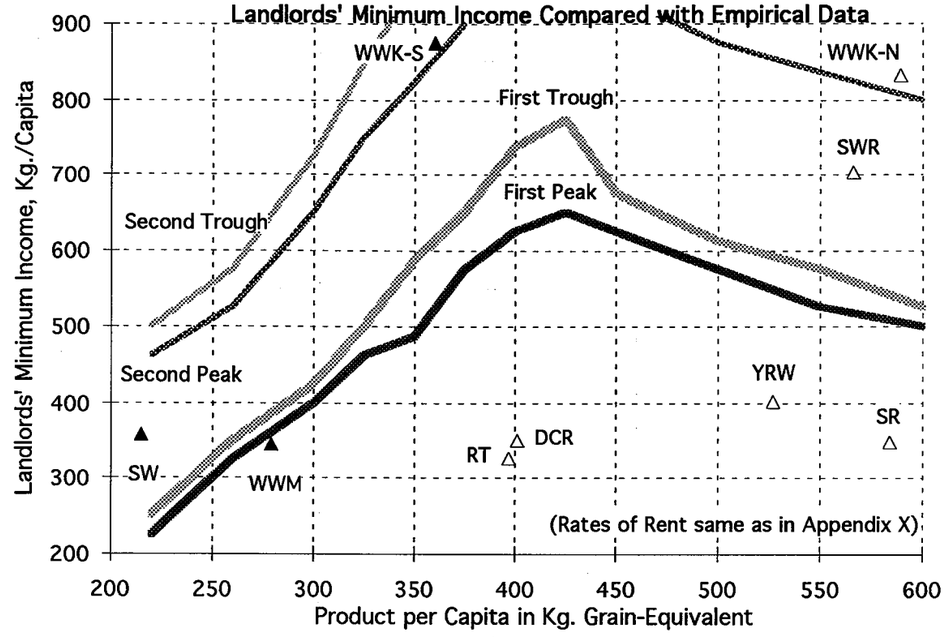
should not produce the appearance of data falling in two parallel lines. The relationship between population density and differential rates of rent in general is another matter, to be discussed in Section 9.4.

Third, the sufficiency thresholds for renting-out land for each area, given in Dataset 9.2.1, seem to have only two rough levels for minimum income for landlords, either about 350 kg., or about 800 kg. Of course 350 can be outside of and below the cliffs of maximum extraction on the left end of low productivity, while it is certainly well up on the plateau in the surplus range. In Dataset 9.3.3 these sufficiency thresholds are mapped against the troughs and peaks of the extraction topography, shown before in Dataset 9.1.3. It makes sense in terms of the wedge-shaped promontory that Winter Wheat-Kaoliang, South, with product per capita of only about 380 kg., would have to settle at a high sufficiency threshold for landlords — one which yields a very high rate of rent —, because the alternative would be a very low one, and the terrain in between the two alternatives seems nearly impassable. On the other hand, it is perhaps not a contradiction that Winter Wheat-Millet has a lower sufficiency threshold with higher population density than Spring Wheat, despite slightly higher productivity; WWM falls on the south side of the crest, which is not so high at that low product per capita. It is also consistent, as will be seen in Section 9.4, that WWM has a rate of rent that is unexpectedly low.

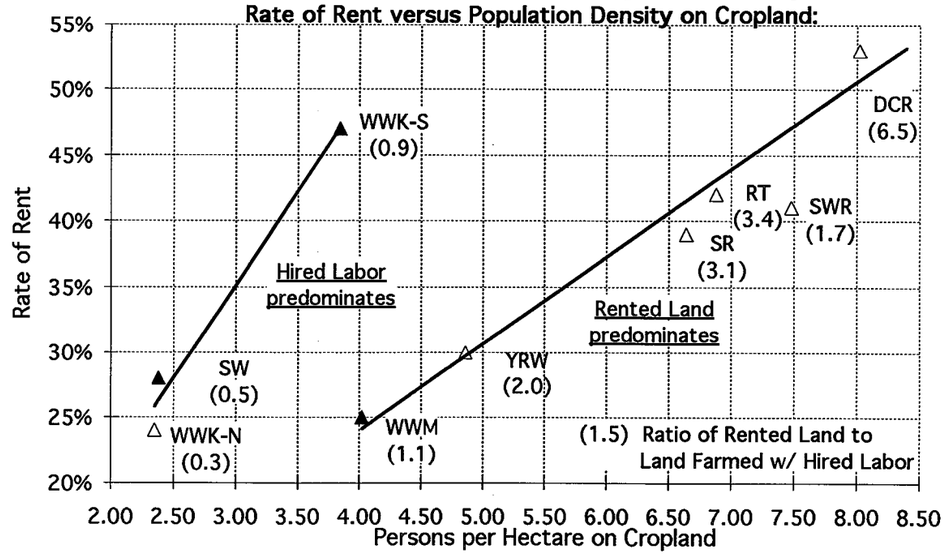
Fourth, the best evidence for bending of the agricultural economy towards two shapes is in a simple plot of rate of rent versus population density on the cropland, Dataset 9.3.4. There seem to be two parallel lines, one at overall lower population density in which land farmed by hired labor predominates over rented land, and one at overall higher population density in which rented land predominates over land farmed by hired labor. A surplus area, Winter Wheat-Kaoliang, North, is on the lower-density line, and a deficit area, Winter Wheat-Millet, is on the upper-density line. So the gap between the two parallel lines is not due to the oppositions between surplus and deficit effects that will be seen several times over in Section 9.4. Within each series rent increases with population density, and the ratio of rented land to land farmed with hired labor increases as well. But it is the offset that is seen here as the sign of a shift between states.

These four items are not conceptually consistent or very convincing evidence, but they suggest an intriguing discontinuity in social forms. They imply a nonlinear interaction

Dataset 9.3.3 Theoretical Rate of Rent at Varying Landlords' Minimum Income Compared with Empirical Data



Dataset 9.3.4 Two States of Agrarian Economy: Rate of Rent versus Population Density on Cropland:



that can only very clumsily be modelled through multiple linear regression techniques.[99] I do not dare claim that the imaginary topography of extraction that I have created is the particular answer, but it is plausible that some such structure of economic interaction could be posited from theoretical deliberations and tested with modern anthropological techniques such as estimating population and agricultural productivity in past centuries through aerial photography and satellite sensing of buried sediments and structures.

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99 In my 1990 ms. "The Economics of Social Stratification in an Agrarian Society: Landownership Distribution, Land Tenure, and the Rate of Rent", I did match empirical and predicted sufficiency thresholds and population density in the rate of rent solution to a significant degree, using multiple regression, but that provided little more explanation than the disembodied coefficients themselves. In this revision of the manuscript for dissertation Chapters 7-10, I have avoided multiple linear regression for the most part. Dealing with abstract factors and automatically-generated coefficients increases the danger that mathematical relationships without a basis in physical analogy will be introduced into the model. Some aspects, such as the effect of the friction of transport and population density, seem to call for empirical discovery through statistical techniques, rather than modelling; in Appendix H the coefficients for the effect of population density on cropland and over the gross area are given, as computed in the previous manuscript, since these may be of use for comparing with other surveys. But I think that a higher-level explanatory model should be constructed to integrate more of the relationships that have been found in this research, and I believe that it can be constructed, even just on the basis of the data presented in this thesis, by someone with higher mathematical capabilities than myself.

9.4 Land/Labor Relations and Rents in the Context of Geography

Chapter 8 has expounded a logic for the determination of the absolute rate of rent. This logic takes as its starting point the four inputs 1) a particular distribution of land ownership, 2) the average product per capita, 3) a sufficiency threshold beyond which physical labor is avoided, and 4) a level of minimum subsistence. The last two are fixed in their position on the landownership distribution by the average product per capita, which is the foundation of the whole dynamic. So subsistence and sufficiency can be directly translated into the amount of land units (relative to the average) that they are produced from. In the abstract these four factors are adequate to yield the rate of rent that is the outcome of the land/labor market, and the amount of land that is rented out. This is a relatively straightforward, if time-consuming.

But now it is time to lay this logic upon a varying landscape, one in which transfer of the surplus means a physical transport of produce and goods. Here the working out of this logic, which is non-linear and discontinuous in the first place, drives currents and counter-currents of social and economic processes whose variegated manifestations in land tenure patterns, intensification by size of farm, labor forms and demographic processes would never yield to positivist or purely numerical analysis.

Aside from the above-mentioned four factors, the major factor that has been seen in previous chapters to influence land tenure patterns is population density. Population density is of course a simplified and unified measure for a myriad of physical conditions that facilitate or impede the collection and extraction of surplus, a.k.a. the marketing of crops. At the least population density can be differentiated into two kinds from the Buck data compilations: population density on the cropland, and the density of cropland over the gross area. We will deal with both of these, but for now the concern is with a more general issue.

It has long been observed that agricultural rents are higher where population is denser. There have been several models of differential rent formulated to explain this, based on land fertility or on costs of transport (Ricardo and von Thunen respectively, summarized in Chisholm 1962, pp. 22-28), and on the marginal productivity of labor and land. By differential land fertility or costs of transport, land which is more fertile

or which is closer to market yields a rent which is the differential in production on less fertile land, or the differential which is saved by minimizing transport costs.

The marginal productivity model is that most prevalent in neo-classical economics. That model is based on the output resulting from varying inputs, i.e. production functions, with the expectation that prices, including rents and wages, should reflect the relative productivity of the input factors. For China, the model has been developed by Kang Chao (1986), and data from the Buck survey has been tested for marginal productivity of land and labor by Wiens (1982) and by Brandt (1989). Wiens says

> In the past twenty years, a considerable body of literature has grown up with relevance to any attempt to explain the determinants of the distribution of income in "overpopulated" agrarian economies. Most of this literature has naturally centered around the issue of to what extent the marginal productivity theory of distribution, developed for modern, industrialized societies, holds also in such agrarian economies. The discussants can be sharply divided into those who hold that the marginal productivity theory applies without amendment and those who allege that, because the marginal productivity of labor in such economies is observedly below subsistence and quite probably zero, this theory cannot adequately explain returns to labor which are greater than subsistence. (Wiens 1982, p. 12)

In his conclusion, Wiens seems to make only a very qualified affirmation of marginal productivity theories, noting difficulty in finding the conditions for a tradeoff of labor and capital. Brandt, also applying production function analysis to the Buck data, says "The farm-level survey data for North China helps explain why there is no tendency for land productivity to decline with increasing farm size" (Brandt 1989, p. 169).[100] However, there are occasional signs in the Buck survey of slightly decreased labor input on large farms; and the marginal productivity argument for rents may still be valid even if it is hard to find data to test it. So I wish to examine this alternative model of marginal productivity before proceeding to further develop the model of the absolute rate of rent based on alienation from ownership.

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100 Common to the marginal productivity proclivity to assume that equalization of returns to factors of production must mean equalization of incomes, Brandt says, among other similar statements, "If land rents remained the same percentage of output, land and labor would have shared equally in the increase in incomes associated with rising farm output" (Brandt 1989, p. 170). In his production function analysis (p. 160), Brandt does not distinguish family labor from hired labor. This obfuscating of class relations and inequalities is typical of marginal productivity analysis, although it seems quite possible to apply marginal productivity analysis within a framework of inequality as well.

The Marginal Productivity Version of the Association between High Population Density and High Rents

An association between population density and high rents has frequently been described in economics literature. The common explanation for this is the marginal productivity argument, as propounded by Kang Chao (1982, 1986) and also supported by examination of historical sources. The theory is that increasing population means less land is available per laborer, and even intensification of cultivation cannot maintain levels of product per laborer. There is a decreasing return to additional inputs of labor on the same land. So the factor contribution of land becomes higher relative to the factor contribution of labor, and it is this differential that yields a high rate of rent to the landowner.

This reasoning can be clarified with an example. I have set the numbers in this example to conform to the mid-range of product per hectare and per capita in the Buck survey data. The marginal product of labor decreases only very gradually. Dataset 9.4.1 depicts a curve in which marginal productivity of labor decreases as population density increases. The marginal product of labor drops to subsistence at about 7.5 persons per hectare, at which point average product per capita is about 400 kg. From this curve, the following table of production in kilograms of grain-equivalent can be presented:

Two persons on one hectare	Two persons on two hectares	Difference
1086 kg. total	1116 kg. total	30 kg. total
543 kg./capita	558 kg./capita	15 kg./capita
Eight persons on one hectare	**Eight persons on two hectares**	**Difference**
3176 kg. total	4040 kg. total	864 kg.
397 kg./capita	505 kg./capita	108 kg./capita

Let us assume that the two groups of people in these two cases are each households, with two and eight persons respectively, and they each have ownership of the first hectare. It would be advantageous for them to rent the second hectare, as long as the rate of rent is at least a little lower than the additional product they enjoy by farming it. Then the ceiling on the rate of rent for the additional hectare, as a portion of the product of that hectare, is:

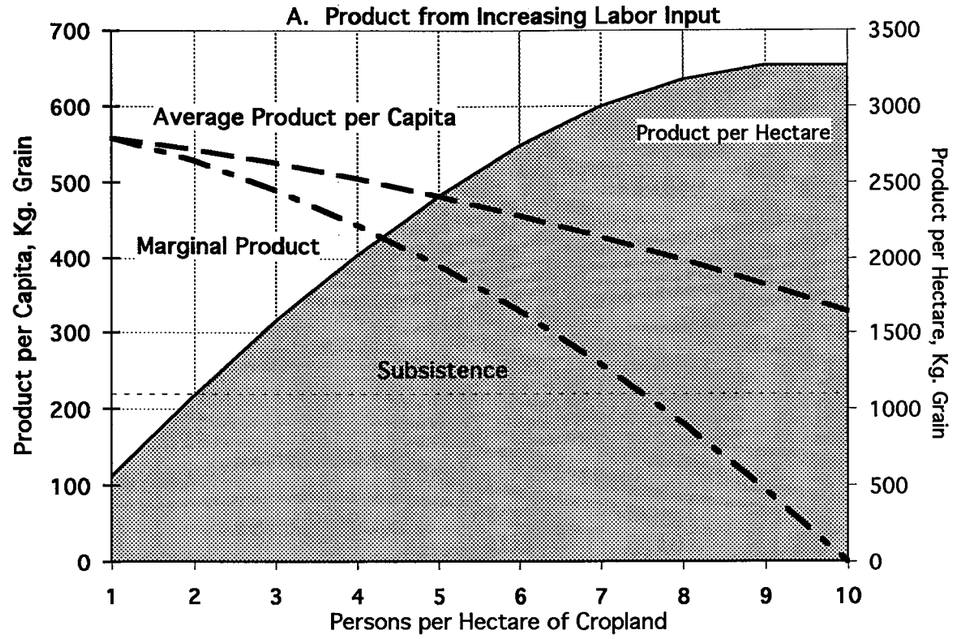
Two persons on two ha.		Eight persons on two ha.
30 / 558 = 5.4%	and	864 / 2020 = 42.8%

That is, rent is higher, the denser the population and the lower the marginal productivity of labor. This example confirms the direction of the relationship. In Dataset 9.4.1 A,B and C I have inset small graphs of the rate of rent by population density and by product per capita. When the marginal product equals subsistence (220 kg.) and average product is 400 kg., the rate of rent is 42%, close to that of the model of the absolute rate of rent. But at higher levels of product per capita, the marginal productivity rents fall off much faster. The main divergence is that for the marginal productivity model rents still rise as product per capita falls below 400 kg. Marginal productivity is zero in this example at ten persons per hectare, where product per capita is 330; the rate of rent is supposed to be over 60%. The absolute rent model predicts about 40% for this low productivity case.

The marginal productivity argument diametrically contradicts the argument that rent equals surplus, which proposes that rents should increase as product per capita increases. This direction of change is indeed the case in the absolute rent model when supply of rented land falls short of demand, but even then rent is not the same as surplus. The marginal productivity explanation does not address subsistence requirements and the capacity to pay rent, except to conclude, as Kang Chao does, that labor will be pressed by Malthusian pressures to work for wages less than subsistence. It is a schematic explanation that gives a rationale for increasing rents, but does not come to a solution of the land/labor market.

But on the surface, the marginal productivity explanation is supported by the preceding chart of population density on cropland versus rate of rent (Dataset 9.3.4). The points may be divided between regions where rented land predominates over land farmed with hired labor (see Table 4 for data source), and regions where land farmed with hired labor predominates; this bifurcation is of course not explained by the marginal productivity argument. But the relationship holds for each. And under either situation the ratio of rented land to land farmed with hired labor increases with population density, also appearing to confirm the Malthusian analysis of Kang Chao that intensification of cultivation renders renting-out more profitable. However, knowing more as we do about productivity in each area, the marginal productivity explanation cannot be accepted without reservation. The low-rent areas include both those that have

Dataset 9.4.1 Model of Marginal Productivity of Labor and Rate of Rent



high product per capita with a relatively lower burden of population (Winter Wheat-Kaoliang, North; Yangtze Rice-Wheat Area) and those where the population is relatively dispersed but hard-pressed to survive (Spring Wheat Area, Winter Wheat-Millet Area). This does not accord with the single direction of causality of the marginal productivity explanation.

Marginal productivity of labor on land has not been incorporated into the model of the solution for the absolute rate of rent, which deals expressly with the demand and supply of rented land at a constant level of production. In dealing with the issue of landownership concentration in this research the data on land productivity has been controlled for intensification as much as possible. This integration might be desireable over the long run, in that the effect of intensification on small farms might be to decrease demand for rented land, and the effect of less labor input on large farms might be to shift the sufficiency threshold upward, a refinement of modelling that would not however be expected to change the overall results. Computationally it would not be easy to do so, but it is not intractable. My opinion is that marginal productivity cannot account for as much of the rate of rent as does alienation from ownership, i.e. the absolute forces that coerce payment of rent due to subsistence needs of a large land-short population.

Population Density and the Determination of the Absolute Rate of Rent

The previous discussion of the abstract model of the determination of the absolute rate of rent treated extracted product as if it flowed with no friction, that owners of property could realize the full rent that was surrendered by the tenants. In fact, this neglect of transport friction seemed to work well enough in predicting land rented out for areas of the survey where population density on the cropland exceeded about five persons per hectare, a very dense population. But overland bulk transport is notoriously costly and insecure in pre-industrial societies; water transport is generally a requisite for a major concentration of agricultural surplus. Discussing the range of state power in ancient times, J. Hall and G. Ikenberry comment that "a bullock pulling a cart of grain would eat its load within a hundred miles" (Hall and Ikenberry 1989, p. 23.). Whereas much of South China, and in particular the middle Yangtze provinces, was criss-crossed by waterways, North China lacked water transport over most of its area. According to

R.H. Tawney, in China the cost of transporting grain 50 miles often exceeded the cost of the grain where it was grown (Tawney 1932, pp. 55-56.).

These are reasons why, as was explored in Chapters 5 and 7, it was less practicable for landlords to remove the surplus from the agricultural sector and market it to town and city if population was dispersed or other impediments to transport were present.

Review again Dataset 9.3.2, the observed rate of rent against product per capita. Dataset 9.3.2 shows the population density on cropland shown in parentheses next to each point of empirical data. As before, each data point is labelled with the initials of the name of the region to which it refers. Product per capita is the outcome of several factors: fertility of the land, water supply, length of the growing season, land per capita and labor input. The three regions with lowest product per capita (under 400 kg. per capita) and a large impoverished population are the northern areas, Spring Wheat, Winter Wheat-Millet, and Winter Wheat-Kaoliang, South. These are the areas where the land-short cannot survive through renting alone. Only Winter Wheat-Kaoliang, North, with some land newly opened in the early 1900's, has a population sparse for its land productivity. The southern areas generally enjoy higher product per capita, though it seems to have been driven down by overpopulation in the Double-Cropping Rice and Rice-Tea regions. By the previous analysis, rented land is sufficient to meet the needs of the land-short in these areas.

But next the reader should focus on the deviation of the data points from the theoretical prediction, and note also the population densities relative to those nearby. For the surplus areas (400 kg. per capita or greater), the regions with higher population density have higher rates of rent than expected. For the deficit areas, there is a hint that the relationship may be reversed; the area with the highest population density in the north (Winter Wheat-Millet) has the lowest rate of rent. This is a slim clue, but it has still led the way to discovery of the possible logic of such a reversal.

This figure in fact contains in a nutshell the indirect effect of population density that is inherent in the model of the determination of the rate of rent and will be demonstrated. For surplus areas, increased population density at same product per capita raises rents; for deficit areas, increased population density lowers rents. It will, however, take somewhat of a roundabout journey to arrive at this conclusion, and more distant deductions to substantiate it.

Alternative Sources of Subsistence, Demand for Rented Land, and the Rate of Rent

When our conceptualization of the agrarian economy moves back towards the complexities of the observables, and land/labor relations are differentiated between managerial farmer/agricultural laborer and landlord/tenant, we cannot reach such grand and determinative vistas as seen in Section 9.1. For one, there seems to be some dynamic tension between the two kinds of land/labor relations, no doubt through the mechanism of wage levels as seen in Chapter 6 and 7, but the equilibrium is not yet predictable. Consider that if, under conditions of sparse population, absentee landlords require a very high income to achieve town residence, and so there are few of them and little land rented out, then there is, conversely, a great number of managerial farmers farming with hired labor.

Dataset 9.4.2, to be presented below, gives some information about the nine regions we are studying, in presentation for comparison with theoretical predictions. Dataset 9.4.3 summarizes the shifting levels expected for sufficiency thresholds for hiring-in labor and renting-out land, as population increases. This is for an abstracted constant productivity of 375 kg., an average case. The curves were generated from the results of multiple linear regression on the empirical data, including in the factors population density on cropland, density of cropland over the gross area, and several factors designed to mimic a tendency of rents towards the level of maximum extraction. The hire threshold represents the level of ownership at which hired labor begins to replace family labor of the owner; the rent-out threshold is the minimum rental income for landlords, not their landholdings. The precise numbers are not important, but the overall pattern is. A little past the density of four persons per hectare, there is a rapid transition towards very low minimum income for landlords, i.e. a great deal of land is rented out. Then the hire threshold even rises above the rent-out threshold of income (although the absolute level of ownership is still higher for landlords than for managerial farmers, because they only receive part of the product of their land, depending on the rate of rent), due to rise in wages. Below four persons per hectare in population density, there is a wide margin for landholdings to be farmed by hired labor; we have seen in the Winter Wheat-Kaoliang Area, North, that over 30% of farms had hired adult male year laborers.

The question might be asked then, what is the effect of the prevalence of wage labor on the rate of rent. We may recall the statement of J. Ghosh (1985, p. 78), quoted at greater length in the beginning of Chapter 8, that "Some of the essential features of peasant rents are thus: a direct positive relationship with relative population pressure, a negative association with wages and the demand for rural labour..."

This is particularly notable at high levels of productivity, where the total amount of land farmed by others is predictably high. The prototypical case is the Winter Wheat-Kaoliang Area, North. Then large numbers of the land-short can take up this labor, and it provides a portion of their subsistence. Moreover, since less of the surplus extracted by managerial farmers leaves the countryside, and more circulates within the countryside in payment for personal services, non-agricultural labor, and craft goods, other income may also be available to the land-short population. The complementary outcome might be that their dependence on rented land for subsistence decreases, and this might affect rents. How much that might be so is a matter for empirical inquiry.

We saw in Section 9.1 that withdrawing land from the land/labor market under an abstracted unitary form of labor exploitation — as if the ruling class chose to squeeze the land-short population through their oligopoly on land — tended to raise the rate of rent, though unevenly. Population dispersion creates a natural withdrawal of land from the rental market, because of difficulty and cost of transport of the surplus (raising necessary minimum income for landlords), and it might seem destined to have the same effect. But if there is then more alternative subsistence for the land-short population as a side-effect, the proposed increase in rents might be stymied or even pushed in the opposite direction. Only the interplay of the two forces can yield the answer.

The basic model of the determination of the rate of rent took as a basic postulate that there is a minimal level of demand for rented land determined by physiological needs for subsistence, and that this defines the inescapable demand of the land-short population. However, in introducing the matter of extensive use of hired labor, it may be seen that this basic equation may also be changed. Hiring of labor is part of the market between land and labor, and can provide part of the subsistence of the land-short population. Secondly, as considered when the model of the determination of the rate of rent was first constructed, it is possible that if renting land can yield a surplus for the tiller, the demand for it may expand beyond those who are pressed by subsistence. Just as in the previous section the sufficiency threshold which determines the supply of rented land

was questioned and subjected to empirical analysis, here the demand parameter is re-examined. The significance of this is that the level of demand, like the supply, influences the solution for the rate of rent.

In the data dealt with here so far there is no immediate way to estimate what portion of production is transferred in wages to hired labor, and what fraction of subsistence that may provide to the land-short. Chapter 6 has only provided indirect measures and some plausibility for the idea of the variation in secondary circulation of the surplus, depending on the relations of production.

Now, however, it is possible to push the model of the rate of rent to still another stage in attempting to mimic the empirical data and account for alternative income, by asking what would be the effect of varying the "subsistence" parameter while unrelated inputs are kept constant? If the demand level is not fixed at minimal subsistence, 220 kg. of grain per capita per annum, but may be set greater or lesser, then the percent of population in the demand pool, the land they own, and the amount of rented land they demand slides with it in the model. The landownership distribution, the product per capita, and the sufficiency threshold are of course independent inputs for the model and need not vary. But the outcome of the solution for the rate of rent is affected. If this adjustment in the subsistence level input is made, it cannot then be assumed that only subsistence is represented in the demand, but for the sake of continuity and as a reminder that this serves to define demand in the same way as the minimum subsistence originally set in the model, I will dub this parameter the "subsistence demand".

We can experiment within the model to find just what level of supposed subsistence demand can generate precisely the observed rate of rent at the observed product per capita, with the requirement also that the observed amount of rented land must be matched (and so also the minimum scale of landownership for rentiers). Though the model can be stretched this way and that through its many inputs,[101] these stipulations

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101 The match can only be achieved by setting the landownership distribution slightly lower in inequality than the 42% displacement that seems to match in most other respects. A further test of the empirical landownership distributions in the areas will be seen in Chapter 10. Only the Szechwan Rice Area seems somewhat higher in inequality, and the Southwest Rice Area much lower, i.e. about 49% and 30% displacement respectively. The fact that the match for "subsistence demand" requires a lower inequality setting on the model may reflect the effects of greater intensity of farming on small holdings and higher on large holdings, or that there are other neglected factors or adjustments that affect the outcome, such as the cost of production.

together leave in fact a very small range of possible answers. So the subsistence demand measure indirectly gauges how much and in what direction the observed rate of rent differs from the prediction of the model in the first stage of renters' optimization.

Dataset 9.4.2 gives the resulting numbers for subsistence demand and for some other measures that will be used later. The subsistence demand numbers are obviously rough ones, because so many estimations have been involved along the way, notably the looseness of the rate of rent estimate. Still, in the following charts the subsistence demand measure seems to tell us a great deal.

The subsistence demand numbers cluster in the range of 220-260 kg. per capita for most of the areas, which is close to the minimum subsistence of 220 kg. But these are also areas that have a fair amount of hired labor. For the Double-Cropping Rice Area, where hired labor is minimal, subsistence demand is over 300 kg.; we will discuss this higher end later.

Dataset 9.4.2 Land-Short Population, Relative Share of Rented Land, Subsistence Demand, and Subsistence from Owned and Rented Land

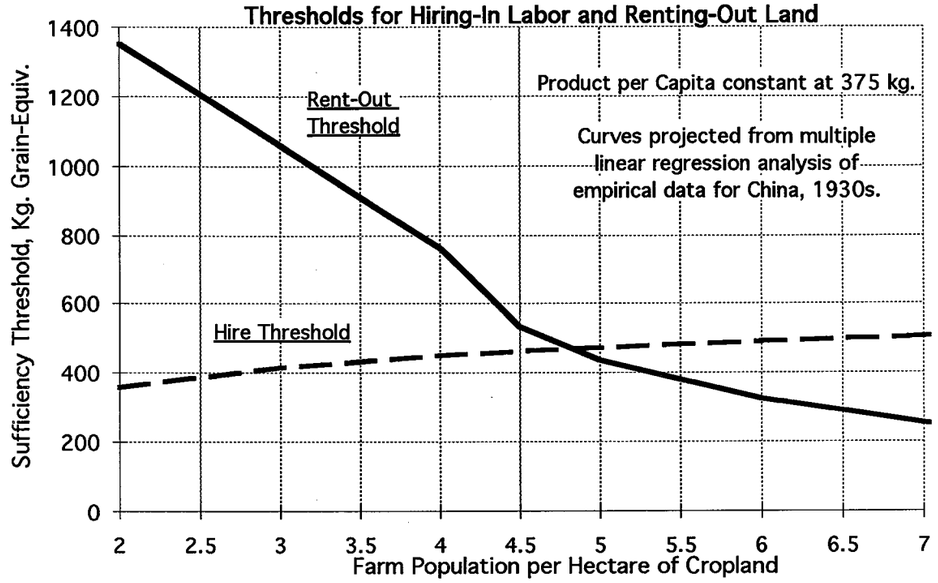
	Land-Short Population		Land-Short Total Farm Holdings		
	as % of Farm Population	as % of All Pop	Owned Land	Rented Land	Share of Rented Land
Spring Wheat Area	67.2%	71.8%	41.6%	7.1%	1.11
Winter Wheat-Millet Area	57.6%	60.4%	25.9%	10.7%	1.22
Winter Wh-Kaoliang, South	46.9%	50.7%	16.8%	5.9%	0.92
Winter Wh-Kaoliang, North	17.9%	26.8%	5.2%	1.2%	0.68
Yangtze Rice-Wheat Area	40.4%	41.0%	8.5%	11.0%	0.73
Rice-Tea Area	57.7%	54.3%	17.0%	26.5%	0.95
Double-Cropping Rice Area	51.1%	45.7%	11.4%	41.0%	1.46
Szechwan Rice Area	54.7%	50.7%	8.8%	28.2%	0.90
Southwestern Rice Area	11.9%	16.0%	3.3%	3.4%	0.97

	Income Less Rent for Land-Short Farm Population from Own Farm Holdings			"Subsistence Demand" to Match Rent
	Own Land	Rented Land	Total	
Spring Wheat Area	121	15	136	260
Winter Wheat-Millet Area	115	36	151	320
Winter Wh-Kaoliang, South	118	22	140	220
Winter Wh-Kaoliang, North	156	27	183	95
Yangtze Rice-Wheat Area	110	100	210	235
Rice-Tea Area	125	113	238	260
Double-Cropping Rice Area	100	169	268	308
Szechwan Rice Area	107	209	316	450
Southwestern Rice Area	154	94	248	230

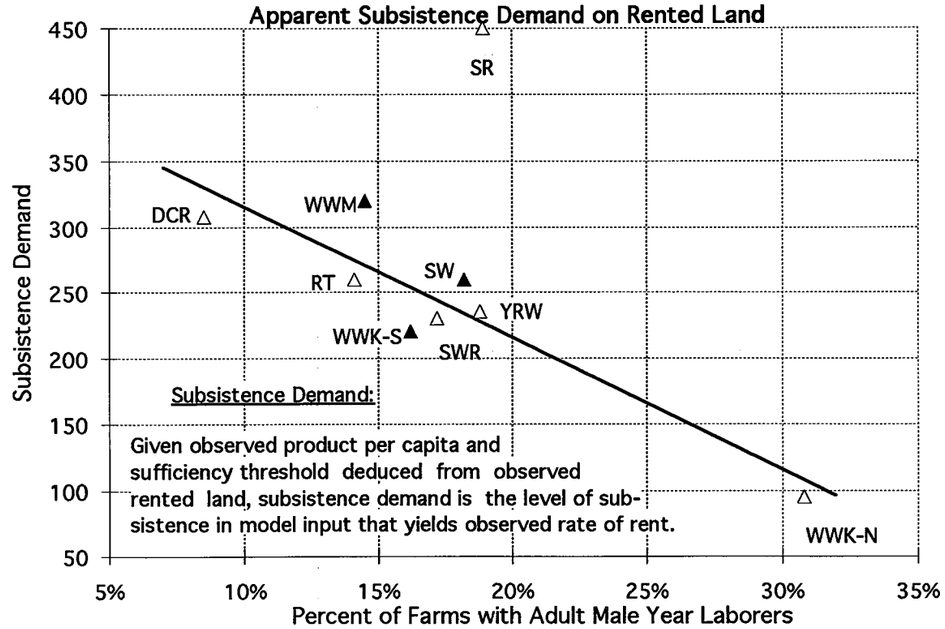
Notes: Land-Short Farm Population was calculated from Buck survey farm size group data; the land-short are those whose landownership falls short of subsistence at 220 kg. per capita. Land-Short as percent of all population includes consideration of absentee landlords and includes agricultural laborers, estimated as 0.3 x % Farms with Adult Male Hired Labor. Subsistence demand is subsistence input to model that matches empirical rent,when sufficiency threshold is also based on empirical estimate; see text.

Overall, these figures are consistent with the hypothesis that subsistence demand on rented land is alleviated when agricultural wage labor is widely available. Dataset 9.4.4 shows a clear negative relationship between the prevalence of hired labor, as indicated by the percent of farms having adult male year-laborers, and the measure of subsistence demand. The only region which falls out of the pattern is the Szechwan Rice Area, where the large surplus retained by renters stimulates the greatest demand both for the rented land and for labor to be applied to it. However, the Szechwan Rice Area is not far out of line on several other charts coming up below (Datasets 9.5.1 and 9.5.2), suggesting that it is not the subsistence demand measure that is the problem there, but the extensive use

Dataset 9.4.3 The Effect of Population Density on Sufficiency Thresholds for Hiring-In Labor and Renting-Out Land



Dataset 9.4.4 Prevalence of Hired Labor versus Apparent Subsistence Demand on Rented Land



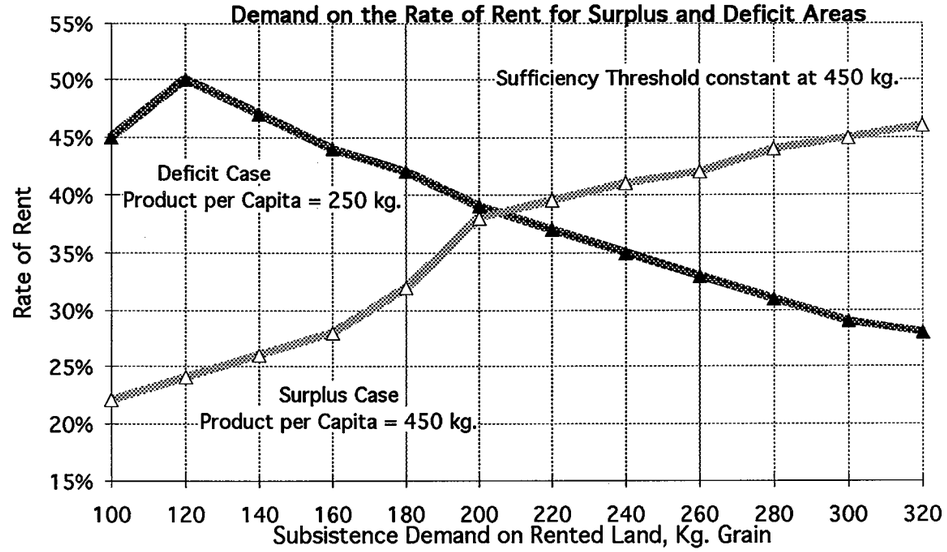
of hired labor on rented land (57.6% of land is rented land). Other than that, Dataset 9.4.4 tells us that there is more hired labor present than expected in the impoverished Spring Wheat and Winter Wheat-Millet Areas, but it does not resolve the subsistence demand, something we could already guess from the very low wages in those areas.

Given then that the prevalence of hired labor alleviates subsistence demand (although to what precise degree may be subject to several intermediate conditions, wages among them), we must pursue the next question, what is the effect of subsistence demand on the rate of rent.

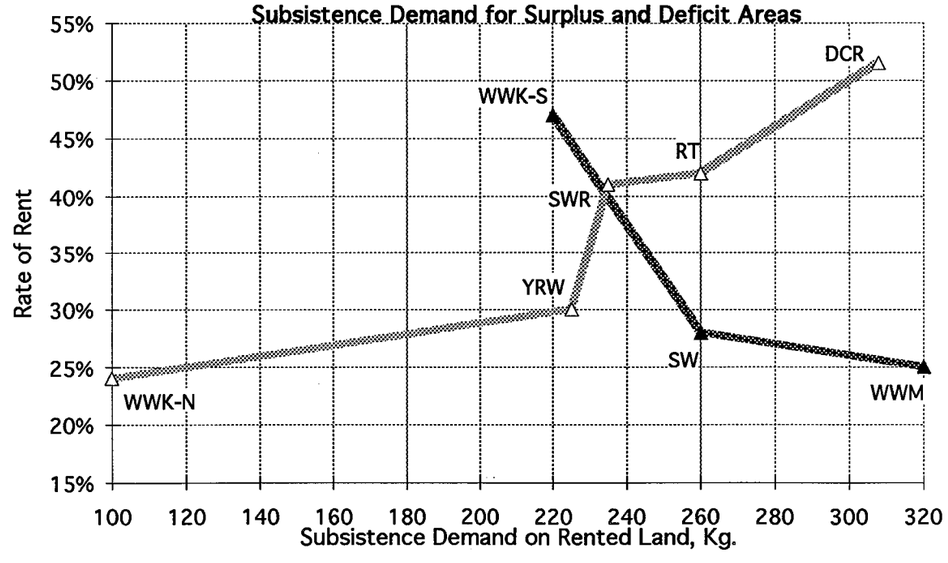
The theoretical answer to this question of demand is both complex and intriguing. This is illustrated in Dataset 9.4.5 with data generated from the first-stage model. For the more common case of product per capita to the right of the boundary line between deficit and surplus condition, worked out for 450 kg. per capita in the example, the lower the subsistence demand per capita, the lower the solution for the rate of rent. But for the deficit case, 250 kg. per capita in the example, the lower the "subsistence" demand per capita, the higher the solution for the rate of rent. This surprising effect is merely the outcome of the different forms of maximization in the model, under the surplus and deficit conditions. The sufficiency threshold for landlords remains constant. The two lines cross at 200-220 kg. in subsistence demand.

The theoretical answer is not easy to comprehend in physical terms, but it might be explained this way. Even small changes in the subsistence level input to the model have large repercussions in the percent of population that is land-short, and the amount of rented land they need under any particular rate of rent. For the surplus areas, decreasing demand (RS) lowers the level to which renters are willing to press maximum exertion, and lowers the rate of rent, which is easy to see. But for the deficit areas (where the fact that about 60% of the population is land-short magnifies the effect), lowering subsistence needs (RS) means that the land-short population has a greater surplus that can be expropriated, and more, due to their continuing desperation. This is the same effect as the increasing rates of rent seen over the low range of product per capita, 220 to nearly 400 kg. per capita. In other words, if the poor souls are given more work as "bare stick" laborers, they can be made to pay more rent for a paltry plot, and still survive. That approach does not work, however, for the well-fed tenants of the surplus areas.

Dataset 9.4.5 The Theoretical Effect of Subsistence Demand on the Rate of Rent for Surplus and Deficit Areas



Dataset 9.4.6 Observed Rate of Rent versus Apparent Subsistence Demand for Surplus and Deficit Areas



This mechanism of the model parallels the apparent effect of population density on the rate of rent in the empirical data, as seen from Dataset 9.3.2 before, and even more clearly in Dataset 9.4.6, which crosses somewhat like the theoretical graphing even though the empirical data points all have different product per capita. That is, for the surplus areas (those with product per capita at or over 400 kg.), high population density raises the rate of rent; but for the deficit areas high population density lowers the rate of rent. Since there are only three deficit areas, the Winter Wheat-Millet area is the best test case, the one with the highest population density. According to the prediction of the absolute rate of rent, the rate of rent there should be about 35%; instead it is 25%. Also, it is the only one of the three in which there is more rented land, 15.2%, than land farmed by hired labor (Dataset 9.3.4).

This empirical mapping implies that something like the subsistence demand affects the rate of rent, and that the effect of the increase in the sufficiency threshold when population is dispersed (the increase in the sufficiency threshold should raise rents) has lesser impact than the simultaneous effect of the decrease in the subsistence demand (seemingly due to wages from hired agricultural labor and other secondary circulation within the countryside). This balance is a matter that cannot be predicted from the model. If the yield towards subsistence provided by land farmed by hired labor (as found in Dataset 9.4.4) and by the presence of managerial farmers and other exploiters within the countryside (i.e. secondary circulation of the extracted surplus) could be specified, then the topography of the rate of extraction presented in Section 9.1 for a unitary form of land/labor relationship could be adjusted into a dual interaction of internal and external relations of production, both of which would also be affected by the labor markets they spawn. The landscape might be radically redrawn; but I believe it would still have a wedge-shaped crease across it, due to the characteristic profile of a landownership distribution created through repeated partible inheritance, and the effect of that unevenness on the point of maximization.

The figures in the table Dataset 9.4.2 may also seem to imply that "subsistence" may be actually somewhat higher than the necessary nutritional sustenance of 220 kg. grain per capita — which plainly leaves little margin for clothing, shelter, medical and social expenses, or investment in production —, especially when the average product per capita and probably also the average standard of living for the region is in the higher range. But that is not my interpretation. In Dataset 9.4.2 there are also figures for the numbers of land-short population (the numbers of farm population owning land

supplying less than 220 kg. per capita), and the amount of land they rent in, calculated from the farm size group data in each area. Estimated income for the land-short farm population is very low. At the observed rates of rent and the observed amount of rented land they obtain, only in the southern regions do the land-short seem to be able to meet their subsistence needs exclusively from renting. That is, the actual income of the land-short population from rented land is much lower than the subsistence demand. How much of the rented land falls into the hands of the land-short population who generated the rental demand in the first place — that is the subject of the next section.

9.5 The Allocation of Rented Land: Profits or Penury

As can be seen in the third column of Dataset 9.4.2, the land-short population actually does not enjoy the rental of all of the rented land, and thus does not achieve the subsistence level that would be assumed from its production. The question is why they do not, since the land-short would seem to be those most motivated to rent, and why in some areas most rented land is held by the poor, while in other areas more is held by medium or medium-large farmers.

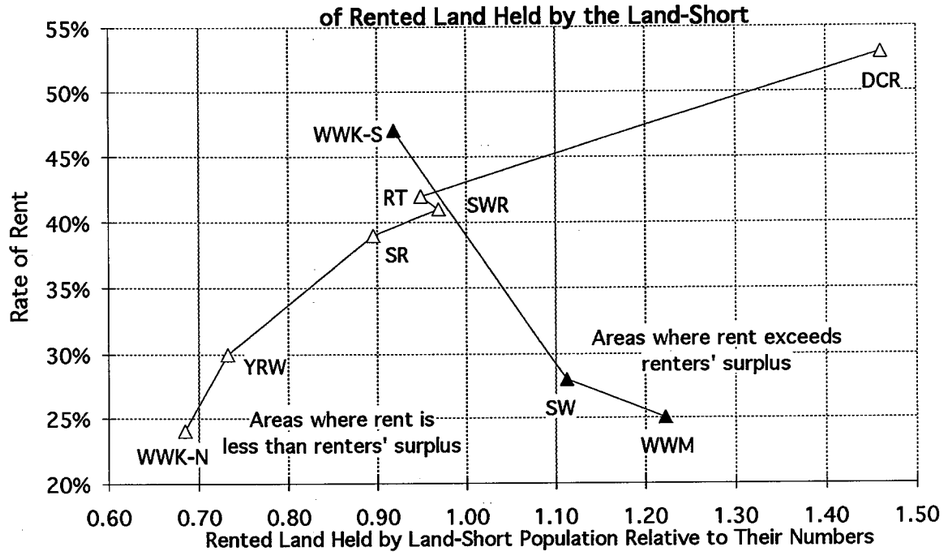
To produce a reliable measure of how much rented land the land-short population gains control of, hopefully a measure that can validly be compared among areas, I calculated how much of the farm population in each area consists of those whose owned land yields less than subsistence at 220 kg., and calculated as well the land owned and the land rented-in by the land-short population. Then I figured how much more or less rented land they got than their numbers. This seems to infer that the normal condition should be for rented land to be spread evenly throughout the population, but no such supposition is intended; the choice is merely a measure that yields a good spread in the results. For an example, if 60% of the population were land-short, and there were 20 units of rented land among a total of 100 units cultivated in the area, then the land-short would be rated 1.0, a neutral number, if they held 12 of the units of rented land. If they held 6 units, only half relative to their numbers, they would be rated 0.5, meaning the richer farmers got a disproportionate number of units; holding 18 units they would be rated 1.5.

Dataset 9.5.1 compares this measure of allocation against the rate of rent. Similar to Dataset 9.4.6 just past, in which the y-axis was also the rate of rent and the x-axis was subsistence demand, the deficit areas behave just opposite to the surplus areas. How may this be interpreted, in terms of common-sense causation?

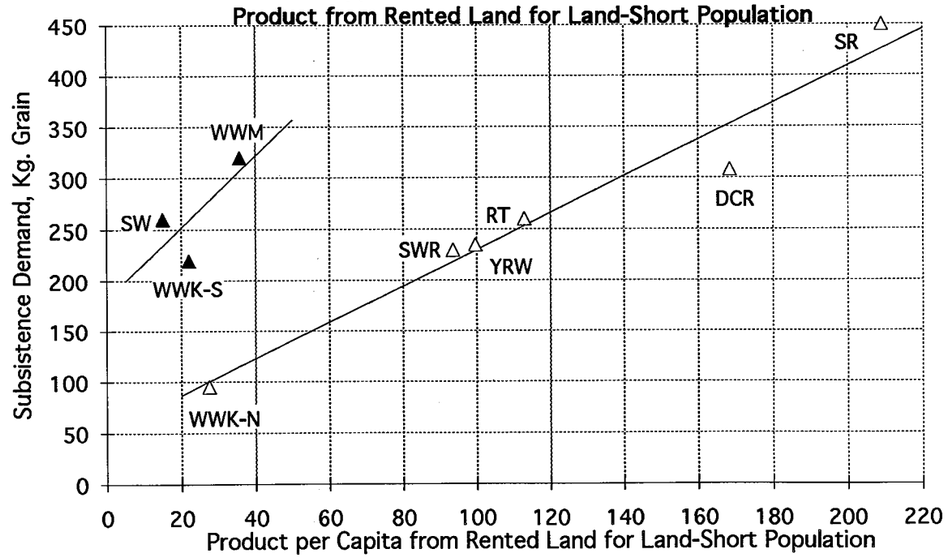
Surplus Areas: If the Surplus on Rented Land is High, Rich Farmers Want It

For all of the surplus areas, the rate of rent leaves at least some surplus for the land-short population, if they control all rented land. The surplus for others not pressed by

Dataset 9.5.1 The Rate of Rent and the Proportion of Rented Land Held by the Land-Short



Dataset 9.5.2 Apparent Subsistence Demand on Rented Land vs. Product from Rented Land for Land-Short Population



subsistence would be even greater. And among the surplus areas the rate of rent and the margin over the average surplus varies considerably. The level of the surplus shapes the outcome of allocation. If the rate of rent is so high that it leaves little profit for the renter, only the poor want rented land. But if the surplus retained by renters is high, those not pressed for subsistence want rented land, and those with greater resources have considerable advantages in acquiring and tilling it. So we see in Dataset 9.5.1 that for the surplus areas, the lower the rate of rent, the less the control of rented land falls in the hands of those who need it most, the land-short population; and vice versa.

But such a pull of rented land towards those whose subsistence is already assured also pulls the land-short population below subsistence, particularly in areas where there is little alternative in hired labor. So the land-short population is forced to bid up rents a little to redress the balance. If the land-short pay a higher rent, they will not just lure more landowners in the aggregate to enter into tenancy contracts, they can beat out some of the easy-time renters among the medium-size farmers who thought the surplus was a plum ripe for the picking. In terms of the model, that is an increase in subsistence demand over minimum subsistence, although that demand really does not yield the high incomes demanded; it only yields about half, as can be seen in Dataset 9.5.2. The parallel of rented land allocation with subsistence demand in Dataset 9.4.6 is not a coincidence; the subsistence demand measure was engineered to adjust to deviation of empirical rents from the theoretical solution at standard subsistence. The measure subsistence demand, despite all the convolutions by which it has been produced, appears to be successfully related to the net income the land-short actually achieve on rented land.

We see in this tug-of-war over rented land that its allocation introduces another small revision into the determination of the rate of rent, but one that is merely an aspect of the land-short population trying to make good, part of their diverse attempts to reach subsistence through hiring out as agricultural labor, handicrafts, or whatever. The possibilities are shaped and constrained by the agricultural economy under conditions of scarcity, so the outcome is not arbitrary. All of this subsistence-seeking dynamic is subsumed in the model under the rubric of the subsistence demand.

Let us examine the texture of these cases in greater detail. For the most extreme case on the right of Dataset 9.5.1, the Double-Cropping Rice Area, the rent (53%) is in fact greater than the average surplus for the whole population (at 401 kg. per capita, 181/401 = 45%), but the rent is still virtually just equal to the surplus of the renters, since much rented land is available to them. This case is on the borderline of

deficiency. It is logical then that in this region virtually only those who are deprived of the means of subsistence wish to farm land on which such a prodigous effort must be exerted while most of the produce goes to the landlord. The land-short, 51.1% of the population, hold 74.7% of rented land (41.0 out of 54.9 units of rented land), i.e. 1.46 times their numbers (see Dataset 9.4.2 for source of numbers). The use of hired labor is also minimal, as may be expected since even large tenants would have little margin for the luxury of leisure. As an offshoot of this, for the land-short population there is little alternative to renting-in land.

At the other extreme of the surplus regions, for the Winter Wheat-Kaoliang Area, North, the rate of rent (24%) is only a fraction of the average surplus (369/589 = 63%). However, because of low population density, there is very little rented land. A disproportionate quantity of the limited rented land is taken in by medium and large farmers, who can probably still make a profit using hired labor on rented land. The land-short, only 17.9% of the population, hold 12.2% of rented land (1.2 out of 9.8 units of rented land), i.e. 0.68 times their numbers. If there is a substantial surplus to be kept on rented land, it is not surprising that rich peasants would grab the rented land, and the land-short would be relegated to the role of hired labor. But since work as agricultural labor is plentiful, the land-short do not seem pressed to raise the demand for rented land.

Such an effect is much more significant in scale for the Szechwan Rice Area, where rented land is 57.6% of all land in the survey sample. The low 39% rate of rent takes only about two-thirds of the average surplus (coincidentally the same as WWK-N, 369/589 = 63%). And the rate of rent would be even lower, about 30%, if it were not bid up by a very high subsistence demand level. The outcome is that the land-short population in the Szechwan Rice Area has control of half of the rented land, 28.2 units out of 57.6 units, i.e. 0.90 times their numbers, and this yields income after rents of about 200 kg. per capita from rented land (Dataset 9.5.2), a very high number. The other half of rented land goes to medium and large owners. The medium and large landholders have greater capacity for investment in farm facilities and inputs, which gives them the competitive edge over smallholders and landless; especially for families with several adult males, economies of scale seem to be in operation (Dataset 2.10.3 examples for Szechwan Rice Area and Double-Cropping Rice Area). It seems that it is the surplus retained on rented land that sets off the tenants' race for reproduction, as described in Chapter 2 for areas with much rented land. In the Szechwan Rice Area there

is much hired labor used on rented land, suggesting that under these conditions of high surplus and low wages the control of rights to rented land can serve as another basis for exploitation of labor.

Deficit Areas: If Rent is Higher Than the Surplus, Only Rich Farmers Can Benefit from Rented Land.

In the deficit areas, the allocation of rented land is very different. As seen in Dataset 9.5.1, the land-short get more of the rented land where rents are low, and the medium or larger farmers get more where the rents are high, a seemingly paradoxical situation. But it has a logic that could be called the logic of default.

Since the rate of rent is in all deficit cases greater than the average surplus, and greater than the surplus of renters, it seems that only the desperate would want it. In fact, renting land virtually presumes other income from ownership or wage labor, to subsidize the payment of rent. If the rate of rent is low, the poor can better afford it; if the rate of rent is high they would be better off as full-time agricultural wage labor. If the rate of rent is high then only medium or larger owners who already have their subsistence covered on their own land can find benefit in renting-in land. The quantity of rented land is anyway limited due to the small number of landholdings that are capable of supporting landlordship, and with the depressed price of labor, hiring labor generally predominates.

For the Winter Wheat-Millet Area, densely populated given its thin resources, rented land is 15.2% of the arable, and it is held more commonly by the impoverished, at a low 25% rate of rent (product per capita is 279 kg., average surplus is 21%). The land-short, 57.6% of the population, rent 10.7% out of the 15.2%, 1.22 relative to their numbers. This area has the highest ratio of rented land to land farmed by hired labor among the three deficit areas, and there is relatively less utilization of hired labor. But if higher productivity and surplus allows a still higher rate of rent which digs deeply into subsistence needs, as in the Winter Wheat-Kaoliang Area, South (360 kg. product per capita, 39% average surplus, 47% rent), then only the partially-landed can afford to increment their income by renting. The greater number of estates that can afford use of hired labor must provide the major livelihood for the landless and owners of small parcels.

Although it can be seen that the land-short population does not adequately benefit from its role in the land/labor market, still the conclusion of this investigation is that it is the subsistence of the land-short that sets the level of demand.[102] On the basis of need, we would expect that the land-short would be those most desirous of renting land, and also those from whom the highest portion of the surplus could be extracted; but once the rate of rent is set by their desperation, other forces of allocation take over. There are other exchange relationships that may serve as the mechanism for the exploitation of the land-short, and those exchange relationships are of course conditioned as well by the underlying inequality in ownership of the means of production.

The phenomenon that has been described here, the uneven and varying allocation of rented land, is important to understanding and seeing beyond the surface of aggregated agricultural statistics that describe conditions of inequality. Holders of rented land may or may not be impoverished. Farm size disparity may be equalized or may be maintained under conditions of prevalence of rented land. In fact, it is under the conditions of highest exploitation, as in the Double-Cropping Rice Area, that farm size is most equalized. Under the high rate of rent, it is the land-short who gain control of most of the rented land, and they must labor on twice as much land as do owners in order to achieve the same income. Therefore in terms of farm size many of the near-landless may operate on a scale comparable to that of large owners. Many surveys, the Buck survey among them, first sort their interview schedules by size of farm, regardless of the portion that is rented. When farms of the same size are averaged, both owners and tenants, a false appearance of equality is created. Of course it is necessary to have a sizeable sector of rented land, at least 30%, for this to be significant. This effect was implicit in the regional patterns of inequality laid out in Arrigo, 1986, p. 275-6, and I believe underlies the observation of Kang Chao that inequality appears to have decreased in China over the last millennia.

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102 In my 1990 manuscript on the rate of rent, I also tried several alternative solutions, such as figuring demand according to the population at the bottom of the landownership scale that could receive rented land, if rented land were allocated so that they all were allowed to reach a certain highest-possible income watermark. This formulation of a variable renter pool did not match the empirical rates of rent nearly as well as the simpler formulation based on the gap from subsistence for the land-short population.

This point on appearances of equality deserves to be carried further. Mark Elvin sees Chinese peasants as a multitude of smallholders, and concluded that "the amount of land held by landowners who did not themselves farm was clearly too small to serve in and of itself as an adequate basis for a distinct and socially dominant class" (Elvin 1973: 254-255); Ramon Myers concurs from his study of North China. Where rented land is minimal, this view might erroneously be accepted if differentiation within the ranks of peasant owner-operators, those who hire in and hire out labor and the area of land they own respectively, is ignored, and if legions of landless laborers are overlooked. And when rented land is 40-50% of the cultivated area or more, farm size and even percent of land rented by size group may impart a deceptive appearance of equality. Large tenants may have the same income as small landlords. Yet in both cases exploitation is inherent to the social structure, and the finding in this research is that in both cases the underlying degree of inequality in landownership is about the same.

9.6 A Further Examination of the Empirical Landowership Distribution and the Theoretical Effect of the Level of Inequality on the Rate of Rent

After deriving a theoretical rationale for the probable stability of the landownership distribution in Chapter 1, I took as a working model of the landownership distribution a curve midway between two extremes of possibilities generated by the computer simulation of repeated partible inheritance:

- Partible inheritance with all classes reproducing at the same rate, a process which reaches equilibrium after about 20 generations at 52% displacement from equality, and
- Partible inheritance with class differentials of reproduction, i.e. reproduction is proportion to landownership, a process which reaches equilibrium after about 20 generations at 32% displacement from equality.

This was described in Section 1.2, and the two curves were shown in Datasets 1.2.5 A and B (they are reproduced again in Datasets 9.6.2 A and B below for comparison with empirical data). The midway curve was prepared by averaging the two curves over their entire range; the midway curve has, of course, 42% displacement from equality.

After experimenting a great deal in generating theoretical land tenure patterns through the landownership distribution model that approximated those of the empirical data, I concluded that the 42% curve produced fairly good matches for most areas. However, I have not yet presented direct evidence that the 42% curve is a good approximation for the landownership distribution. It is difficult to get closer to reliable measurement of the underlying landownership distribution, for reasons that have been discussed several times: especially where rented land is plentiful, the averaging of owners and tenants in farm-size groups obscures the actual size of ownership; second, again where rented land is plentiful, the peak of the landownership distribution is not to be found in the farm surveys; and, third, portions of the population that do not reside on farms, hired laborers and peddlers as well as landlords, slip through the population count. So, since the 42% curve has been serviceable all the way through the complexities of the rate of rent, I have not yet moved to seek a higher level of precision. But the rate of rent solution, sensitive as it is to the details of the landowneship distribution, makes investigation of the landownership distribution more pressing.

Comparing the Numbers of Land-Short Population

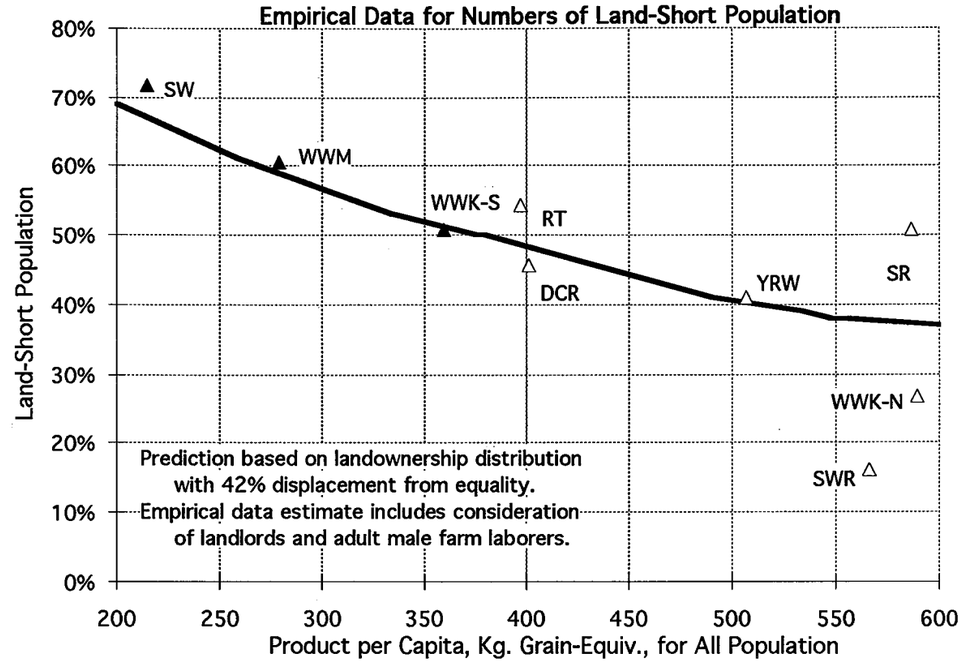
It is reasonable to ask again how close the 42% curve is to what we can know about the empirical landownership distributions for the nine areas of the Buck survey. We cannot see the whole landownership distribution due to the dispersion of its peak in rented land. However, we have seen earlier in this chapter that the amount of rented land can be generated from the 42% curve with the given rate of rent and product per capita, plus slight adjustments to the "subsistence demand" that are understandable in the context of the total agricultural economy. The other end of the landownership distribution, the tail, might also provide comparison with the 42% curve. It can be asked whether the theoretical landownership distribution at the given product per capita matches with the empirical numbers of the land-short population (those owning less land than necessary for subsistence at 220 kg. per capita) in the survey data.

Since the numbers of land-short population were just calculated for investigation of the allocation of rented land, in Dataset 9.4.2, it is convenient to make this comparison now. Some additional adjustments have been made to the empirical numbers of land-short population derived from the farm size group data, and the adjusted numbers are in column two of Dataset 9.4.2.

The adjustments are as follows: To the numbers of land-short farmers in the survey data, a conservative estimate of the numbers of agricultural laborers resident on large farms is added. The percent of farms hiring adult male laborers by the year is multiplied by 0.3, based on an educated guess on what portion of the employer's household may be composed of laborers, and whether those laborers also have some dependents. So if 20% of farms have adult male laborers, there may be about 6% of the population in agricultural laborer households. Then the land-short population must be considered as a proportion of the total population, including the landlord population, in order to compare with the theoretical prediction.

Dataset 9.6.1 overlays the empirical data points on the line of prediction for numbers of land-short population at different levels of product per capita, given a landownership distribution with 42% displacement from equality. The match is good for six regions. The Winter Wheat-Kaoliang Area, North, and the Southwest Rice Area, which fall lower than expectation, are the only regions with some open land for agricultural expansion. Even at that, it is likely that WWK-N does not vary too much from the usual

Dataset 9.6.1 Theoretical Prediction versus Empirical Data for Numbers of Land-Short Population



landownership distribution, but the landless and near-landless population is heavily employed as agricultural labor, and undercounted. On the other hand, the divergence of the Southwest Rice Area from the trend in several charts where all the other areas fall into place, such as in Dataset 5.4.8 (surplus per hectare versus total land farmed by others), suggests that in this area the landownership distribution is really less skewed than in the other areas. The Szechwan Rice Area, in contrast, has considerably more land-short population than anticipated. It may be the case that ownership is somewhat more skewed there, but the complication of much rented land and much hired labor makes it difficult to confirm that conclusion.

From the tail view of the landownership distribution, the curve with 42% displacement from equality seems to provide an acceptable model of the empirical landownership distribution. This comparison also seems to confirm that there may be considerable stability of the landownership distribution even though product per capita varies greatly from area to area. However, the simple measure of displacement from equality is admittedly a rough one, and it is possible for there to be many variations in the distribution that still yield the same measure of displacement. So we would still want to investigate and compare the empirical landownership distribution further if possible.

Comparing the Theoretical Landownership Distribution with the Landownership Distribution for North China

The landownership distribution is an indispensable element in the determination of the rate of rent, as was seen in Chapter 8. The precise solution may be affected by slight irregularities in the landownership distribution, and points of reversal and maximization on the cosmic scale of the rate of extraction for a civilization, as proposed in Section 9.1, may be shifted. While I cannot pursue all the possibilities at present, some further small advance in exploration of the landownership distribution can be made.

Thoughout this dissertation I have used a landownership distribution with a displacement from equality of 42%. This choice was largely based on experiments with the empirical data such as that conducted for Dataset 9.6.1. The choice was also reached by my intuition that the maximum degree of inequality would be that for the case of no land accumulation and no differential reproduction, 52% (because that would cause continual jacking up of inequality, which would be intolerable to the relations of production,

without class-differential fertility), and the minimum degree of inequality would be that for the case of differential reproduction but no accumulation, 32%.(implying land is too plentiful to be restricted, and rather like the land sown distribution in Dataset 3.7.3 A for Russian peasants mostly in redistributional traditional communes). The midpoint between these two is 42% displacement; in my spreadsheet model I had designed the capacity to shift in increments between the 32% and the 52% boundaries, for exploration in matching the empirical land tenure patterns.

But the third crucial element in this choice was that the computer simulation combining high accumulation and high class differentials of reproduction resulted in a landownership distribution with 42% displacement from equality. I did not at that time consider, however, the subtle difference between the 42% midpoint distribution and the computer simulation with both accumulation and differential reproduction. It would not change the preceding results to any noticeable degree; but still there is something to think about in this comparison, which is shown in Dataset 9.6.2 A and B.

The two curves do not seem very distinct when seen as a histogram, as in Dataset 9.6.2 A, but when the frequency distribution of ownership sizes for each one is calculated, the difference appears. (In preparing Dataset 9.6.2 B, as before in Dataset 1.2.5 and Dataset 1.3.1 for Bangladesh I cut the landownership distribution into segments of increasing size, somewhat like a logarithmic scale, to flatten the peak at small sizes while still producing numbers big enough to be seen at the large sizes of ownership for a frequency distribution.)

Dataset 9.6.2 B shows that for the midway case, Curve A, which has no mechanism of accumulation for the rich and dispossession for the poor, the number of medium-small owners is predominant. This turns out to be like the empirical case based on farm households for North China (Dataset 9.6.3 B, next page), which may neglect the landless population even after adjustment. Or it may be that the failure of small owners to fully reproduce does actually help prevent swelling of the landless ranks in North China, and accumulation is low.

The case of class differentials of reproduction and accumulation shown as Curve in Dataset 9.6.2 B is somewhat different. The peaks of the curves do not seem to be as different as the mid-sectors. Curve B has a lump of medium-large owners at 1.5 scale of ownership, a depressed mid-sector, and many more landless and near-landless than Curve A, suggesting the effects of expropriation of small peasants. This irregularity

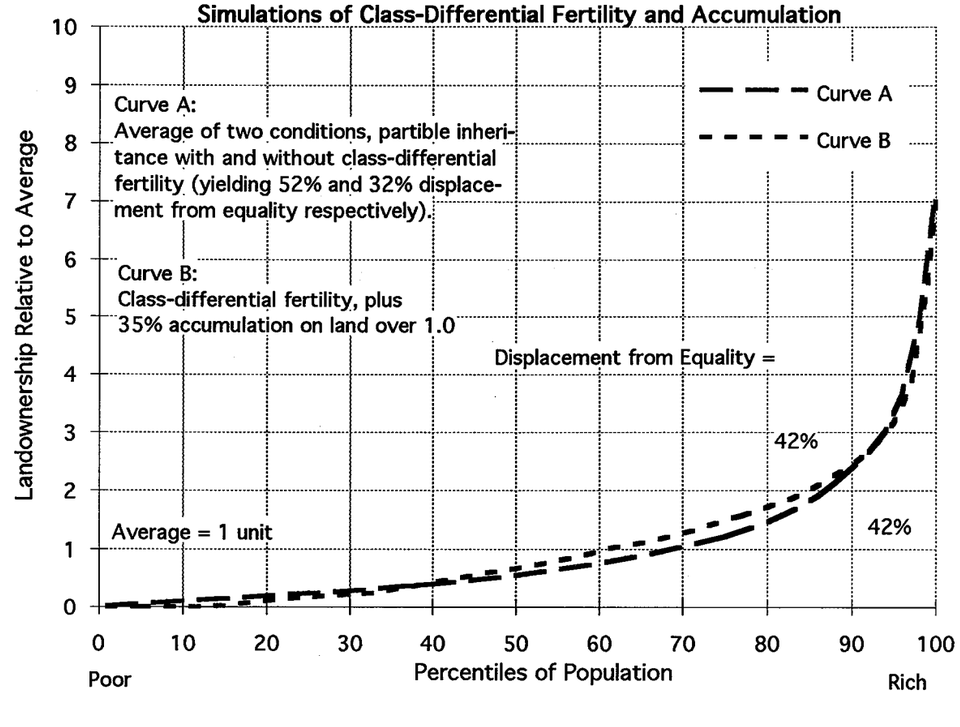
rather resembles the distribution for Bangladesh (Dataset 1.3.1), which however has even more swollen ranks of landless and near-landless, perhaps the outcome of proliferation of wage-earners in a partly commercialized semi-modern society (as suggested by the transition to industrial society depicted in Section 6.8).

I am not able to carry this reasoning further with such limited information, but I do wish to suggest the kind of inferences that may grow out of the model of class differentials of reproduction. It may be possible to do empirical studies that tie together more precisely the relations of production and the relations of reproduction. In addition, these subtle differences in distribution may influence the rate of rent and points of equilibrium of the social form.

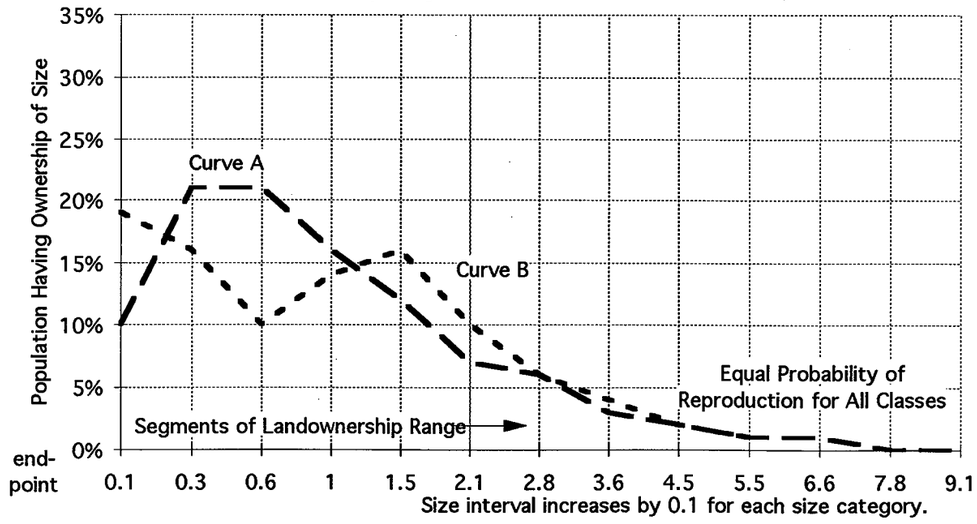
Let us move on to examine the available empirical data for prerevolutionary China. The presence of rented land obscures direct observation of the landownership distribution, but at least for North China, where rented land is only a small percent of the area, we can make a direct comparison between the empirical distribution and the theoretical distribution derived from computer simulation of partible inheritance.

I have combined all of the farm size groups for North China for this purpose, covering a total of 7035 farms. This encompasses a range of conditions of productivity and population density, including even the locality of Paotow in the Spring Wheat Area which was previously excluded because its high productivity is quite atypical of the area. The ownership of the farm size groups is evaluated, as before, according to it production in kilograms of grain-equivalent. The average product per capita for the farm population is 385 kg. But adding in estimated uncounted population of 1.5% in landlord households (based on 11.7% rented land) and nearly 3.8% in hired laborer households (based on 14.9% of farms having adult male year laborers), the product per capita drops to 365 kg. Pegging the ownership of production to this baseline, the highest ownership per capita for the whole region is in Paotow, with some 70 families owning land producing eighteen times the average. But for the most part the maximum scale of ownership does not much exceed 10 times the average. I have smoothed the top of the distribution a little for the graphic presentation; the peak includes the estimated scale of ownership of landlords, which is 9-10 times the average.

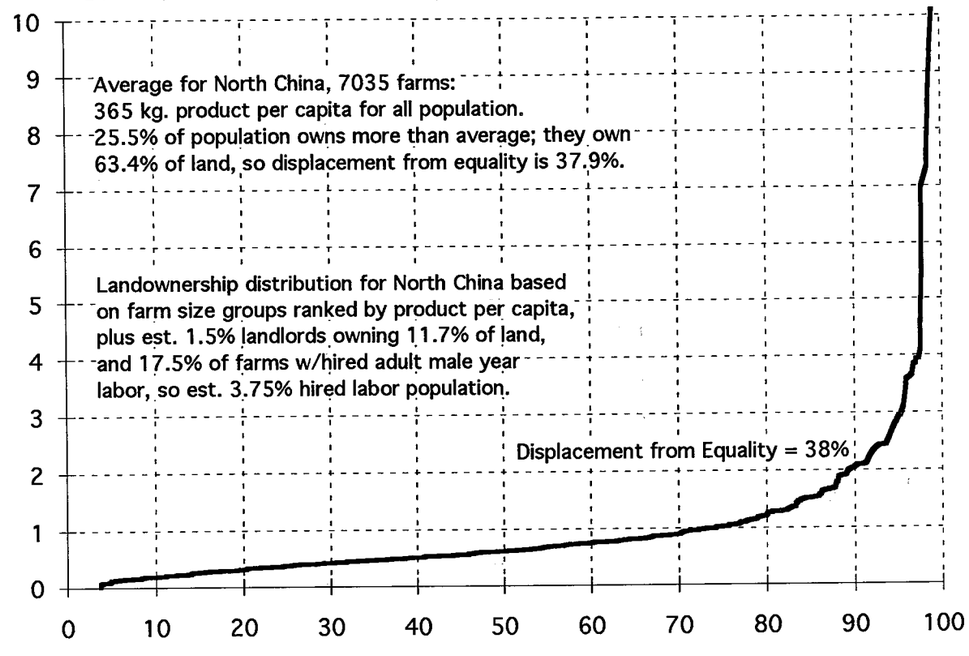
Dataset 9.6.2 A Landownership Distributions Generated by Computer Simulations of Class-Differential Fertility and Accumulation



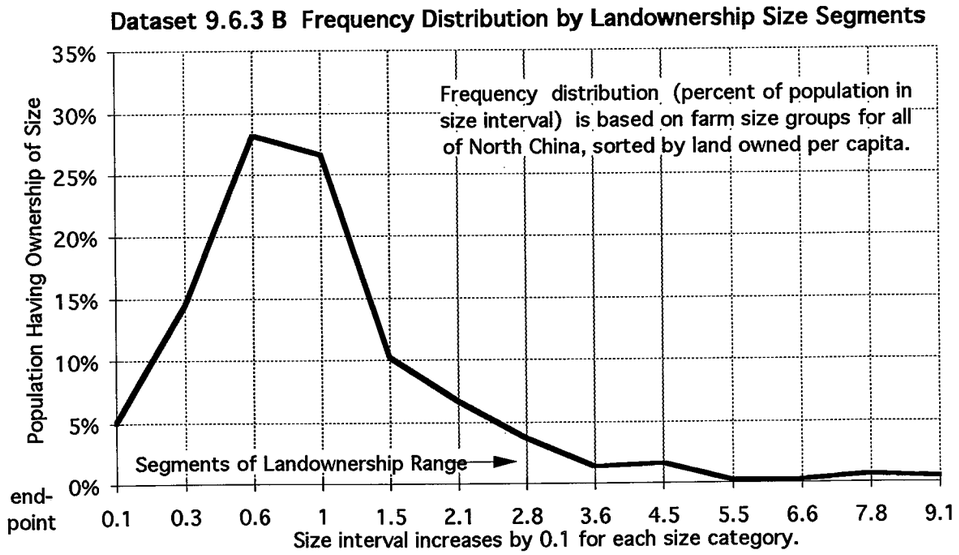
Dataset 9.6.2 B Frequency Distributions for Landownership Distributions



Dataset 9.6.3 A Landownership Distribution for North China, 1930s



Dataset 9.6.3 B Frequency Distribution by Landownership Size Segments



Datasets 9.6.3 A and B provide the same charts for the empirical North China data as for the preceding theoretical curves in Datasets 9.6.2 A and B. Dataset 9.6.3 A is plotted directly off the farm size group data, with the exception of slight smoothing of the peak and the addition of 3.8% totally landless population (of course the number totally landless is probably somewhat higher than that, but full tenants are averaged with owners in the farm size groups and so appear to have some land). The peak of the empirical curve is as high as the 52% theoretical curve. But it can be seen in the frequency distribution, Dataset 9.6.3 B, that the proliferation of medium-small holdings is even a little greater than in the 32% theoretical curve that modelled moderate class differentials of reproduction.

Another minor point of comparison should not be neglected: there are slightly elevated numbers of owners in the 3.6-4.5 scale range, similar to the 52% theoretical curve. This is the slight "hump" at the upper reaches of the landownership distribution that creates the main discontinuity in the rate of rent. Although the numbers of potential landlords here are small, their scale of ownership is still large enough that they influence the supply of rented land. The large numbers of owners in the 0.6-1 scale range do not directly enter into the supply and demand of rented land except possibly at very high population densities with very low minimum scale of ownership for landlords. Those in the 0.6-1 scale of ownership are generally the self-sufficient farmers. But the large numbers on the petty self-sufficient farmer scale do mean that the landless are relatively fewer.

For the estimation of overall inequality in North China, 25.5% of the population owns more than the average, and what they own is 63.4% of all land, so displacement from equality is 37.9%. Of course these numbers cannot be so precise as the decimals represent. The numbers of landless population outside of farmholders are actually unknown, and are probably much greater than the estimated 3.8%. So the midway landownership distribution with 42% displacement from equality is serviceable as a model.

A general deduction from the comparison of the theoretical and empirical curves might be that accumulation of land continually rebuilds a high peak of ownership for large owners, even while differentials of reproduction tend to break down concentration of holdings. Thinking in greater detail, it may be the case that rates of reproduction are still lower than rates of accumulation for most landowners on the scale of 4-5 times average ownership (noting also the tendency for reproduction to drop off for those who

live entirely from rents and profits, as described in 6.8 with reference to South Asian studies), but for those on the scale of 1.5-3 times average ownership, who are generally managerial farmers, accumulation of land is not sufficient to stave off dispersion of estates in partible inheritance. This interpretation might explain the difference between the empirical landownership distribution and the 42% theoretical curve with class-differential reproduction.

9.7 Levels of Inequality in Landownership Distribution and their Theoretical Impact on the Rate of Rent

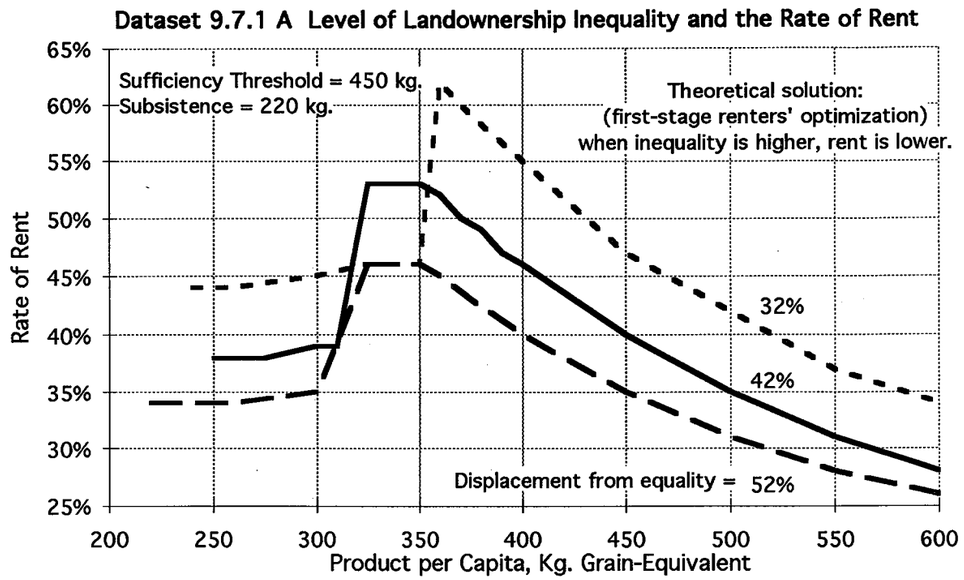
This broaches the issue of how difference in levels of inequality of the landownership distribution might affect the rate of rent. Although the range of variation in the landownership distribution within the Chinese data does not seem so great as to necessitate straying from a single landownership standard for the modelling of land tenure patterns and rent, still the question is of interest, because landownership structure has varied greatly over history and over regions of the world. We might wonder how the land/labor market might work out under the greater concentration of European feudalism or of New World haciendas.

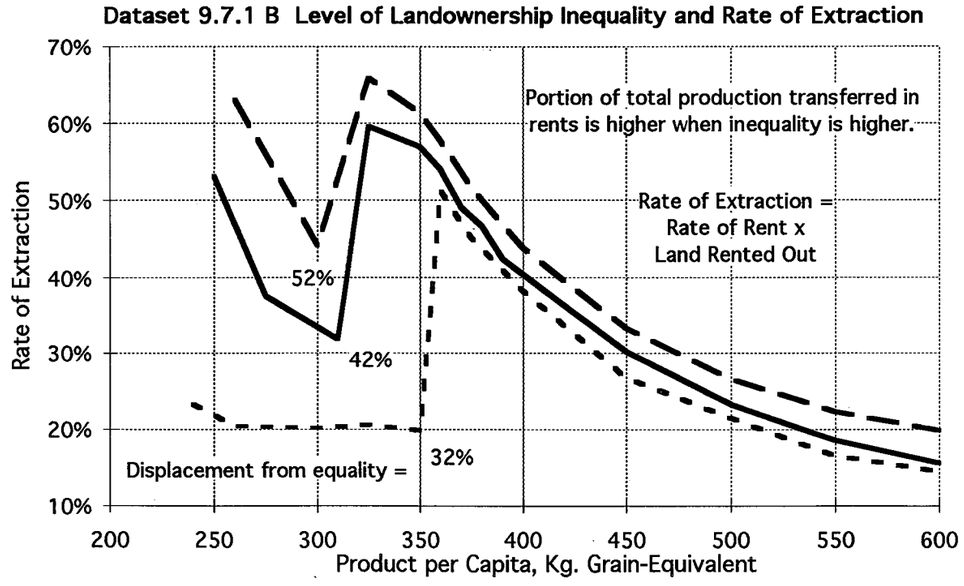
The 32% and 52% displacement curves can serve as examples of lesser and greater concentration for a theoretical working out of the rate of rent. For comparison with others' research, I have calculated Gini coefficients for these curves:

Displacement 32% = Gini 0.45;
displacement 42% = Gini 0.55;
displacement 52% = Gini 0.72.

We can explore further here with this variety of curves the effect of different degrees of inequality on the solution for the rate of rent. However, for this many calculations it is only feasible to take the solution for the rate of rent to the first-stage of renters' maximization, which should suffice for comparative purposes. Dataset 9.7.1 A illustrates rate of rent by product per capita for each of the three curves of landownership distribution, with 32%, 42% and 52% displacement from equality (these are generated by the computer simulation of partible inheritance with class-differential reproduction for 32%, partible inheritance with same reproduction for all classes for 52%, and the average of the two for 42%).

The common-sense prediction is that the greater the monopoly on landownership by a small class of landlords, the more they can squeeze the land-short population; rents should increase. But it is found in Dataset 9.6.2 A that the solution for the rate of rent, while strongly affected by the degree of landownership inequality, moves in a direction which is entirely counterintuitive. Other things being constant, rent decreases with increasing concentration of ownership.





This surprising finding on the relationship between landownership distribution and rate of rent, though based only on a theoretical model, should throw into disarray the previous speculations of economic historians, both neo-classical and Marxist. The usual facile conclusions that higher rents in some historical period represent increasing demand for land, or consolidation of the landlord class, or increasing exploitation, must be subj ect to new doubts.

Reflecting again on the model of the solution for the rate of rent, we can understand that this outcome is based mainly on one of its central parameters, the "sufficiency threshold", the level of income at which freedom from labor is preferred. Here it has been set as a constant at 450 kg. per capita. We may describe the logic of this outcome as follows. Imagine a beginning state in equilibrium with a particular rate of rent, number of landlords and amount of land rented out. When concentration of ownership increases, the amount of land owned by those above the sufficiency threshold — the landlords — increases. The numbers of landlords may also increase slightly. Then, given the same sufficiency threshold, more rented land is available to the land-hungry at the original rate of rent. On the other hand, the number of the land-hungry has somewhat increased since a portion of their ownership has been transferred to the landlords; also increased is their shortfall from subsistence and the amount of land they must rent in to subsist. This should jack up the rate of rent. But it is likely (as is the case of a smooth curve of landownership distribution) that a large part of the gain in ownership for the wealthy has come at the expense of the middle sector of self-sufficient farmers, who do not figure much in the supply and demand of rented land. (The landownership distribution could not shift much otherwise, because the land-short have too little to begin with.) In whole, there are factors operating in both directions, to lower and to raise rent, and their net effect cannot be arrived at without the quantification of the model. The resolution of these counterpoised factors, according to the model, is that the increase in supply is greater than the increase in demand, and the rate of rent falls, as is graphed in Dataset 9.7.1 A.

The constancy of the sufficiency threshold, or minimum income for landlord status, need not mean that the average wealth of the landlord class is constant; the average wealth of landlords still increases with greater concentration of landownership, since the average landlord owns more land. And the counterpart to the wealth of landlords, the exploitation of tenants, may increase as well. Although the rate of rent has decreased with increasing concentration of landownership, the amount of land on which rent is collected has

expanded. What I have called the rate of extraction measures the transfer of product from renters to landlords for the whole society. It is the rate of rent times the portion of all land that is rented land. Again, the trend in the rate of extraction cannot be known without the quantification of the model. But we see in Dataset 9.7.1 B that overall the extraction does increase, theoretically, with concentration of ownership. In this first-stage approximation of the rate of rent, this increased extraction is severe as a percentage if renters are in the deficit area, product per capita under 350 kg., but mild otherwise.

I have no empirical data to present to test this theory on the relationship between inequality and the rate of rent. But even at that, the theory should challenge the neo-classical projections on economic history, which for the most part are also unsupported by empirical studies.

This discussion completes exploration of the potential variation in parameters of the rate of rent solution.

9.8 A Summary of the Determination of the Absolute Rate of Rent and its Impact on the Forms of the Agrarian Economy

Since this has been a long and convoluted analysis, the reader may appreciate a brief review that ties together all of the elements. First the general features of the analysis will be laid out. Secondly I will look again at the Chinese agricultural economy and describe a typology of its forms, based on the actual cases. Such a typology may be more meaningful to scholars who study Chinese society in detail than the abstract principles of determination of land tenure and rents.

Three Stages of the Determination of the Absolute Rate of Rent

Chapters 8 and 9 have carried the analysis of the determination of the rate of rent through three stages, as follows.

First-Stage Solution

The first-stage solution in Chapter 8 set up the basic paradigm of the market between the land-short population that wishes to rent-in land in order to meet subsistence, and the large landowner population that wishes to gain a comfortable living from its ownership while forsaking all physical labor and farm management. That solution has four elements:

1. the landownership distribution
2. the average product per capita
3. the minimum subsistence
4. the sufficiency threshold of income for landlords

The solution was set by the maximization of the interests of the land-short population, which does not necessarily mean the lowest rate of rent. The solution includes the avoidance of exertion to produce the landlord's share, as much as feasible while obtaining the most rented land.

In Chapter 8 only the second element, the average product per capita, was allowed to vary. This variation, however, introduced the matter of two forms of maximization, one for the case where supply of rented land exceeded the demand, and one for the case where demand for rented land exceeded the supply. There is a sharp discontinuity between the two cases at about average product of 350 kg. per capita. For the first, the "surplus" case at product per capita of 350 kg. or more, the rate of rent is lower than the surplus production of the renters after their subsistence is covered, and so the renters retain some of the surplus. As product per capita increases, the rate of rent decreases, and the renters retain progressively more of the surplus. For the second, the "deficit" case, the rate of rent is higher than the surplus production of the renters after their subsistence is covered, and so the renters must make up subsistence from other sources. Moreover, the higher the product per capita, the higher the rate of rent, until the boundary condition is reached.

Second-Stage Solution

In Chapter 9, the fourth element, the sufficiency threshold of income for landlords, was allowed to vary. Two reasons why this might vary were discussed. The most obvious, following on Chapter 7, is that the sufficiency threshold for landlord status is sensitive

to conditions of population density, because of the cost of transport of and perhaps also social and political impediments to removal of the surplus. The higher the cost of transport, the higher the sufficiency threshold.

In general, all other things in the land/labor market being equal, an increase in the sufficiency threshold should shrink the supply of rented land, and raise the rate of rent. In general this is the case, both under surplus and deficit conditions, except that unevenness of the landownership distribution resulting from repeated partible inheritance causes an abrupt and brief reversal in the pattern of rents increasing with the sufficiency threshold.

This leads to the second reason for variance in the sufficiency threshold, the possibility that the land/labor market would be pulled by this discontinuity to leap between states in which either hired labor or tenants predominate as the form of labor exploited.

Third-Stage Solution

Beginning in Section 9.4 the third element of the solution, specified as the level of subsistence needs demanded from rented land rather than as minimum physiological subsistence, is allowed to vary. This variation is introduced as part of the solution of the effect of population density on the rate of rent. There are two reasons why the land-short population's demand for subsistence from rented land should differ from minimum physiological subsistence. First, part of subsistence may be provided within the land/labor market for hired agricultural labor. Second, the land-short population may have to compete with the richer farmer population for control of rented land.

Although lower population density should lead to higher rents as the sufficiency threshold rises, it seems that the alternative farming of large landholdings with hired labor provides part of subsistence for the land-short population and thus decreases the subsistence demand on rented land. The effect of decrease in subsistence demand more than offsets the effect of the increase in the sufficiency threshold, and for the surplus condition the net outcome is decrease in rents as population density decreases. For the deficit condition the effect is the opposite, and rents increase. This is one of several startling differences between the surplus and deficit cases, among them opposite tendencies in the allocation of rented land to poor farmers or to medium and rich farmers.

A Further Solution

It is desirable that these features of determination of the absolute rate of rent be further refined and integrated into a single quantitative model, but that is another thesis.

One element has not varied through most of the theoretical and empirical analysis of Chapters 8 and 9, the landownership distribution. Since the landownership distribution in China seems to have been largely standardized, relative to the average, by the process of repeated partible inheritance, the empirical data for the areas of the Chinese survey cannot much elucidate the effect of variation in the landownership distribution. However, the effect of variation in level of inequality on the rate of rent can be modelled theoretically, and this was a topic in Section 9.7. Surprisingly, the prediction is that the rate of rent should decrease if the concentration of landownership increases.

A Typology of Chinese Agricultural Economies

The analysis of land tenure and the rate of rent has been developed in continual interaction with the empirical data. The logic of the determination and the range of variation in the parameters mean that there is a limited range of outcomes for the form of the agricultural economy. This is one reason to create a typology from the agricultural areas described by the Buck survey statistics. Another reason for a typology is to assist visualization of the combined effects of all the factors analyzed up to now in this complex presentation.

Let us review the physical conditions in the agricultural crop regions of the Buck survey. The areas have been outlined on two maps presented in the front of the thesis.

The four northern wheat-growing regions suffer from a short growing season and arid climate, especially the northwest interior, a loess plateau (Spring Wheat and Winter Wheat-Millet Areas). The northern seaboard regions are plains crossed by a few rivers. The Winter Wheat-Kaoliang Area, North, including the southern fringe of Manchuria, centers on Peking (now Beijing), the national capital of the last dynasty, 1643-1911, and till late in that period population density was held low by estates dedicated to growing food for military supply and by restrictions on migration.

Moving south, the growing season and rainfall increases, and multiple cropping increases as well. The middle and lower Yangtze River regions (Yangtze Rice-Wheat Area) are densely populated and commercialized, with a complex of water transport and major cities. The cities are further supplied from the surplus of the rich Szechwan Basin (Szechwan Rice Area), linked by the upper Yangtze River. The Southeast coast regions (Rice-Tea Area and Double-Cropping Rice Area) are intensely cultivated on the available cropland, apparently close to the point of "agricultural involution", but population is scattered among low mountains. The southwest interior (Southwest Rice Area) is isolated by mountains and lack of navigable rivers, though densely populated on cropland, with year-round cultivation. Until the last century it was largely the terrain of tribal peoples. With the exception of this region and the far northeast, unused arable land has been virtually exhausted in the past few centuries. The heavy press of population is reflected in the Buck survey, and seems to have constrained the range of social development, lending credence to Mark Elvin's concept of a "high-level equilibrium trap". It is probably the fact that most of the areas are so constrained within narrow ecological bounds that has led the survey data to conform to a limited range of patterns and facilitated this analysis.

The previous rationale for the solution for the rate of rent combined with the analysis of variation in land tenure explains why a prevalence of rented land may be the outcome of several very different economic preconditions. This has been recognized in only a few empirical descriptions, e.g. D. Perkins speaking also from early Republican period data: "In Shantung Province, for example, some of the highest rates of tenancy were in the highly commercialized regions around the cities of Tsingtao and Tsinan, but then there was also relatively high tenancy in some of the more mountainous hsien in the center of the province." (1969, p. 96. Agricultural Development in China, 1368-1968. Chicago: Aldine). In most historical and sociological discussions these varying phenomena have been conflated, with rented land assumed to be a sign of commercialization, or with the supposed poverty of tenants set up as a straw man (R. Myers, 1970).

First in this section I will review from the results of this research the characteristics of three socio-ecological environments in which rented land is significant. These are as follows, with productivity stated in kilograms grain-equivalent as in the Buck survey:

1) Very low productivity, under 275 kg. per capita. Such areas are likely to be the population centers of remote mountainous regions or plateaus, of intermediate

population density but long-occupied and depleted, or naturally infertile. Rents, though low, are greater than the surplus; wages are very depressed. Landlords demand a livelihood only a little better than their destitute tenants, since the leisure is bought cheaply.

This description is modelled on the Winter Wheat-Millet area in the survey, the Gansu corridor in the loess area of northwest China, which in Skinner's analysis of Chinese economic macro-regions contains the core of the northwest, for which the Spring Wheat Area is the periphery. Here population is dense relative to the meager resources. For the whole region 15% of all land is rented land (low, but still higher than nearby low-productivity areas), the rate of rent is 25%, and there is relatively less hired labor. However, under these conditions it is quite likely that there will be small areas where rented land is 40% or so of cropland.

2) High product per land area matched by very dense population, with about 380-420 kg. per capita production for the rural population. Intensely farmed and highly commercialized, over-populated and somewhat depleted, perhaps to the point of "agricultural involution". The town and urban sector is relatively large and in close proximity to the farm sector, if not intermingled. Despite the relatively low product per capita and fragmentation of landholdings, about half of all land is rented land. This is due to the exorbitant rate of rent, at least as high as the average surplus, though at least marginally less than the surplus of renters. Since little surplus is to be retained from rented land, the renters tend to be those who own little or no land, and thus farm size is considerably equalized between tenants and owners — the tenants may even have larger farms on the average, because they are forced to till a much wider expanse to achieve subsistence. Related to this, there are few full-time agricultural laborers, because the larger owners rent out their land, while large renters have little margin for the luxury of respite from physical labor.

This is the outline of the case of the Double-Cropping Rice area, Guangdong Province on the southeast coast. The rate of rent is 53% and 55% of land is rented.

3) High product per land area and per capita, over 500 kg. per capita. Fertile but distant from major urban centers, population fairly dense but not extreme. Rent is medium, about 40%, but far less than the surplus of the renters, given the expanse of rented land they can farm. Medium-size owners edge out the landless in

capturing rented land, such that they can operate with some economy of scale, using both family and hired labor. There is a large range in farm size and a considerable reservoir of hired labor among the male population; wages to agricultural labor are medium-low, and much hired labor is applied to rented land.

The Szechwan Basin, a rice-growing region separated from the eastern heartland of China by mountains and the Yangtze River gorges, has these characteristics, with a rate of rent of 39% and 57% of land rented out. The Yangtze Rice-Wheat Area, West portion only, is similar. Part of the reason for these characteristics may be that a significant portion of the surplus leaves the area, resulting in less of an urban sector than would be expected from the high surplus. This keeps rural wages low.

This could be just an abstract typology, except that the model of the rate of rent shows these types to be logical and quantitatively accurate outcomes of ecological and economic preconditions.

Chapter 10 Conclusions and Implications of the Economics of Inequality in an Agrarian Society

10.0 Introduction

It may have been easy to lose sight of the forest because of the trees in this dissertation. In summarizing the conclusions, it is not feasible to rewalk every one of the many paths through the forest. A map will be laid out that will allow review of the many landmarks and the intersections of the paths. More significantly, this conclusion explores the implications of the discoveries of this journey, and asks where do we go from here.

Section 10.1 of this final chapter briefly lists the major findings, refers to the chapters, sections and datasets that substantiate the point, and highlights the interconnections among them, in particular the complex interaction between the form of the agrarian economy and demographic processes.

In Section 10.2 the theoretical conclusions and order-of magnitude findings on land tenure and rents are combined to serve as the basis for projecting what might logically be the sequence of change in social structure over several centuries of gradually increasing population density, including both increasingly intense use of cultivated land and expansion of the cultivated area onto previously fallow areas. This approaches a universalistic scheme for explaining change in social structures over long historical time, one that I have modelled as an "evolutionary scenario". The evolutionary scenario is an example of one of the uses to which this research may be put, recasting understanding of social evolution and economic history on a very broad horizon. It is also a useful stepping-off point for discussing a few general implications of this research.

In Section 10.3 I touch lightly on some basic philosophical issues central to Marxist and neo-classical economics on which this research bears. Some of these are quite distant from the conditions of agrarian China, but my views follow from analysis of the variation in Chinese data and from the evolutionary scenario of the previous section: what might be the nature of the transition from feudalism to capitalism, and how the modes of production framework in Marxism should be reshaped.

Section 10.4 points out how the picture of the agrarian economy could be brought into sharper focus with more work on the data for China, and suggests that the paradigm of

the economics of inequality should be expanded through application to other culture areas as well. Though the implications for the philosophy of history have not been fully developed in this dissertation, the findings of this dissertation point toward a further theorization on a higher level.

10.1 A Summary of Theory and Findings on the Economics of Inequality in an Agrarian Society

This dissertation presents three major models that seek to explain the patterns teased out of survey data and ethnographic literature. The common thread of the three models is the landownership distribution. It unites demographic and economic phenomena, and provides the crucial measure of inequality and class relations. Aside from the landownership distribution, a curve representing the scale of ownership for each percentile of population relative to the average, the basic inputs for these models are simple:

annual product per capita in absolute terms of kg. grain-equivalent, which also serves to gauge the annual product of the average ownership per capita;

population density, a proxy for difficulty of extraction and transport of the agricultural product. This has two components with slightly different effects, population density on cultivated land and the density of cultivated land over the gross area;

minimum subsistence, a constant stated in kg. grain-equivalent; and

the sufficiency threshold, the minimum level of income at which an owner of land will prefer freedom from physical labor to additional income. In terms of net income this is virtually a constant equal to about one and a half times subsistence, but in terms of the ownership of land required to provide that net income, the sufficiency threshold is at least two times subsistence, and may be much higher, to the extent that costs are incurred in order to collect, transport, and market the agricultural product.

Although the inputs of these models are simple, the outcomes and the range of social phenomena that they purport to illuminate are complex and diverse. In this sense the models may be said to be concise and elegant. These are quantified models, but they are not composed of disembodied factors like the variables and coefficients resulting from multiple linear regression or factor analysis, factors that exist only in the mind of the computer. The processes simulated in these models, like the four inputs above, are for the most part concrete and richly recorded in ethnographic descriptions.

Cautions and Reconsiderations

At the same time that we note high correlations of the aggregated data, we should realize that the models and empirical findings presented in this dissertation cannot in themselves provide the deep explanation for the form of social structures. Even if these models are accepted as suitable likenesses of social processes, a higher stage of interpretation is called for: Why have productivity and population density reached the observed state? Is there are higher-level logic in operation? All the same, higher interpretation could only be metaphysical musings if not informed and supported by empirical investigation and efforts at mid-level theorization for empirical patterns. If mid-level models can increasingly approximate both the apparent logic of social processes and their quantitative outcome, and can be increasingly integrated and comprehensive, that is progress towards an explanation, at the least in narrowing the plausible range of explanations.

As these models are refined and compared with more empirical data from a variety of environments, it may be possible to say more clearly how much of social variation they can help to explain. From the present match between models and empirical data, they appear to explain a great deal, in the sense that the output of the models satisfactorily resembles the data. But any model is merely a form of logically summarizing multiple observations from a social reality that cannot be apprehended in its entirety. Even in the natural sciences, what is "real" in a theory can be questioned.

One proposed set of explanations does not preclude that alternative explanations could be constructed that would also provide the same resemblance. Indeed, it would be another stage of progress in basic social research if alternative models as wide-ranging and inclusive as these, involving both temporal processes and spatial variation, could be constructed; then we could have a synthesizing debate and a further dialogue with empirical studies.

Finally, I wish to repeat, as I stated in the methodology section of the Introduction, that although I have a commonsense opinion of the direction of determination for many relationships — for example, I would argue that the subsistence needs (in absolute terms of grain-equivalent) of the land-short population determine the rate of rent, and not that the rate of rent determines the subsistence needs of the land-short population — still I do not claim that the relationships necessarily signify causality, although clear

exposition in this complex dissertation has called for a minimum of mincing and equivocation in this regard. A social system is built up over millennia of interactions of human needs and competition, physical environment, technological capacities, accumulation of infrastructure, cultural developments, and random catastrophes. In fact many of the relationships dealt with in this dissertation are of the nature of boundary conditions, in that they may limit the spiralling interplay of other forces.

An important example is the level of product per capita. Peasants in a subsistence economy would not produce more than is necessary for their own comfortable living and some year-to-year protection from periodic famine, if it were not for coercive extraction of rents and taxes. It may be the case that intensification of production and even reproduction and expansion of labor power is a long-term response to that extraction. But with increasing population density, the tactical capacity of the ruling class and the state to force extraction increases, along with the market-mediated rate of rent. So it is not surprising that there is generally a positive correlation in large-scale aggregated area data between product per capita and product per hectare (Dataset 5.4.3), even if, as upheld under marginal productivity theories, product per unit of labor tends to decrease. The underlying reason such a correlation would be found in these regional comparisons, though, is probably that in nearly all areas intensification is already advanced to virtually the maximum possible under the necessity of local self-sufficiency, the available technology and the given climatic limitations (as seen in the close relationship between growing season and product per hectare, Dataset 5.4.2). The climatic limitations are a boundary and in some sense a co-determinant; but a strong positive relationship between climatic conditions and product per hectare would probably not be found from a batch of samples taken randomly around the globe.

A similar discussion can be advanced about why class differentials of reproduction may be proposed to be in considerable equilibrium with the process of concentration of landownership due to extraction and accumulation. It may not be the case that in all cases and environments the rate of extraction approaches the maximum possible; but the quantified logic of Model One suggests that if high rates of extraction are not balanced by class differentials of reproduction (Dataset 1.2.7), the system must break down; and that is a limiting condition that must shape the relationship between the two processes.

This commentary has been an extended cautionary perspective that most readers are no doubt already well aware of. It has also served to review the context of some of the conclusions of this research.

Summary of Theoretical and Empirical Findings

The major findings in this dissertation are summarized as follows. The main pieces of analysis that support these findings are to found by means of the listed section and dataset numbers. These may be located fairly easily by means of the section headers at the top right of each page of text. There are thirty-two items of conclusions to this dissertation, labelled A through Z plus AA through AF for convenience of reference.

PART ONE. Model One is presented in Chapter 1.

A The system of partible inheritance with differential reproduction of classes reproduces the relations of production in a stable pattern even while families and individuals shift position in the process of physical reproduction of the population. Downward social mobility is the mode; the wealthy overreproduce and the impoverished underreproduce (Chapter 1; Sections 3.9, 3.10).

B The dispersion of landed estates in the process of partible inheritance serves to balance the effect of exploitation in the relations of production, the tendency towards landownership concentration due to accumulation and reinvestment of profits into land (Section 2.12, 2.13).

C For an agrarian society with high population density and very limited land resources relative to population, the outcome of these two processes is a characteristic landownership distribution that is more-or-less stable relative to the average ownership of the land's product, even if productivity per capita varies considerably. The top 25-30% of population owns more than the average, and they own 65-75% of all land; half of the population are smallholders owning about half the average. (Datasets 1.2.5, 9.6.2, 9.6.3)

D Theoretically, the landownership distribution may be most unequal at its equilibrium state where the rate of both accumulation and reproduction by the rich is lowest (Dataset 1.2.7). This has implications for theoretical understanding of feudalism that will be developed in Section 10.2.

E Chapter 2 The crucial mechanism in maintaining class differentials of reproduction is female infanticide, along with female child neglect and mistreatment, producing heavily-male pre-marriage age sex ratios and preventing the marriage and reproduction of indigent males (Sections 2.3, 2.4, 2.8, 2.10). This also puts a brake on population growth overall (Section 6.7, Dataset 6.7.2).

F Pre-marriage age sex ratios are shaped by the class structure and the demand for labor through the micro-economic logic of household economies at different positions of landownership. (Sections 2.9, 3.4) Wealthier families kill more daughters to avoid future dowry obligations, but take in more women in marriage. Poorer families raise relatively more daughters to use their labor and to receive brideprice, but lose the daughters at marriage age and fail to take in enough women in marriage to fully reproduce their own numbers in the next generation.

G Overall, pre-marriage age sex ratios are highest where population is densest. Adolescent sex ratios may reach as high as 135 males per 100 females, implying that one-quarter of males marry late or never (Section 2.10). This parallels the general increase in rate of extraction (rate of rent times land rented out) and outflow of the agricultural product from the agricultural sector where population density is higher (Datasets 6.2.2 and 9.3.4), with the additional element that population is densest around areas where intake of the surplus is accumulated (i.e. for China the Lower Yangtze region). The implied intermediary mechanism is that the expenditure of a greater surplus outside the rural sector creates more demand for male labor in town and city where the surplus is consumed in goods and services (Section 6.4).

H Post-marriage age sex ratios reflect the form of the agricultural economy, primarily whether or not there is much hired labor. If there is much land in large estates farmed by hired labor, then adult sex ratios tend to be high, as high as 115 males per 100 females, because hired agricultural labor in the countryside receives wages that afford the cost of subsistence, but not the cost of reproduction. Since there is generally tenancy rather than use of hired labor where population is dense, it also follows that commercialization and outflow of adult male labor where population is dense leads to a sharp drop in sex ratios at marriage age. (Datasets 2.9.4 B, 2.10.1 C, Sections 6.3, 6.5)

I These are the general class relations of reproduction as long as subsistence and reproduction are closely tied to ownership of land. But these class relations of reproduction are altered in some ways to the degree that ownership of land is separated from labor on the land. That is, the prevalence of rented land provides the landless with some control over the means of production and some capacity to reproduce. Moreover, the availability of rented land sets off a race for reproduction of labor to compete for control of rented land. (Sections 2.5, 2.6, 2.7, 6.5).

J This is seen in a heightened rate of reproduction for large tenants and part-owners, and a lowered rate of reproduction for landlords who are entirely separated from production. Such a shift in the class relations of production presages a more general shift in the class relations of reproduction towards the form that is predominant in industrial society, with relatively low reproduction for the owners of capital and high reproduction for the reproducers of labor (Section 6.8)

PART TWO Model Two is presented in Chapter 4.

K The extent of land that is farmed by other than the owner, whether tenants or hired labor, is the major manifestation of the inequality of land-ownership distribution. There is a substantially constant absolute level of income at which owners of land prefer freedom from physical drudgery to further income, the "sufficiency threshold". The sufficiency threshold is on the average achieved at ownership of land producing 450-480 kg. per capita (at least double minimum subsistence of 220 kg.) Therefore the extent of land farmed by others is a measure of the amount of land owned by those whose holdings exceed the scale providing the sufficiency threshold.

L Given a landownership distribution which is more-or-less constant relative to the average, the higher the product per capita, the greater the portion of the population whose holdings exceed the sufficiency threshold, and the greater the extent of land farmed by non-owners.

M Chapter 5 The friction of transport in a pre-industrial society impedes the removal of the agricultural surplus. In general, the lower the population density, the greater the distance to transport the surplus, and the greater the cost of transport and the difficulty of extraction of the surplus (Dataset 6.2.3, implying that most marketing is abandoned if outside markets are too far away). A higher gross income will be required for large leisured landowners to achieve the same net income as under conditions with no friction of transport. Therefore conditions of population density will influence the realized extent of land farmed by others, although the maximum potential extent is set first by the scale of ownership necessary to provide sufficiency to owners in absolute terms of income.

N The extent of land farmed by others, both tenants and hired labor, is proportional to the surplus per land area over necessary subsistence for the farm population (Dataset 5.4.8). This significant relationship is co-determined by the product per capita and the friction of transport. This is a not quite linear correspondence, but a positive curve with slightly decreasing slope, reflecting the shape of the landownership distribution (i.e. the area under the curve of the landownership distribution, accumulating from the richest percent of population down).

O Population density and the friction of transport affects absentee landlords collecting rents from tenants much more than it affects managerial farmers using hired labor (Chapter 7), because they must transport all of the rent due them in order to consume it, either in direct consumption or in exchange on the urban market. Therefore rented land as a portion of the land farmed by others decreases markedly as population density decreases (Dataset 5.5.3). This largely determines what relations of production predominate in the land/labor market, whether managerial farmer/hired labor, or landlord/tenant.

P Chapter 6 The absolute outflow of the agricultural product from the rural sector sets the size of urban concentrations. It also determines the scale of the non-agricultural labor markets that are engendered by consumption of the surplus in the rural sector and the urban sector. (implied by population data, Dataset 2.10.1 D, and migration data, Section 6.4)

Q The outflow of the agricultural product from the producers is parallel to the product of rented land (in fact almost equal to it); the product of land farmed by hired labor makes a lesser contribution to the outflow (Dataset 6.2.2).

R Consumption of the surplus in the urban sector drives urban labor markets and pulls young male migrants from rural households, creating a pool of largely non-reproducing population that is absent from the rural sector, though it may contribute to farm households through remittances. The outflow of surplus consumption also leaves the countryside relatively emptied of craft producers and specializing in agricultural production, except where the rural sector is very close to the nexus of surplus accumulation and in range of benefiting from the overflow of the labor markets.

S Consumption of the surplus within the rural sector provides a secondary circulation back to the rural producers in the form of wages for crafts and personal services, and allows the presence of non-reproducing male labor in the countryside beyond the numbers occupied as agricultural laborers. Thus there is more occupational differentiation within the countryside and within farm households. (Sections 6.3, 6.4)

T This conceptualization of a secondary circulation in consumption of the surplus provides a rationale for core-periphery differentiation, as well as for the land tenure and labor forms that distinguish core and periphery. However, the data in this dissertation has not been organized to specifically address this issue.

PART THREE Model Three, stage one solution for the rate of rent, is presented in Chapter 8.

U The rate of rent does not equal the average surplus and it does not equal the surplus of a land-short renter population. The rate of rent is determined by a land/labor market between would-be landlords and the land-short population. Supply is determined by the number of landowners who can, at a particular rate of rent, achieve the sufficiency threshold in income. Demand is determined by the shortfall from subsistence of the land-short population, and the amount of land they would have to rent to make subsistence, at a particular rate of rent. (Datasets 8.2.2).

V Minimum food subsistence for a self-reproducing population of men, women and children is about 180 kg. grain per capita, or about the value equivalent of 220 kg. grain for all minimum needs, including clothing, shelter, and perhaps costs of production (minimally seed). The estimated income for the poorest fifth of farms in nearly all areas of China, 1930's, is 180-190 kg. grain-equivalent, roughly confirming the absolute level of minimum physiological subsistence, but also suggesting that they may be somewhat short of the costs of reproduction, as also proposed according to Chapter 1 on the class differentials of reproduction. (Datasets 6.3.8 A, B, C)

W The point at which supply and demand meet is the point at which the land-short population optimizes its income while avoiding excessive labor. There are two cases for the working out of this optimization, the deficit case and the surplus case; the boundary is at average productivity of 350-400 kg. per capita (about 1.6 to 1.8 times minimum subsistence of 220 kg.).

X For the low-productivity deficit case, there is no rate of rent at which rented land is sufficient to meet the rental needs of the land-short population. The rent at which they minimize the shortfall is a rent higher than their surplus, implying that they must make up the gap in hired labor, as in a latifundia-minifundia interdependence where hacienda owners provide just enough hillside land to the peons to make them cover part of their own subsistence but not enough to allow them freedom from wage labor. (Datasets 8.5.2, 8.5.3)

Y For the high-productivity surplus case, the land-short population could achieve bare subsistence by paying a fairly low rate of rent, because many large landowners own sufficient land to yield the sufficiency threshold even at a low rate of rent. But by paying a rent that is higher than that which would allow them to merely obtain minimal subsistence, the renters can induce more landowners to rent out their land. With more land to farm, the renters can produce a greater surplus. Their optimization of the rate of rent allows them to retain a portion of surplus on rented land beyond their subsistence (Datasets 8.4.1, 8.4.2).

Z For both deficit and surplus cases, the renters' optimization of the rate of rent, and the solution which seems to best match the empirical data, implies that renters are compelled by necessity to seek subsistence, and also try to retain a surplus, but they calculate also the returns on their labor and avoid producing for the landlord as much as possible. In contrast, the principle of maximization of absolute income does not provide a plausible solution for the rate of rent. (Datasets 8.6.1, 8.6.2, 9.3.2)

AA Chapter 9 The rate of rent over a range of productivity is an inverted "V" (Datasets 8.6.1, 9.3.1, 9.3.2), with the theoretical peak point of rent, after some adjustments for non-linear maximization effects, at about 425 kg. per capita. (This ideal solution does not yet incorporate the effects of population density, but substantially matches the trend of the empirical data.) That is, for the deficit case, the rate of rent increases with increasing product per capita, somewhat like the Marxist assumption that extraction will increase as the surplus increases. But for the surplus case, the rate of rent decreases with increasing product per capita, meeting the general expectations of the marginal productivity theorists in neo-classical economics. Only the supply/demand solution based on the landownership distribution explains both legs of the trend and also the point of transition.

AB Unevenness in the landownership distribution generated by partible inheritance and its interaction with the rate of rent and the rate of extraction (rate of rent times extent of land rented out) seem to provide reason for leaps in the configuration of the agricultural economy between low population density and high population density states. (Datasets 9.1.5, 9.3.3, 9.3.4).

AC At low population density, wages from hired labor mitigate the demand of the land-short population for rented land, lowering the rate of rent in the surplus case and causing a further shift towards hired labor and away from use of tenants. (Datasets 9.4.3, 9.4.4) A decrease in demand for rented land has the opposite effect in the deficit case. (Datasets 9.4.5, 9.4.6)

AD Although the solution for the rate of rent is driven by the subsistence needs of the land-short population, they are not necessarily the beneficiaries of rented land obtained. The logic for this, which is contrary in surplus and deficit cases, depends on the rate of rent relative to the surplus of the renters. (Dataset 9.5.1).

AE In areas where rented land is prevalent, the surplus retained by renters in the surplus case explains the apparent drive for early reproduction of male labor which would allow the household to compete for rented land. (Sections 2.5, 2.6, 2.7)

AF Theoretically, increasing concentration of ownership will decrease the rate of rent, although the rate of extraction (rate of rent times land rented out) still increases slightly. (Dataset 9.7.1 A,B)

These findings are powerful tools for analysis of pre-industrial societies, including those considerably commercialized. They may be applicable in some aspects even to societies that are composed predominantly of agriculturalists but have some modern sector, as in much of contemporary East, Southeast and South Asia.

The models encompass nearly all major economic and demographic aspects of agrarian societies with partible inheritance, but their limitations must be acknowledged again. They are mostly of the nature of the cogs and springs of co-variation, explaining how the enormous machine of the society is articulated and how it functions in daily run-of-the-mill production. They do not explain how the machine came to be designed the way it is, i.e. the origins of the system, or how it is calibrated to keep the processing synchronized, i.e. whether there are feed-back mechanisms or self-righting controls. These questions move into historical analysis, for example whether the machine's functioning in itself has cycles of variation.

Jin and Liu (1992), for example, have systematized from an economic standpoint what is often said about the dynastic cycle, that it coincides with a cycle of relative levelling of landownership in the aftermath of conquest or revolution, followed by slow buildup of top-heavy social hierachy and concentration of landownership until the polarization is intolerable. Jin and Liu do not, however, present empirical measures of landownership concentration; their scheme is mostly interpretation from the historical record. The economics of inequality may complement their scheme, not contradict it, by illustrating how relatively small movements in the underlying structure of landownership might lead to rupture.

The high population density of China and India has usually been perceived in population policy studies as dysfunctional. Although the marginal productivity model depicts population density as inevitably leading to lower product per capita (Dataset 9.4.1), to the contrary the cross-sectional comparison of the data exhibits a positive correlation

between population density and product per capita, for the most part (Dataset 5.4.3). Such an analysis of rice agriculture has been made by Frances Bray (1986); intensification brings higher product per capita.

The level of production is not divorced from the relations of production and the level of exploitation within them, as was discussed at the beginning of Section 5.4 and also earlier in this section. Exploitation can be conceived as forcing higher production, as portions of the population struggle to meet subsistence or retain more surplus. After the analysis of the rate of rent, there is more with which to consider the issue. The topography of the rate of extraction (Dataset 9.1.5) suggested that there may be configurations of productivity and population density that maximize the absolute yield (e.g. tons of grain) of surplus extraction. Population density, which in general increases the rate of extraction and eases the capturing of the surplus, is to the benefit of a ruling class in pre-industrial society, to a point. This discussion is the beginning of a direction for investigating this central question, though much more study of world history and careful reasoning would be required to even propose a definitive answer.

It is, however, possible to immediately utilize the main results of the research up to this point, i.e. the predictions about land/labor relations and the rate of rent, in order to project an evolutionary scenario of increasing population density and its concrete outcome in terms of extraction of the agricultural product. In this evolutionary scenario, following, product per hectare will be set to increase with increasing population density, but at a slightly decreasing rate of increment, until it reaches a ceiling.

10.2 An Evolutionary Scenario: Increasing Population Density and the Relations of Production

The model of the rate of rent has been developed from cross-sectional data taken at a single point in time. Yet the logic of the model and some findings from the empirical study can be applied, speculatively, to conjure up a scenario of evolution over time. Let us review some relevant studies on long-term social evolution in China.

Decreasing Marginal Productivity and the "Nurksian" Point of No Return

The historical research closest to this evolutionary scenario is Kang Chao's Man and Land in Chinese History: An Economic Analysis (1986), which hangs a bare Malthusian model of marginal productivity on rich and creative use of historical sources. His implied conclusion is that by the seventeenth century or so growth in the Chinese population and increasing population density reached the "Nurksian" point at which marginal productivity of additional applied labor is less than the requirements of its subsistence. This is also given as the reason for a transition from use of hired labor to use of tenants in working large estates, which Chao believes occurred some centuries ago in Chinese history. This point is concurred in by Eastman in his overview of Chinese society; his summary is that most of the landlord class vacated the rural sector in the late imperial period, the eighteenth and nineteenth centuries, which was also a period of population expansion.

Chao, following the the marginal productivity logic, believes that the burden of over-population was absorbed by the family economy, and so tenants with their uneconomically intense application of labor yielded a greater profit to landowners than hired labor. This would seem to be a self-defeating agricultural involution. Moreover, over-population may have advanced to the extent that less surplus was available from the rural sector, and the percent of the population that was urban-dwelling fell below that of earlier periods.

Although he does not incorporate it into his economic model, Chao combs historical sources to estimate inequality in landownership in the past, and finds Gini coefficients

generally around 0.6-0.7, in his estimate probably higher in antiquity than in the recent centuries. Chao finds that, with drastically decreasing land per capita, even landlords were mostly relatively small owners in the early twentieth century data.

A Gini coefficient of 0.6-0.7 is equivalent to displacement from equality of about 45-50%, which would be within the range of inequality estimated from the computer simulations of partible inheritance in this dissertation, and just a little on the high side of the examples found empirically from China and Bangladesh.

The evolutionary scenario I have constructed utilizing the rate of rent model does not contradict, but rather complements, most of Kang Chao's observations. However, it differs in several important points of interpretation with his neo-classical Malthusian model. These will be discussed after the scenario is laid out.

My scenario accepts that decrease in marginal productivity occurs over long periods of time with increase of population density, though probably due to resource and soil depletion as well as to decreasing productivity of additional labor applied to the same land. There are of course also factors working against a marked decrease: advances onto new land, increasing time and intensity of labor input (which in the obverse means that early farmers in a plentiful environment would produce enough for their needs, but not the maximum possible with their labor power); advances in crops, tools, and techniques; building up of infrastructure. But at some point of density the limits of labor capacity and environment are approached, and product per capita must decrease. This has been modelled with a curve illustrating decreasing marginal productivity, product in kilograms of grain equivalent on one hectare of cropland, versus number of persons and their implied labor input on one hectare of cropland, as was shown in Dataset 9.4.1 A. The curve shows a positive relationship that at first decreases in slope only slightly as population pressure increases, but gradually accelerates its drop, ending at a slope of zero.

The model of the rate of rent demands concrete figures and orders of magnitude. The point beyond which marginal productivity drops below subsistence for the additional labor (7.5 persons per hectare of cropland) is set at a product per capita (415 kg.) and population density with product per hectare of cropland (3100 kg.) comparable to that

for the Double-Cropping Rice Area (Guangdong and Guangxi Provinces, the tropical and densely-populated South of China), a crucial anchor that affects all of the analysis.[103]

As seen also in Dataset 9.4.1 A, the average product, i.e. product per capita, starts with a steep positive slope at 558 kg. grain-equivalent at a population density of 1 person per hectare of cropland and decreases only slowly, but its downward bend begins to accelerate at 6 persons per hectare of cropland, where it is 456 kg. At 9 persons per hectare, it is at 363 kg., on the brink of transition to deficit conditions. [104]

The Pace of Population Growth

This is an evolutionary scenario for a well-watered area with a long growing season, admitting of extreme intensification and density. It is also a speculation that is not far removed from the comparisons with empirical data seen so far. The product per capita and per hectare at the bottom of the range of population density covered in this exercise, one person per hectare of cropland and 560 kg. grain-equivalent per capita, still implies mostly settled agriculture and socio-economic inequality that forces production far in excess of the needs of the producer. For comparison, according to one field study

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103 The population density per crop area is given as if the absent landlords, who also own and live off the land, if indirectly, were present in the rural sector. Therefore the count of "capita", as if consumers, includes this absent population in the measure product per capita. The count does not inflate to include some other sector of population that may be supported by landlord consumption in an urban sector, such as servants and craftsmen. The absence of landlords causes some inconsistency in the conceptualization of decreasing marginal productivity here, because none of their labor is added to the land. They are merely a parasitic class. In fact, although in the neo-classical formulation the curve of marginal productivity is based on uniform labor inputs, these cannot be seen as inputs increasing uniformly with population density in the model of the rate of rent, because this model specifies inequality in landownership and assumes unequal labor expenditures for different sectors. Be that as it may, let us assume that the increased exertion of tenants and hired labor compensates for the leisure of landlords and managerial farmers, and that in the long-term time sequence product per capita decreases with with increasing population density, as depicted by the curve of decreasing marginal productivity.

104 Economists who do not take into account the effects of uneven distribution of resources and the transfer of surplus from laborers to exploiters (e.g. R.F. Dernberger, p. 25 in Perkins 1975) take average product per capita at subsistence as the point at which Malthusian checks on population, starvation and disease, come into play, but my model places that point at much higher level in product per capita for the whole population.

swidden rice agriculturalists utilize at least ten times as much land in shifting rotation, and do not produce more than 400 kg. per capita of unhusked grain. They enjoy a high efficiency of labor and are not subject to exactions of rent or tax (Dove 1984, pp. 99,101).

I have specified above the contrast with swidden agriculture in order to clarify the initial phase of the sequence in evolutionary time. Population begins very loosely distributed both on the cropland and over the gross area, with room to renew the land through long-fallowing and shifting fields (which could make the scenario more applicable to early European agriculture, which also required meadows to supply grass for cattle and draft animals), and from that initial point begins both to intensify cultivation and to expand onto new land, gradually bringing the fallow under continuous cultivation. A further question is what may be the temporal lapse for the completion of this sequence. In this scenario, cropland is 20% of the gross area when there is only one person on a hectare of cropland; at eight persons per hectare of cropland, cropland is 81% of gross area.[105] Population has increased from 0.2 to 6.5 persons per hectare of gross area, i.e. by 32.5 times.

For temporal comparison, at a steady population growth rate of 20% a century (a modest 4.7% growth per generation of 25 years), it would take 20 centuries to cover the range from 1 to 8 persons per hectare of cropland. According to Dernberger (in Perkins 1975, p. 25), Chinese population increased by 141% from 1600 to 1893, nearly three centuries. This is equivalent to a compounded growth of 25% a century. Historical demographers have suggested a lower average rate of increase than that in world population in previous millennia, but there has clearly been rapid acceleration in the last few hundred years, with population easily doubling in a century. Such a sequence

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105 Numerically, the ratio of the remaining wasteland to cropland is decreased by one-third at the same time that one additional person per hectare is added to the cropland. Logically enough, population attempts to escape the control of landowners as long as possible by opening new lands. In effect, population at first spreads rapidly, but after most of the land is filled, it only makes incremental additions to the arable. This mimics the spread of cultivation onto marginal lands or those which require more intensive labor inputs, e.g. terracing and irrigation. This dimension of increasing density, expansion of arable over the gross area, influences the friction of transport of the surplus and thus transformation of managerial farmers into landlords and assumed urbanization. Incidentally, the assumption that over 80% of the gross area can be cultivated means that most of the terrain in this scenario is a plain with no more topographical irregularity than rolling hills, much less broken by mountains than the real Double-Cropping Rice Area.

from 0.2 to 6.5 persons per hectare of gross area could possibly occur in a few centuries.

Applying the Magnitudes Found in Empirical Data to the Scenario

The specific contribution of the rate of rent model to the scenario of social evolution is to predict specific rates of rent and patterns of land tenure given the increasing population density and decreasing product per capita. It is assumed in application of the model that the landownership distribution is no more skewed than that used previously in this article, a landownership distribution that can be demographically explained by repeated partitions and accumulations at the point of inheritance and transmission of ancestral property; and that relative to the average ownership this distribution does not change over time. This may be a challengeable assumption, but I do not have a more plausible hypothesis to apply. All the patterns that have been presented in this paper are applied in the evolutionary scenario, often with considerable speculative license.[106]

As shown in Dataset 10.2.1, the rate of rent in theory increases steadily from a minimum of 20% at one person per hectare of cropland, to a maximum of 56% at 7 persons per hectare; it drops off slowly after that, as product per capita (numbers shown imposed on Dataset 10.2.3) falls below 400 kg. for the whole population, including landlords. The calculations are not carried further than a population density of 9 persons per hectare, at which point marginal productivity is close to zero and product per capita well into deficit conditions. This last point is a speculation that is slightly beyond the limits of the previous analysis, since the empirical data contains no densely populated deficit areas; I rather think that there may be demographic mechanisms that curtail expansion of the population past that point, especially since renters retain none of the surplus.

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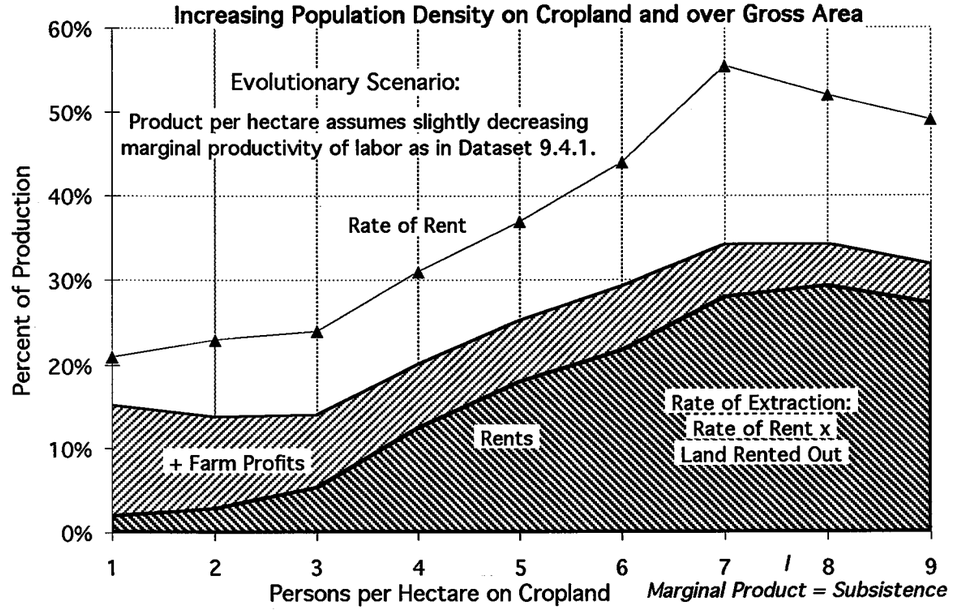
106 The sufficiency thresholds for renting-out land and hiring labor are estimated according to the multiple linear regression coefficients for population density effects calculated in Arrigo (1990) and summarized in Appendix H. The "subsistence demand" is allowed to float as well, depending on estimated hired labor and the portion of rented land obtained by the land-short population. The resulting rate of rent is the solution point of the supply and demand for rented land, under all these stipulations. The only effect that has not been worked into the scenario is the proposed leap between conditions of low and high population density, and this may be envisioned as uneven passage of time scaled to persons per hectare of cropland, with a collapsed lapse of time between say 4 and 6 persons per hectare.

The amount of land rented out also increases with the rate of rent, from 10 units per 100 of total area, to a maximum of 56 units at 8 persons per hectare (see Dataset 10.2.3), and the multiplicative effect of these two is a fifteen-fold increase in extraction in the form of rent, as shown in Dataset 10.2.1 also. Overall, this extraction is highest just beyond the "Nurksian" point at which marginal productivity equals subsistence, as also marked between 7 and 8 persons per hectare. In addition to extraction in rents, if we assume that no less than the same rate of profit is made off land farmed with hired labor as would be collected in rents, then the extraction from both sources together is somewhat greater, increasing from 15% of the total agricultural product of the society to a maximum of 34%.

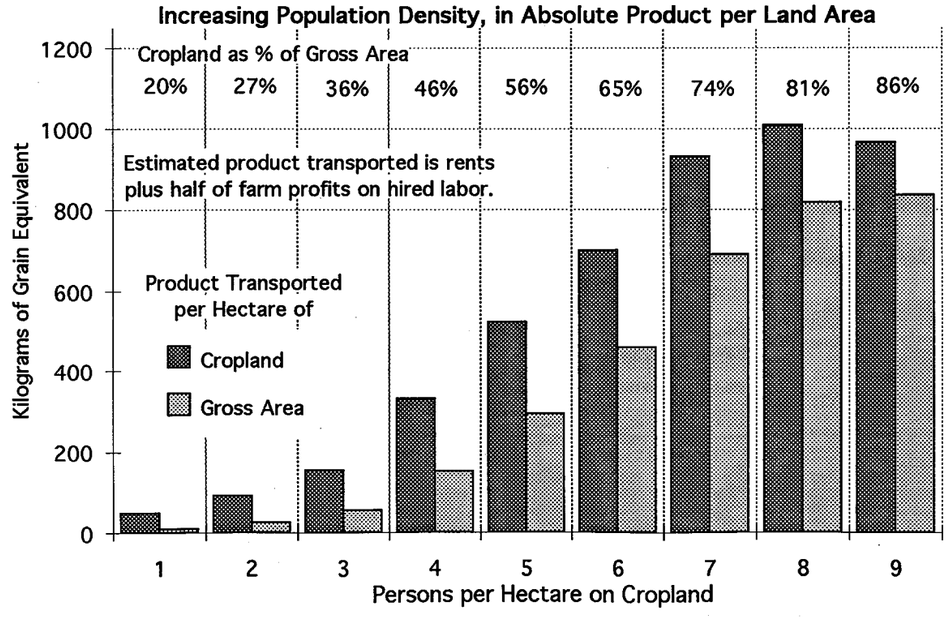
These figures are especially significant for considerations of the rise of an urban sector and state structures when they are translated into the concrete measure of kilograms of grain-equivalent, as shown in Dataset 10.2.2. Dataset 10.2.2 displays the absolute product per land area that might be transported out of the farm sector; this includes all of the rents but only half of the profit from farming with hired labor, since the owners of that land reside in the rural sector and maintain at least a comfortable living there. Given the population density on cropland and on gross area modelled in the scenario, product transported per hectare of gross area does not seem to be significant until density reaches 4 persons per hectare of cropland, after which point it surges in absolute quantity. The maximum transported per rural producer occurs at 8 persons per hectare of cropland, i.e. 6.5 producers; this level of extraction from the farm population could sustain about 3 urbanites, in addition to the 1.5 landlords they are obligated to support in style.

To recapitulate, the surplus per hectare is higher and the welfare of the population is much better before the Nurksian point at which marginal product equals subsistence (between 7 and 8 persons per hectare) is reached, but the point at which maximum extraction from the populace is achieved is at a slightly higher population density. It seems as though a considerable portion of the population must be constrained to small plots and stripped to penury before the owners of property or the authorities of states can exercise maximum control and extraction, in absolute terms of product per hectare — product that is within a certain distance, susceptible to capture by a certain physical force. Thus there may be a logic to expansion of the population beyond the optimal carrying-capacity of the land, not merely the irrationality or inexorable breeding of the species.

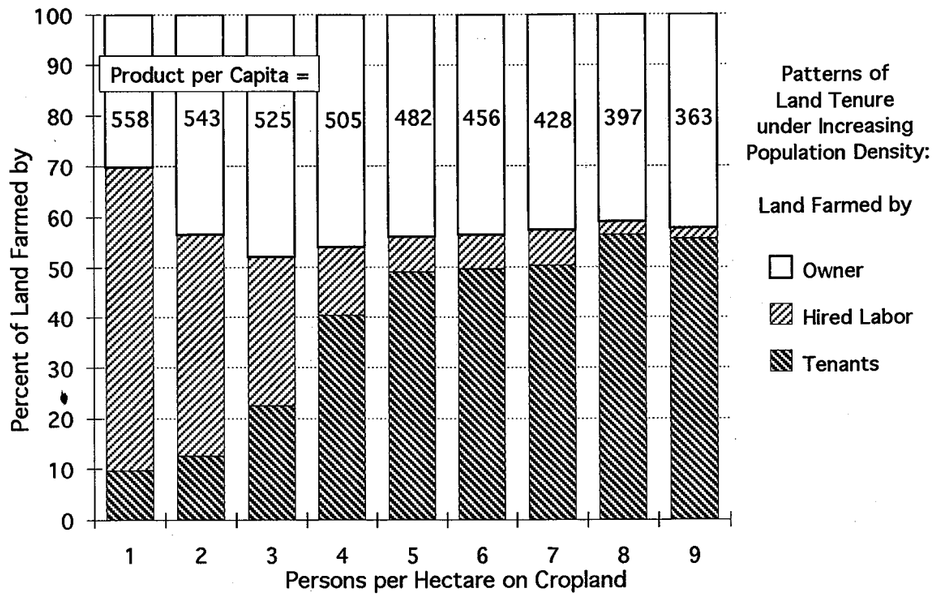
Dataset 10.2.1 Rate of Rent and Rate of Extraction under Increasing Population Density on Cropland and over Gross Area



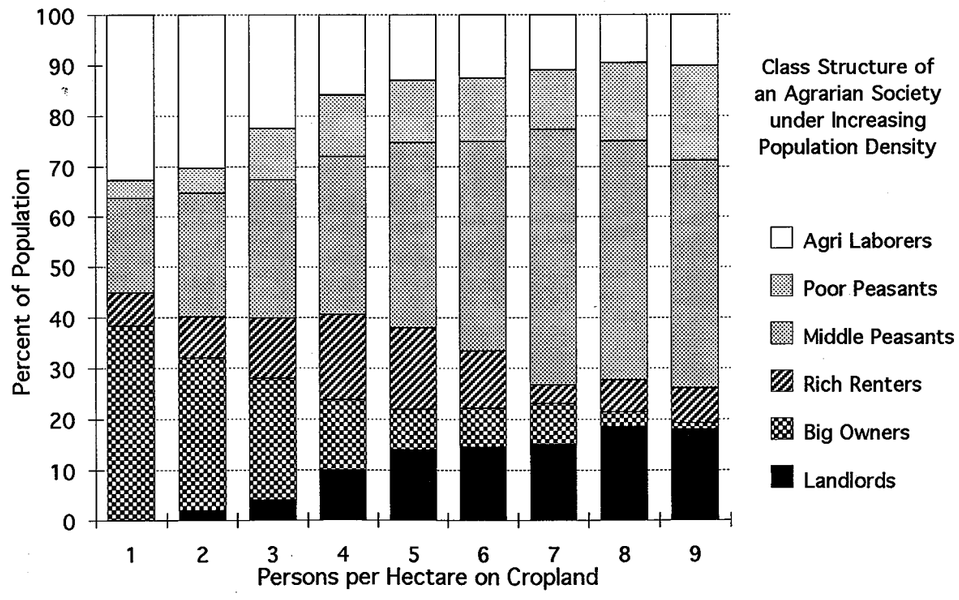
Dataset 10.2.2 Estimated Product Transported out of Farm Sector under Increasing Population Density, in Absolute Product per Land Area



Dataset 10.2.3 Evolutionary Scenario: Change in Relations of Production



Dataset 10.2.4 Evolutionary Scenario: Change in Class Structure



The Evolution of Relations of Production and Class Structure

This application of the model of the rate of rent also gives us indicators of land tenure and social structure over this evolution, illustrated in Datasets 10.2.3 and 10.2.4.

As shown in Datasets 10.2.3, when population is sparse, most of the land is worked by hired labor. This is seen more clearly in terms of land area than in terms of populations of landowners and agricultural laborers, because on large estates labor can be used extensively and worked a maximum number of days. The projection of the coefficients predicts that at the lowest population density, one person per hectare of cultivated land, nearly 60% of all land would be farmed by hired labor; this is population density below the range seen in the Chinese cases, while assuming that hired labor can be found for landowners who want it, an assumption that should perhaps be adjusted. But as population becomes denser, hired labor is supplanted by tenants. As analyzed previously, the rationale for this is complex, involving an interactive dynamic between the subsistence afforded to the land-short population by wages as agricultural labor, and the rate of rent.

In Dataset 10.2.4 the evolving social structure has been stipulated in terms of six classes: landlords, big owners, rich renters, middle peasants, poor peasants and agricultural laborers.[107] These categories, some of which combine different fractions, need to be clarified.

Landlords are the largest landowners, and they rent out all their land. They are assumed to be absent from the rural sector. Land rented out by small owners is taken to be insignificant.

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107 The numbers of landlords and farmers using hired labor are set in the model by the sufficiency thresholds, which depend in turn straightforwardly on population density and product per capita. The product per capita likewise determines the numbers of the land-short population, which increases from 40% to 52% over the course of the scenario. In addition, the previous empirical findings on whether the land-short obtain rented land (see Dataset 9.5.1) allows some finer shading of the picture of social structural evolution. Specifically, we can reach some rough idea of how many of the land-short can obtain land to rent and thus reach subsistence, and how much rented land at what rate of profit would be available to middle-size owners who can then operate as "capitalist tenants" using hired labor. Even a small portion of rented land at a low rate of rent can make this an option for many. This greater detail carries more certainty of the direction of change than the precise quantity, so I have not provided numerical tables to accompany the figures.

Big owners are defined by the use of long-term hired labor, i.e. they are managerial farmers in Philip Huang's terminology (Huang 1985). They may also apply their own or family labor to the land, but, as defined in this scenario, for the class as a whole 50% or more of their production is due to hired labor.

Rich renters are medium-large landowners who by renting in some land are able to reach the level of income and scale of holdings at which hired labor is applied by big owners. This is feasible because at higher levels of productivity the renters retain some of the surplus. The number of rich renters is arrived at by assigning rented land (other than that captured by the land-short at the ratio seen in Dataset 9.5.1) to those just below the status of big owners, and seeing how many could be pushed up to that level by the net income from rented land. Some assumed overlap with big owners is subtracted. It is assumed that rich renters also use some hired labor, so two-fifths of their estimated farm profits on rented land are added to the account of farm profits in general.

Middle peasants include both medium-size owners, and part-owners and tenants who can obtain enough rented land to live well (300 kg. per capita). The latter component, part-owners, increases as the availability of rented land for the land-short increases; they may pay high rents.

Poor peasants are those who lack enough of either rented land or owned land to achieve subsistence on their own farms. It must be assumed that they function partly as agricultural labor, as well as poorly-paid craft and wage labor.

Agricultural laborers are the estimated number of the land-short who can live entirely upon wages, although they may own also slivers of land and achieve part of subsistence from them. Their numbers are generated very speculatively, assuming their labor is applied extensively to the land of big owners (weighted by 0.60) and rich renters (weighted by 0.15); and the more extensively, the higher the productivity of labor.

It is likely that agricultural labor and poor peasants in particular are subject to noticeable immiseration in absolute income and lengthening of labor time when product per capita decreases below 400 kg. per capita, late in the evolutionary span and at population densities of well over six persons per hectare.

The continuous unfolding of the evolutionary scenario may be segmented into three phases:

1. A semi-feudal minifundia/latifundia structure divided between large owners and agricultural laborers (at 1-2 persons per ha.),
2. Presence of "capitalist renters" based on cheap rent and hired labor (at 4-5 persons per ha.), and
3. A relatively egalitarian rural landscape of tenants and part-owners paying exorbitant rents (at 7-8 persons per ha.).

At low population densities and high product per capita, there are numerous landowners who can afford full or partial leisure, but the cost of transport prevents their leaving the rural sector. It must be remembered in looking at Dataset 10.2.4 that it represents the population composition, not percents of farms or families. In empirical data very large farmers commonly have household sizes twice the mean, and three times the median size. According to the figure, at one person per hectare big owners constitute almost 40% of the populace; but the comparable figure for empirical farm surveys would be 20-25% of farm households.

At one person per hectare and a high 558 kg. product per hectare, those who lack enough land for independent subsistence are fewer, but still 40% of the population. The land-short obviously must seek to make up the shortfall by wage labor. The rate of rent is very low at low population densities, and consequently there is little rented land available. This configuration depicts a minifundia/latifundia structure, one in which the subsistence of farm laborers is subsidized by their own production on tiny holdings they own or rent, but they cannot escape submitting themselves to labor for the estate masters. Master/laborer ties may resemble feudal servitude. All the same, at this high product per capita and high demand for hired labor, the land-short may very well achieve a margin over subsistence as agricultural laborers. This speculation is consistent with findings by W. Kula in An Economic Theory of the Feudal System (1976) that wage labor was relatively expensive in Poland until the 18th century. It may be expected that population would increase very slowly under these conditions, since marriage is particularly constrained for dependent laborers.

Are the Characteristics of Feudalism Set by Low Population Density?

The speculation of a parallel or continuum with European feudalism may be pushed farther. With so much land available at low population densities, from the perspective of the rate of rent model it is not possible for large landowners to extract much rent; so private property customs might be weak. Wages to labor would probably be high in terms of grain, if not in terms of cash. It seems unlikely that under these conditions actually 38% of the population would be big owners enjoying use of hired labor, as projected in Dataset 10.2.4 for one person per hectare on cropland (only 0.2 persons per hectare of gross area). On the other hand, if there were greater concentration of

landownership,[108] i.e. a more unequal distribution, the market solution for the rate of rent and/or profit on hired or serf labor would theoretically be much lower. At the same time the slightly higher rate of extraction would be spread over a larger population (see Section 9.7), and presumably less burdensome. With higher landownership concentration the leisured class would be smaller, though its average consumption per capita would be much higher.

The figure for rate of extraction in this scenario at lowest population density, 9% of the total product, is comparable to what may be gathered from W. Kula's budgets for Polish feudal estates and other information (Kula 1976, pp. 29, 65, 104), in the range of 5-15%. Section 9.1 posed the suggestion that social systems might "leap" or transform rapidly at certain points of increasing population density. The rate of extraction would almost certainly be in the low extraction, low population density state.

More concentrated "landownership" plus the dispersion of population under extensive agriculture could explain the low yields to feudal lords, rather than the low productivity of agriculture that is usually cited. In this alternative vision, then, most feudal peasants may have lived fairly well and produced less because less was extracted from them given the equilibrium of the land/labor market. We have also seen in this research, Chapter 6, that low population density inhibits external trade and marketing and necessitates differentiation of production internal to the agricultural economy, the general features of a feudal desmesne.

Continuing in this vein, the model could also be taken to imply a rebuttal to the concept of "extra-economic extraction" that Marx attributed to feudal society, extraction by coercion usually interpreted to be of arbitrary or militarily-determined level. Of course all extraction is based upon some form of coercion, if only the state coercion that maintains property rights and enforces taxation. But it may be argued from the model

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108 The distribution of landownership shown in German and Prussian data for the late 19th century was about 60-65% displacement from equality (calculated from Tracy 1964, p. 85, N = 5558 holdings), much higher than the standard of 42% displacement from equality for a society with partible inheritance applied in this research. East of the Elbe, including Prussia, has been considered the region where European feudalism lingered longest. A sample of 694 farms in the Netherlands, 1721, an area of early commercial development, showed displacement from equality of 38%, comparable to the Chinese data (calculated from de Vries 1974, p. 135).

that the level of extraction averaged over time must be set by some sort of economic equilibrium, perhaps equivalent to that of the demand for and supply of rented land.

There is also more to say on the basis of the demographic models of the dissertation. There may be a further logic for the presence of feudalism at population densities probably even lower than the 0.2 persons per hectare (20 persons per square kilometer) of gross area that is the starting point of the evolutionary scenario. Feudal lordship over a large domain is maintained by impartible inheritance and even augmented through occasional female inheritance (i.e. merging of estates through marriage). We have seen in Chapter 1 that, according to Model One, low rates of land accumulation could be balanced by low class differentials of reproduction to create a stable system of land/labor relations. In fact Dataset 1.2.7, the compiled results of several computer simulations with concurrent differential reproduction and land concentration, contains a hint that the highest degree of inequality that is stable under low accumulation, low differentials of reproduction may in fact be higher than that under conditions of high accumulation, high class differentials of reproduction (see discussion around Dataset 1.2.7). And very low class differentials of reproduction are in effect nearly the same as impartible inheritance: one son inheriting from one father, whether rich or poor, lord or cottier/serf. Then impartible inheritance, a very high concentration of ownership, low rates of extraction, and an inward-turning economy are features of a coherent system at low population density and medium-high levels of production.

The form of feudalism and the transition from feudalism to capitalism are beyond the scope of this dissertation, but it is not beyond the range of the kind of models that have been developed here. Consideration of such a contrasting system enriches reflection on the Chinese agrarian economy. While the above discussion of feudalism is only a speculation, it is an example of the possible applications and implications of this research.

"Capitalist" Renters Profiting from Hired Labor

But let us move on to slightly more familiar circumstances that may be comparable to more recent history in Europe, though on the horizon of past centuries for China.

Medium-large owners renting in land appear as soon as rented land is present, particularly since the rate of rent is low in the early phases of population growth; they are able to engross the lion's share of rented land. But until rented land is a substantial portion of the total area, it cannot serve as the basis of extensive exploitation of labor by rich owner-renters. In the step from 3 to 4 persons per ha., rented land increases at the highest rate, nearly doubling from 22 units to 40 units; while the rate of rent after the step, at 31%, is still far below the average surplus. Less than half of the land-short population can obtain enough rented land to reach subsistence; 13 out of 40 units of rented land go to the land-short, 27 units to rich renters. The segment of rich renters is most sizeable at 4-5 persons per hectare of cropland (480-500 kg. product per capita), but decreases thereafter.

Therefore, it is at about 4 persons per hectare that the conditions appear for "capitalist" tenants or part-owners to exist alongside estate owners: that there is availability and a profit to be made on rented land, and a labor force that is still somewhat dependent and limited to the agricultural sector. But although the existence of large tenants producing for the market with wage labor has been taken as a mark of the rise of capitalism in sixteen and seventeen century Britain, there is nothing in the model to mark it as other than a particular phase in relations of agrarian production under increasing population density. It might be contemplated then that there were other factors that made Britain a center for surplus accumulation and set a different trajectory for further agrarian and commercial development.

Tenants: Exploited and Free

The next phase in the evolutionary scenario of increasing population density is a transition to a tenant peasantry which pays high rents but is free of personal dependence or labor burdens to landowners. At 6 persons per hectare, 456 kg. product per capita, and an increased rent of 44%, 25 out of 50 units of rented land are available to the land-short. The land-short, who are 46% of the population, would all be able to achieve independence as tenants and part-tenants if this rented land were distributed among them according to need. Since this is probably not the case, some minority of the group still labors in agricultural wage labor, though most appear as middle-income part-owners. In fact, this tendency towards equalization of holdings reaches its height when

the rate of rent is highest (56%), at the point that marginal productivity equals subsistence (7 persons per hectare of cropland). Thus, ironically, when exploitation is highest, the appearance of income equality is greatest. This disguise is augmented by the absence of most of the largeholders, the landlords, from the rural sector. There may still be large renters, but it is unlikely they can afford or can obtain much long-term hired labor, because they must pay such high rents and wage labor costs may be inflated by urban labor demand.

A new population dynamic logically appears at this point, I believe, as has been seen in Chapter 2. Expansion onto rented land for individual families turns on the reproduction and control of a large family labor force. Where rented land is nearly half the cultivated land, variation in farm size increasingly reflects variation in labor power. The positive relationship between landowning and rate of reproduction begins to be inverted, as tenants propagate at an stepped-up pace and rentiers consciously or unintentionally curtail their numbers of heirs. In the aggregate, the relative equalization in the farm sector may facilitate the poor marrying and continuing to reproduce on the land towards a density at which the decrease in average product per capita accelerates. The Malthusian forces are embedded in the socio-economic matrix of exploitation.

After this discussion, the model of the rate of rent again begins to look more like sociology, rather than purely abstract economics. But notably, the sequence of evolution calls on no factor of class struggle or political mobilization, it is merely the working-out of a market relationship between the owners of land and the hands of labor. Although what has been presented in this section is a paradigm dependent ultimately on variation in only one dimension, the density of population on the land, it carries myriad implications for historical sociology, even for deliberations on the transition from feudalism to capitalism. For instance, it could be envisioned that there is a point in this evolution, say at the point at which "capitalist tenants" are numerous and farming still fairly extensive, when a breakthrough to a greater predominance of mercantile relations over landed gentry/peasantry relations would be possible, given favorable ecological and political conditions. Past that point, though, there may be no return from a "high-level equilibrium trap", à la Mark Elvin (1973), in which product per capita is so low and extraction from the countryside to a parasitic urban sector is so great as to prevent accumulation of productive capital in agriculture, or even extensive rural manufacturing like that seen in proto-industrialization in Europe.

Finally, to go back to the broad evolutionary perspective of extraction of the surplus, disparate social forms may be reinterpreted in terms of the forces of a land/labor market even if there is no obvious institution of private ownership. For the purpose of estimating the rate of extraction it may not be necessary to differentiate land rent from land tax or even from head taxes, feudal dues and labor service and other exactions that fall on the peasant producer. Though operating under different legal and social rubrics, they serve the function of dividing the product of the land between the producers and those who dominate them. It may be that the state commands tribute from the peasantry, directly as under the Ottoman Empire (discussed in Moutafchieva 1988, Chapter 3) or indirectly as under the *zamindari* system in India; such extraction probably reflects an environment in which land is plentiful. Or it may be that the state merely collects a portion from landowners while enforcing their rights of private ownership; for example, Y. Muramatsu, based on his analysis of rent collection accounts in Kiangnan, a fertile and densely-populated region of east-central China, judged that landlords collected something more than 50% of the rice crop, and paid 13% of their receipts in land taxes (Muramatsu 1959, p. 583). In either case it should be possible to specify conditions of separation from the means of production, and estimate the levels of production and the flows of surplus.

These may be distant speculations, coming as they do from a model developed from a study of intensive agriculture in China, but it is an example of the kind of reshaping of thought that may proceed from the model of agrarian society laid out in this dissertation.

10.3 The Mode of Production: Feudal, Petty-Commodity, Capitalist — Or None of the Above?

Karl Marx typified varying social formations, widely separated in time and space, as "modes of production". The term highlights what he understood as a central and determining structure of any society, the "relations of production", which set particular mechanisms of extraction of the surplus. Such relations were characterized and contrasted according to the particular relationship dominant in them: household master/slave; feudal lord/serf; industrial capitalist/laborer.

But this characterization having been set in place and having served a useful pedagogical function, it seems to have calcified due to repetition and to the general Enlightenment vision, in which Marx shared, of Progress through successive stages of human development. Thus, I presume, there followed scholarly attempts to reconcile myriad apparent contradictions, contradictions springing from assumptions that hired farm laborers are figments of past social forms, or that cash rents must displace agricultural rents in kind, etc. Even more complex has been the depiction of "articulation of modes of production" that explains the mixing of relations of production in one time and place. Because each mode is characterized by its typical relations of production, it becomes a task to explain why there is a divergence from "pure" types, a task which may be an extraneous byproduct of the invention of pure categories. That is an extensive literature that I am aware of but will not address directly here.

Is Extraction of the Surplus Prior to Capitalism "Non-Economic"?

Several significant articles published from 1976 through 1987 dealing with the transition from feudalism to capitalism have been conveniently compiled in The Brenner Debate: Agrarian Class Structure and Economic Development in Pre-Industrial Europe. (Ashton & Philpin, 1985). The following extended quotation from the introduction serves both to introduce general Marxist concepts that have informed my investigation and to locate a few that have been jettisoned in the course of this research.

> In medieval society, as in all pre-capitalist economies, agricultural predominated over industrial production. The peasants, who were overwhelmingly the principal producers, certainly put some of their product on

> to the market in order to acquire cash to buy industrial good and products like salt, and especially to be able to pay rent and tax. But most of their production was for self-subsistence and economic reproduction. The luxury goods of international trade; the cathedrals, castles and other massive building enterprises; arms and armour for war and plunder; and all cultural artefacts, depended primary on upper-class demand. Variations in the demand for non-agricultural products by the peasant majority of the population only minimally affected the upper reaches of the economy. It was variations in the incomes of the landed ruling class and its states which were crucial. But what determined these fluctuations? Since the principal component of these incomes was rent, one must enquire what determined the level of rent. It is here that the Marxist contribution becomes relevant. Medieval peasants were not free agents in a market for land which they could take up or leave as they wished. Most of them lived in traditional communities which probably pre-dated feudal lordship. A high proportion were legally servile or, if free in status, were nonetheless dependent on the power of the landlord. For Marxist historians, whatever may have been the influence of the land/labour ratio or of the technological level of agrarian production, the power of the landlord was a crucial element in determining the level of rent. The relationship between landlord and tenant was "political" rather than "economic", hence the use of the term "non-economic compulsion" — contrasted by Marx with the free bargaining between capitalist and wage-worker in a capitalist economy. Non-economic compulsion was not, however, uniformly successful. The exaction of rent, whether as labour service, in kind or in cash, would be seen by the peasant producer as an open appropriation of his product. It was resisted more or less strongly and in many different ways, ranging from labour service inadequately performed to open rebellion. This was the conflict of classes, central to Marxist theory.
>
> Central, but not exclusively so. The contribution of Guy Bois to this debate reminds us that there are important divergences between historians working in the Marxist tradition. To understand these divergences, it is necessary to be aware of the principal tenets of historical materialism. This is by no means a fixed canon: there is debate within Marxism as well as between Marxists and non-Marxists. Nevertheless, the concept of the "mode of production" is accepted by all Marxist historians as an essential tool in undertaking historical investigation. Since Marxism is a materialism, a mode of production is understood as being based, first, on what Marx called the "forces of production", that is, natural resources, technology and labour power — the relations between humanity and nature in the struggle to exist and to reproduce. The second element in the definition is the "relations of production". This brief term essentially describes the relationships between the owners of the means of production and those who, through their labour, provide not only their own subsistence but the income of the owners. The relations of production naturally vary considerably according to the level of development of the forces of production. In what Marxists call the feudal mode of production, this is essentially the relationship between peasants and landlords — or perhaps one should say that it begins with that relationship, for historical development produces other classes and other relationships, in particular with the development of markets and urbanization. (Ashton & Philpin, 1985, p. 5-6).

I agree with the authors in the overall view of agrarian society, that there was a one-sided flow of the surplus from peasant to lord, and that this was the central feature of the

relations of production. But I take isse with the concept of "non-economic compulsion", which has been contrasted with the labor markets of industrial society, perhaps a device to differentiate stages. The concept is stated more starkly by Brenner in his article in the same compendium: "Thus serfdom involved the landlord's ability to control his tenant's person, in particular his movements, so as to be able to determine the level of the rent in excess of custom or what might be dictated by the simple play of supply and demand" (p. 26).

This view of Europe in the Middle Ages has led some Marxists (e.g. Wally Seccombe, personal communication, and others) to object to my application of economic rationality to pre-industrial Asian society; they quote Marx to the same effect as Brenner, that exploitation in pre-capitalist society was "extra-economic". My view, to the contrary, is that the economic, political, and coercive mechanisms cannot be separated, and that it is not necessary for obvious capitalist markets to be present for land and labor to reach a dynamic balance, as shown in my analysis of the rate of rent. It may be noted that research in recent decades such as Kula (1976), John Kautsky (1982), and Durrenberger (1984) has found economic logic in feudal and tribal society. I believe that the decline of the feudal order and transition to capitalism in European history will yield to demographic and economic analysis.

Is Class Struggle Irrelevant to the Long-Term Structure of Land/Labor Relations?

The tug-of-war among demographic, economic, and political explanations of social evolution is also recognized in Ashton and Philpin's introduction to The Brenner Debate. The following quotation serves to neatly summarize the initial realm of considerations in my own outlook.

> ... What caused movement in history? For Brenner, the class struggle has primacy. But his Marxist critics are aware that Marx himself, as well as many working in his intellectual domain, emphasize that developments in the forces of production — new technology, new means by which labour is organized, the economic success of new social classes — come into conflict with the existing relations of production, and, of course, with the legal, political and ideological superstructure. So, to which element in the mode of production do we ascribe primacy in causing movement from one social formation to another? It is possible, somewhat crudely, to give primacy to technological development ("The handmill gives you society with the feudal lord, the steam-mill society with the industrial capitalist" to quote an early formulation of Marx). But it is also clear that those who would give primacy to class conflict must recognize that, however

> crucial in feudal society was the determination of ruling-class incomes through the struggle over rent, this struggle by no means occurred in an unchanging context. In particular, as Maurice Dobb suggested many years ago, the land/labour ratio is of crucial importance in a society where peasant production predominates. ... These contradictions cannot be understood without appreciating that labour power is crucially affected by the essential elements in the demographic profile of a society — birth, fertility, mortality. This, above all, in a society where the basic units of production — the peasant holdings and the artisan workshops — had a labour force based on the family.

At the end point of this research, the demographic and economic dimensions have emerged as central, and little room has been left for purely political explanations of the type Brenner proposes. As the ongoing "Brenner debate" suggests, Marxist scholars have not been entirely satisfied with the explanations of social evolution to date, and several have pointed in general terms to demographic determinants. Those advocating consideration of demographic and environmental factors, however, probably did not anticipate taking the analysis as far in that direction as I have done. From the perspective of this research, it might appear that class struggle should be relegated to the role of a transient epiphenomenon when it breaks out in social upheaval, or of a function within the system that is part of an ongoing contradiction between exploited and exploiter. That leaves little leeway for the willful transformation of the system. However, if class struggle may be said to operate within economic mechanisms, as in the renters' optimization of the rate of rent at a point that puts minimum labor into the landlords' share (see Datasets 8.4.1, 8.4.2, 8.5.2-3, 8.6.1-2), it has not been excluded from my paradigm.

It could also be proposed that class struggle consists of "everyday resistance" that is incorporated within the relations of production: hired labor will not work to the maximum and tenants will not pay full rent unless coercion is applied, and the ruling class must exercise constant vigilance and go to considerable expense to apply appropriate coercion. Intensification of production by renters so as to keep more of the surplus could also be seen as struggle over the product of the land. Be that as it may, the implications of this research and its models of agrarian economy are that recourse to the explanation of class struggle as the motor of history should be rethought.

Modes versus Processes in Delineating Social Formations

The above conclusion is not my only purpose for this discussion. The very conception of modes of production as discrete, self-contained and unique phases of social evolution should be questioned. I do not see that there is such disjuncture in the logic of social structures when they are understood in terms of their components; even the contrast between "pre-capitalist" and "capitalist" forms has been overblown.

The general problem of the conceptualization of social evolution as discrete stages may be seen in many contexts of discourse. It appears in the Lenin-Chayanov debate and in some China studies debates, both concerning the manifestations of commercialization.

For example, in his Development of Capitalism in Russia, Lenin compiled a great deal of information on small-scale industry and agricultural capital, such as horse and oxen teams owned by rich peasants, which he took as signs of the penetration of capitalism and increasing inequality. It is possible that differentiation among the peasantry was increasing, though Lenin's sources do not have sufficient historical depth to confirm it. But it is even more probable that various industries and crafts — oilseed processing, paper making, metal forging, cart construction, leather working — had always been part of the rural economy, and should not have been assumed to represent a new form, capitalist penetration. It has been the finding of recent social history on Western Europe, beginning with Kriedte, Medick and Schlumbohm's Industry before Industrialization (1981), and the point has been strongly made as well by Charles Tilly, that increasingly centralized production in fact began to deindustrialize the countryside long before the Industrial Revolution. This view should put a different slant on how we conceive of commercial and craft activity in the Russian or Chinese rural sectors in the early twentieth century.

In addition to this, the problem of articulation of modes of production, arising from a stage-described typology that is then puzzled by a mixture of relations of production on one landscape, is not an issue if different relations of production are seen as merely outcomes of positions in the array of possibilities of ownership or alienation from ownership, all of which exist simultaneously on a graduated landownership distribution. Further adding to this variation the patterning that is attendant on core-periphery relationships, a mix of relations of production should be the norm, and may require no explanation of transition from one mode to another.

In the case of China, private ownership of land was already well established in previous centuries. Aside from periodic markets in which peasants exchanged their craft wares, regional specialization of porcelain and silk production for export likewise had a history which predates Western incursion. Can it be said that gradually growing though still very limited cash cropping from the late Qing through to the Republican Period indicated an incipient transition to capitalism? There was also impressive growth of specialized production and international trade in the Song and Yuan periods, and period of withdrawal from international trade as in the Ming. The numbers can be reviewed, and either their growth or their limited scale emphasized for an interpretation of one stage or the other. But do we need to specify a stage and a period of "transition", or is it enough to describe an incremental change, without a teleological assumption that it must be a movement towards a next stage? The mechanisms encompassed in this research, variation in the relations of reproduction and production and the extraction of surplus, plus outflow and secondary circulation of the surplus with core/periphery differentiation, may be sufficient to frame the range of agrarian society.

My thought is that social processes have a general continuity and continuation, and also internal counter-currents and contradictions, all of which may swell or shrink in relative or absolute volume and thus vary in manifestation and net outcome. I would be relieved to jettison the "mode of production" terminology and typology in favor of a more detailed specification of the processes of the society and economy, both rural and urban. Consider Esther Boserup's analysis of how modes of agriculture change along with population density: In general, growing populations take up more intensive agricultural techniques, such as plowing, fertilizing, and transplanting, in order to raise yields per land area, at the cost of more labor per unit of product. But if population is decimated through war or disaster, those remaining are likely to revert to less demanding "primitive" techniques, such as shifting agriculture and broadcasting of seeds (Boserup 1965). It need be no mystery that peasants aim to save unnecessary labor, and may also be relieved to escape state control if possible. Such change only appears historically "regressive" in anticipation of an onward march of history marked by increasing technical complexity, productivity, and rising state structures. But such change may just be the variable workings of simple responses to ecological conditions. The fact that social evolution is generally described in rather static, pre-determined stages only indicates that the processes and relationships have not yet been traced and understood,

and the description serves to provide a mnemonic of general observations. I hope that this dissertation has made a contribution towards rectifying that.

This being said, however, it can be recognized that the form of capital and of labor/capital relations has shifted dramatically in industrial society. Land is no longer the critical capital, though it is still necessary, and production is increasingly concentrated in location and in control, a condition very different from agrarian society. In Section 6.8 I speculated on how the relations of reproduction of agrarian society as seen in Chinese and South Asian might be gradually transformed in the early stages of industrial development. However, I am not ready to propose a counterpart to the economics of inequality for industrial society.

The Existence of Markets Does Not Imply Equalization

A similar response is due to the free-market enthusiasts in China studies, a brief one since some of the matter has already been covered in the Introduction to the dissertation and in Chapter 6. If markets of the early 20th century were nothing new in Chinese history, then there is no reason to think they were the harbingers of new miracles of capitalist market-generated equality (see Huang 1991, pp. 305-9). But there is also no reason to deny that increasing capacities for transport and production were reshaping economic interactions in many parts of China.

From the perspective of this research, the major outcome for the rural sector was probably increasing outflow of the agricultural surplus, with loss of income from craft production. But it would also be expected that wages would rise near the locus of surplus accumulation, due to consumption of the surplus, and that there could be some spillover into rural incomes in nearby areas. That would be part of increasing core/periphery differentiation (as Skinner noted in comparing his regional analyses of Lingnan, the southeast coast marketing region centered on Canton, for 1984 and the1890's; Skinner 1994, p. 23). Huang and Brandt could both be correct in their observations, within particular sectors of the core-periphery differentiation. But the specificity of the outcome for different sectors of the population and different geographical domains would

have to be recognized. [109] The same tack of analysis should be applied to the current phenomenal growth of markets and production in the Peoples Republic of China, and concurrent flood tide of "floating" population and renewal of old social practices such as female infanticide and sale of women.

However, the most important critique of the Brandt-Myers school from the perspective of this research is that the activity of markets does not imply equality. Markets are merely the working out of exchange relations, exchange relations that are markedly shaped by inequality in all class societies.

This is seen most clearly in the solution of the rate of rent, which is driven by the subsistence requirements of the land-short population. If there were no inequality in resource endowments, then desire to till more land would probably be driven by labor capacity and in particular by the household dependency structure (consumers/worker), as Chayanov concluded for Russian peasants in communal villages. Rents would not be part of the structure of class domination (rich peasants paid rents to poor peasants for use of their land allotment, as analyzed from Lenin's data in The Origins of Capitalism in Russia. Arrigo 1988 unpublished ms., p. 37). But for China private ownership of land provided both differentiation within the peasantry and the major class relationship of domination and extraction, all within market mediation.

To state the case mildly, it is one-sided to conceive of rented land and agricultural labor work as providing opportunities for poor peasants to obtain income, while ignoring the underlying conditions of inequality that force them to give up a large portion of the product of their labor. Such labor only very marginally redresses the inequalities of income from landownership, as shown in Chapter 6, especially Dataset 6.3.8. The hope and promise of capitalist industrialization has always been that generally rising standards of living would follow from increased productivity. That may be the outcome

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109 For some reason the free-market enthusiasts do not take well to core-periphery analysis; perhaps it would force them to acknowledge problems in their celebration of the benefits of markets and capitalism. In 1986 Sands and Myers attacked Skinner's regional systems approach with its with core-periphery distinctions, even though Skinner's scheme does not incorporate the flow of surplus as proposed in this dissertation, which provides the link of exploitation between city and countryside. This attack set off a debate in the Journal of Asian Studies (Little and Esherick 1989, Lavely 1989).

in some times and places. But there seems no reason to think that labor should fare any better in respect to industrial capital than under agrarian capital.

This discussion by no means exhausts the quarrels that could be picked with the free-market enthusiasts, but perhaps they will surrender rather than exhaust themselves trying to create alternative explanations for the empirical findings in this research. A more important question is where future research in this paradigm might go. Even after a solid five years at it, there is still some work that could be done on the present body of data.

10.4 Researchers of the World Unite! The Next Five-Year Plan

Let us return to the starting point of this research, the relationship between the relations of production and the relations of reproduction. This is the knottiest conceptual issue. Reproduction is logically linked to the relations of production and the conditions of exploitation, in that the workers can be denied their cost of reproduction, though for the most part not their current cost of subsistence. But the exploited class must be reproduced in order to continue the system. In agrarian society, at least, with the major capital, land, the direct source of the crucial sustenance, food, we should be able to come to a firm understanding.

The model of class differentials of reproduction provides a way to begin dealing quantitatively with this puzzle, but solves only part of it. We need to examine an even wider vista of agrarian societies than just the densely-populated East and South Asian ones, and to reach a more articulated understanding of how portions of populations reproduce or fail to reproduce, and what might be the large-scale logic for it. For the specifics we must ask what are the social and economic mechanisms that channel the reproductive patterns. Much fieldwork and detailed study has already been done along these lines, such as from study of parish registers in England and Europe, but for the most part this has only been done from a demographic perspective (for example Wrigley and Schofield 1981, Lutz and Mendels 1979, Chojnacka 1976, Hajnal 1982). A vast amount of scholarly work needs to be done to integrate demographic and economic findings. I hope this dissertation points the way to the centrality of structures of inequality in any such integration and analysis.

The scale of such a mission is daunting. I can only think in terms of what could be done further to improve and advance the present research.

The precise shape of the landownership distribution needs further investigation and modelling; it may yield further clues to the pattern of reproduction by class. Moreover, it is likely that the landownership distribution in systems with partible inheritance is not entirely constant in profile, although it is probably constrained within certain boundaries of degree of inequality; it may reflect somewhat the rate of exploitation, even if that rate is balanced by differentials of reproduction (e.g. a higher peak or a bigger bulge of medium-large owners).

Comparable analysis could be done for other areas with conditions similar to China's, in particular for Bangladesh, in which extensive surveys have been carried out. Aside from the surveys of ownership distribution in every district of the country reported by Jannuzi and Peach (1980, based on a sample survey of 35,000 households), there are several published national surveys on cultivated land, crops, and yields put out by the Bangladesh government. These may be sufficient to replicate some of the study I have done for China.

Greater precision in estimating the underlying landownership distribution in this research would allow a sharper focus on all the other calculations of land tenure and agrarian economy. If the population density data could also be improved and information on rates of urbanization and non-agricultural population marshalled, then it might be possible to move farther towards a core-periphery analysis, breaking the large cropping regions of the Buck survey into smaller geographical units as much as feasible. G. William Skinner, Anthropology, Stanford University, and Lawrence W. Crissman, Director of the Austrailian Centre of the Asian Spatial Information and Analysis Network, Griffith University, are the people who have the database compilation, computerized maps, and the resources to do this (Skinner 1994, Note 16).

The major volume of data in the Buck survey which still seems promising for investigation is the crop allocation data, for which portion of crop reserved for seed, sold, consumed, used for animal feed, used for industrial processing, etc., could be summed up across crops in the same way as I estimated the rate of rent. This could be related to labor, production and marketing data in the Buck survey to investigate concrete and class-differentiated patterns such as the tendency of poor peasants to grow potatoes to eat and cash crops or high-price staples like wheat and rice to sell (Arrigo ms. 1983). In addition, a shortcoming of the present study is that I have not precisely pinned down the level of minimum subsistence and sufficiency in terms of net farm receipts, rather than gross production. More work could be done to estimate the costs of production and how they may vary by region, size of farm, and land tenure form. These topics are some of the nitty-gritty that would be involved in further specifying the volume of the surplus and the labor expended in its production.

Aside from these empirical questions, the three models of the economics of inequality have not yet been taken to their full potential. Model One was finally programmed about two years ago to the point of incorporating both class differentials of reproduction and

accumulation of land for the wealthy (along with loss for the smallholders), but for a decent-sized population of 2,000 or more, enough to dampen random fluctuations, the program runs at a snail's pace. So the full range of the balance between reproduction and accumulation has not yet been explored. More features should be incorporated to better reflect what can be known about patterns of reproduction, such as slightly lower fertility for rentiers, and in order to make more interesting projections of the evolution of relations of production. But that means starting again from scratch.

Likewise, not all elements proposed in Part Three, Chapter 9, to modify the first-stage solution for the rate of rent have been incorporated into an automated program that would find the land/labor market equilibrium quickly. This means, for example, that it is cumbersome to explore the theoretical possibilities of rates of extraction under different social forms; but this might be one of the most interesting applications of the rate of rent model.

We might imagine that, after extensive development of the agrarian models by competent and socially-concerned computer hackers, the class differentials of reproduction, the land tenure relations, the secondary circulation of the surplus, and the determination of the rate of rent would all be fused together into the mother of all computer programs, with graphic display.

Comparative data from a multitude of historical periods and environments would be fed to the computer. European, African, and pre-Columbian New World specialists would weigh the results. A new theory of the rise of civilizations and the movement of history would emerge. For myself, after these many hard years of lonely research, I'd like to enjoy the intellectual fruits of others' labors in this field and to be invited to posh conferences in exotic locales.

艾琳達

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APPENDICES

Appendix A Indicators for Ranking of Localities by Economic Status — Data from Buck, Chinese Farm Economy, 1930

County and Province of Locality, Ranked by Economic Status		N of Families	Family Earnings, Cash & Kind	Non-Farm Income	Crop Area (ha.)	% Farm Land Rented (by Ch$)	Land Owned, Value in Ch$	Owned Bldgs, Trees, Tools,etc.	Family Size	Man Equiv-alent	Family /Man Equiv.	Man-Work Units/ Ha.	Hired Labor/ All Farm Labor
NORTH CHINA													
Kaifeng,Honan	HI	149	$393	$8	3.22	14%	$1481	$598	7.83	2.47	3.17	69	28%
Sincheng,Honan	HI	144	$340	$34	3.00	21%	$1523	$335	6.97	3.55	1.96	79	7%
Su, Anhwei	HI	286	$250	$45	4.46	36%	$978	$294	6.74	1.75	3.85	63	25%
Yenshan 1923,Chihli	MED	133	$114*	$17	3.41	1%	$1216	$355	5.17	1.85	2.79	70	15%
Hwaiyuan, Anhwei	MED	124	$165	$30	3.47	6%	$716	$273	5.20	2.21	2.35	71	21%
Wusiang,Shansi	LO	251	$154	$35	1.84	9%	$499	$301	4.51	1.21	3.73	80	27%
Yenshan 1922,Chihli	LO	150	$135	$15	1.84	0%	$402	$360	5.35	1.54	3.48	77	7%
Pingsiang, Chihli	LO	152	$128	$12	0.99	3%	$632	$286	4.44	1.39	3.19	79	14%
HI		579	$328	$29	3.56	24%	$1327	$409	7.08	2.59	2.73	70	20%
MED		257	$165	$24	3.44	3%	$966	$328	5.18	2.03	2.55	70	18%
LO		553	$139	$21	1.56	4%	$511	$287	4.72	1.38	3.42	78	16%
Total		1389	$224	$25	2.78	11%	$931	$350	5.79	2.00	2.90	73	18%
EAST CENTRAL CHINA													
Kiangning S, Kiangsu	HI	203	$493	$60	2.11	27%	$1070	$741	5.77	1.86	3.10	131	34%
Wuhu, Anhwei	HI	102	$359		1.66	26%	$2022	$378	5.57	2.97	1.87	162	16%
Lienkiang, Fukien	HI	161	$481		1.01	40%	$1053	$553	5.02	1.68	2.99	229	5%
Laian 1921, Anhwei	HI	101	$443		3.96	52%	$749	$679	5.53	4.67	1.19	130	18%
Laian 1922, Anhwei	MED	100	$352	$82	2.53	34%	$612	$604	5.72	3.22	1.78	139	9%
Wuchin, Kiangsu	MED	300	$256	$47	1.14	21%	$660	$605	4.87	1.01	4.83	137	37%
Kiangning T, Kiangsu	LO	217	$255	$23	2.17	51%	$654	$275	6.57	3.17	2.07	180	11%
Chinhai, Chekiang	LO	67	$217		1.30	83%	$196	$627	5.19	1.78	2.92	201	32%
HI		567	$444	$60	2.19	36%	$1224	$588	5.48	2.80	1.96	163	18%
MED		400	$304	$65	1.84	28%	$636	$605	5.09	2.12	2.40	138	23%
LO		284	$236	$23	1.74	67%	$425	$451	6.24	2.48	2.52	190	21%
Total		1251	$357	$53	1.99	42%	$877	$558	5.53	2.55	2.17	164	20%

* Yenshan1923 sample showed lower than normal income due to crop failure.

Appendix B Family Members' Relation to Head of Household, by Economic Status of Locality - Buck 1930, Chinese Farm Economy

NORTH CHINA — EIGHT LOCALITIES WITH INFORMATION ON ABSENT MEMBERS OF THE ECONOMIC FAMILY

Economic Status	Family Size	N of Families	N of Members	Male Head	Wife of Head	Father & Fa Bro	Mother& FaBroW	Married Son	Son's Wife	Unmarr Son	Unmarr Daughter	Unmarr Sister
				ALL MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES								
HI	7.21	579	4173	100.0	88.6	6.9	23.5	71.3	69.3	91.7	72.7	3.6
MED	5.61	257	1443	98.4	80.2	5.1	26.8	50.2	42.4	82.9	72.4	2.7
LO	5.07	553	2806	98.4	79.0	5.4	24.4	41.6	32.4	71.6	61.1	5.6
Total	6.06	1389	8422	99.1	83.2	5.8	24.4	55.6	49.6	82.1	68.0	4.2
(less absent members)				ABSENT MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES								
HI	7.06	579	84	0.3		0.5	0.3	7.1	1.4			
MED	5.16	257	117	4.3	1.6	0.8		23.0	2.3		0.4	
LO	4.71	553	201	0.7		0.7	0.2	21.7	0.2			
Total	5.77	1389	402	1.2	0.3	0.4	0.1	15.8	1.1		0.1	
				ABSENT MEMBERS OF THE ECONOMIC FAMILY — AS PERCENT OF RELATION GROUP								
HI			2.0%	0.3%		7.5%	1.5%	9.9%	2.0%			
MED			8.1%	4.3%	1.9%	15.4%		45.7%	5.5%		0.5%	
LO			7.2%	0.7%		13.3%	0.7%	52.2%	0.6%			
Total			4.8%	1.2%	0.3%	7.5%	0.6%	28.5%	2.2%		0.1%	
				AGE OF FAMILY MEMBERS PRESENT IN THE HOUSEHOLD								
HI			4089	45.5	43.0	65.8	60.9	27.1	26.4	10.7	9.1	13.6
MED			1326	43.4	40.8	73.3	56.8	26.3	26.2	9.5	9.5	14.7
LO			2605	43.0	40.0	63.6	60.3	27.5	25.3	9.5	8.5	11.5
Total			16040	44.2	41.5	65.2	59.8	27.0	26.1	10.1	9.0	12.6

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Appendix B Family Members' Relation to Head of Household, by Economic Status of Locality - Buck 1930, Chinese Farm Economy

NORTH CHINA — EIGHT LOCALITIES WITH INFORMATION ON ABSENT MEMBERS OF THE ECONOMIC FAMILY

Economic Status	Son's Son	Son's Das	Son's Wives	Brother	Bro's Wife	Bro's Son	Bro's Daughter	Bro Son Wife	Bro Son Son	Bro Son Daughter	Matrilineal Ties Male	Matrilineal Ties Female
	ALL MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES											
HI	56.0	36.4	1.9	30.7	23.7	22.5	13.1	4.1	2.4	1.0	0.3	1.0
MED	31.5	19.1	0.4	23.3	8.2	10.9	3.5	1.6			1.2	1.2
LO	23.5	15.4	1.1	20.6	10.5	9.4	4.9	0.7			0.5	0.4
Total	38.5	24.8	1.3	25.3	15.6	15.1	8.1	2.3	1.0	0.4	0.6	0.8
	ABSENT MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES											
HI	0.9	0.2		2.2	0.7	0.5		0.2	0.2			
MED	1.9	0.4		8.9	0.4	1.6						
LO	2.0			8.7	0.4	1.8						
Total	1.5	0.1		6.0	0.5	1.2		0.1	0.1			
	ABSENT MEMBERS OF THE ECONOMIC FAMILY — AS PERCENT OF RELATION GROUP											
HI	1.5%	0.5%		7.3%	2.9%	2.3%		4.2%	7.1%			
MED	6.2%	2.0%		38.3%	4.8%	14.3%						
LO	8.5%			42.1%	3.4%	19.2%						
Total	3.9%	0.6%		23.9%	3.2%	8.1%		3.1%	7.1%			
	AGE OF FAMILY MEMBERS PRESENT IN THE HOUSEHOLD											
HI	6.9	4.9	19.7	31.4	32.5	12.1	6.6	23.4	7.2	8.5		
MED	6.2	6.8	28.0	21.0	32.7	12.9	6.8	20.3				
LO	7.6	7.4	19.9	28.0	29.9	7.0	7.1	19.5				
Weighted A	7.0	5.9	21.2	29.1	31.8	11.1	6.8	22.5	7.2	8.5		

Appendix B

Appendix B Family Members' Relation to Head of Household, by Economic Status of Locality - Buck 1930, Chinese Farm Economy

EAST CENTRAL CHINA — EIGHT LOCALITIES, ABSENT MEMBERS REPORTED FOR FAMILIES IN THREE

Economic Status	Family Size	N of Families	N of Members	Male Head	Wife of Head	Father & Fa Bro	Mother& FaBroW	Married Son	Son's Wife	Unmarr Son	Unmarr Daughter	Unmarr Sister
				ALL MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES								
HI	5.64	567	3199	99.8	89.4	1.6	24.5	51.1	50.3	91.5	57.8	2.8
MED	5.17	400	2069	100.0	91.5	2.8	20.5	34.0	31.5	85.8	72.8	5.3
LO	6.25	284	1774	98.9	87.0	2.5	22.9	28.9	28.2	114.4	131.0	4.6
Total	5.63	1251	7042	99.7	89.5	2.2	22.9	40.6	39.2	94.9	79.2	4.0
(less absent members)				ABSENT MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES								
HI	5.48	567	94	2.3		0.2		12.3	0.2			
MED	5.06	400	47					7.0	1.3		0.5	0.3
LO	6.20	284	15	0.4				1.8	0.4			
Total	5.51	1251	156	1.1		0.1		8.2	0.6		0.2	0.1
				ABSENT MEMBERS OF THE ECONOMIC FAMILY — AS PERCENT OF RELATION GROUP								
HI			2.9%	2.3%		11.1%		24.1%	0.4%			
MED			2.3%					20.6%	4.0%		0.7%	4.8%
LO			0.8%	0.4%				6.1%	1.3%			
Total			2.2%	1.1%		3.7%		20.3%	1.4%		0.2%	2.0%
				AGE OF FAMILY MEMBERS PRESENT IN THE HOUSEHOLD								
HI			3105	40.2	37.6	60.1	57.1	26.0	25.1	10.2	9.0	14.9
MED			2022	40.3	39.3	57.5	58.6	25.4	24.6	10.4	9.7	16.5
LO			1759	42.6	39.1	64.2	59.1	24.3	22.5	10.1	9.3	13.1
Total			6886	40.8	38.5	60.4	58.0	25.5	24.7	10.2	9.3	15.2

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Appendix B Family Members' Relation to Head of Household, by Economic Status of Locality - Buck 1930, Chinese Farm Economy

EAST CENTRAL CHINA — EIGHT LOCALITIES, ABSENT MEMBERS REPORTED FOR FAMILIES IN THREE

Economic Status	Son's Son	Son's Das	Son's Wives	Brother	Bro's Wife	Bro's Son	Bro's Daughter	Bro Son Wife	Bro Son Son	Bro Son Daughter	Matrilineal Ties Male	Matrilineal Ties Female
	ALL MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES											
HI	33.2	13.9	0.4	22.2	13.6	7.9	3.4	0.5			0.2	
MED	14.0	7.0	0.3	23.8	11.8	9.0	6.5				2.3	0.8
LO	15.5	17.3	0.4	15.5	12.7	23.9	13.7	3.2	2.5	1.1	1.8	3.2
Total	23.0	12.5	0.3	21.2	12.8	11.9	6.7	1.0	0.6	0.2	1.2	1.0
	ABSENT MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES											
HI	0.7			0.9								
MED				2.8								
LO	0.4			1.1	0.4	0.7						
Total	0.4			1.5	0.1	0.2						
	ABSENT MEMBERS OF THE ECONOMIC FAMILY — AS PERCENT OF RELATION GROUP											
HI	2.1%			4.0%								
MED				11.6%								
LO	2.3%			6.8%	2.8%	2.9%						
Total	1.7%			7.2%	0.6%	1.3%						
	AGE OF FAMILY MEMBERS PRESENT IN THE HOUSEHOLD											
HI	5.0	4.1	19.5	25.6	23.8	7.2	4.8	20.3				
MED	4.0	2.6	10.0	25.3	24.8	9.9	5.7					
LO	5.6	3.1	20.0	29.4	35.0	12.6	7.7	23.1	6.9	3.0		
Weighted A	4.9	3.9	19.7	26.1	30.7	10.3	6.5	19.7	6.9	3.0		

Appendix B

Appendix B Family Members' Relation to Head of Household, by Economic Status of Locality - Buck 1930, Chinese Farm Economy

EAST CENTRAL CHINA — THREE LOCALITIES REPORTING ABSENT MEMBERS OF THE ECONOMIC FAMILY

Economic Status	HI: Kiangning(S), Kiangsu Family Size	N of Families	N of Members	MED: Wuchin, Kiangsu Male Head	Wife of Head	Father & Fa Bro	Mother& FaBroW	LO: Kiangning(T), Kiangsu Married Son	Son's Wife	Unmarr Son	Unmarr Daughter	Unmarr Sister
				ALL MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES								
HI	6.23	203	1265	100.0	95.1	0.5	28.6	67.5	65.5	80.3	91.1	1.0
MED	5.00	300	1499	100.0	88.3	3.3	25.3	31.0	27.7	88.3	80.0	5.0
LO	6.58	217	1427	98.6	85.7	0.5	22.6	35.0	34.1	98.6	140.1	6.0
Total	5.82	720	4191	99.6	89.4	1.7	25.4	42.5	40.3	89.2	101.3	4.2
(less absent members)				ABSENT MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES								
HI	5.77	203	94	6.4		0.5		34.5	0.5			
MED	4.84	300	47					9.3	1.7		0.7	0.3
LO	6.51	217	15	0.5				2.3	0.5			
Total	5.61	720	156	1.9		0.1		14.3	1.0		0.3	0.1
				ABSENT MEMBERS OF THE ECONOMIC FAMILY — AS PERCENT OF RELATION GROUP								
HI			7.4%	6.4%		100.0%		51.1%	0.8%			
MED			3.1%					30.1%	6.0%		0.8%	6.7%
LO			1.1%	0.5%				6.6%	1.4%			
Total			3.7%	2.0%		8.3%		33.7%	2.4%		0.3%	3.3%
				AGE OF FAMILY MEMBERS PRESENT IN THE HOUSEHOLD								
HI				42.9	41.3		57.2	27.6	26.2	10.1	10.0	16.0
MED				38.8	37.5	58.5	58.6	24.7	23.6	10.0	9.5	15.7
LO				43.7	40.0	55.0	57.9	24.0	22.2	10.3	9.4	13.1
Total				40.8	38.5	60.4	58.0	25.5	24.7	10.2	9.3	15.2

Appendix B Family Members' Relation to Head of Household, by Economic Status of Locality - Buck 1930, Chinese Farm Economy

EAST CENTRAL CHINA — THREE LOCALITIES REPORTING ABSENT MEMBERS OF THE ECONOMIC FAMILY

Economic Status	Son's Son	Son's Das	Son's Wives	Brother	Bro's Wife	Bro's Son	Bro's Daughter	Bro Son Wife	Bro Son Son	Bro Son Daughter	Matrilineal Ties Male	Matrilineal Ties Female
	ALL MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES											
HI	42.9	22.2	0.5	11.8	6.9	5.9	3.0					
MED	10.3	6.0	0.3	18.7	6.0	6.0	2.0				2.7	0.7
LO	18.4	21.7	0.5	20.3	16.6	31.3	18.0	4.1	3.2	1.4	1.8	4.1
Total	21.9	15.3	0.4	17.2	9.4	13.6	7.1	1.3	1.0	0.4	1.7	1.5
	ABSENT MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES											
HI	2.0			2.5								
MED				3.7								
LO	0.5			1.4	0.5	0.9						
Total	0.7			2.6	0.1	0.3						
	ABSENT MEMBERS OF THE ECONOMIC FAMILY — AS PERCENT OF RELATION GROUP											
HI	4.6%			20.8%								
MED				19.6%								
LO	2.5%			6.8%	2.8%	2.9%						
Total	3.2%			15.3%	1.5%	2.0%						
	AGE OF FAMILY MEMBERS PRESENT IN THE HOUSEHOLD											
HI	4.7	3.6	20.0	29.4	14.0	7.0	4.5					
MED	4.0	2.9	10.0	21.0	18.0	10.6	8.7					
LO	5.6	3.1	20.0	29.4	35.0	12.6	7.7	23.1	6.9	3.0		
Total	4.9	3.9	19.7	26.1	30.7	10.3	6.5	19.7	6.9	3.0		

ALL CHINA — SIXTEEN LOCALITIES, MOST WITH INFORMATION ON ABSENT MEMBERS OF THE ECONOMIC FAMILY

Economic Status	Family Size	N of Families	N of Members	Male Head	Wife of Head	Father & Fa Bro	Mother& FaBroW	Married Son	Son's Wife	Unmarr Son	Unmarr Daughter	Unmarr Sister
				ALL MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES								
All	5.86	2640	15464	99.4	86.2	4.1	23.7	48.5	44.7	88.1	73.3	4.1
(less absent members)				ABSENT MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES								
All	5.65	2640	558	1.2	0.2	0.3	0.1	12.2	0.8		0.1	0.0
				ABSENT MEMBERS OF THE ECONOMIC FAMILY — AS PERCENT OF THOSE IN FAMILY ROLE								
All			3.6%	1.2%	0.2%	6.5%	0.3%	25.2%	1.9%		0.2%	0.9%
				AGE OF FAMILY MEMBERS PRESENT IN THE HOUSEHOLD								
All				42.5	40.0	63.9	59.0	26.4	25.5	10.1	9.1	13.8

Economic Status	Son's Son	Son's Das	Son's Wives	Brother	Bro's Wife	Bro's Son	Bro's Daughter	Bro Son Wife	Bro Son Son	Bro Son Daughter	Matrilineal Ties Male	Matrilineal Ties Female
	ALL MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES											
All	31.2	19.0	0.8	23.4	14.2	13.6	7.4	1.7	0.8	0.3	0.9	0.9
	ABSENT MEMBERS OF THE ECONOMIC FAMILY — MEMBERS PER 100 FAMILIES											
All	1.0	0.1		3.9	0.3	0.7		0.0	0.0			
	ABSENT MEMBERS OF THE ECONOMIC FAMILY — AS PERCENT OF THOSE IN FAMILY ROLE											
All	3.2%	0.4%		16.7%	2.1%	5.3%		2.3%	4.8%			
	AGE OF FAMILY MEMBERS PRESENT IN THE HOUSEHOLD											
All	6.2	5.2	21.0	27.7	31.4	10.7	6.6	21.6	7.1	6.7		

Data Source: Buck, Chinese Farm Economy, 1930. Average calculated by simple average of localities.
Table 2, p. 321; Table 3, p. 324. Number & Age of Members of Farm Families of Specified Relationship to Male Head (Living or Deceased).
Table 16, p. 350. Specified Relationship for Absent Members of the Economic Family

Appendix C Age & Sex Distributions for Localities Ranked by HI, MED, or LO Economic Status — Buck 1930, Chinese Farm Economy

NORTH CHINA — EIGHT LOCALITIES, COMPLETE INFORMATION ON ABSENT MEMBERS OF THE ECONOMIC FAMILY

Economic Status	N of Persons		Total	Age 0-4	Age 5-9	Age 10-14	Age 15-19	Age 20-24	Age 25-29	Age 30-34	Age 35-39	Age 40-44	Age 45-49	Age 50-54	Age 55-59	Age 60-64	Age 65-69	Age 70+
				ALL MEMBERS OF THE ECONOMIC FAMILY — PERSONS PER 1000 POPULATION														
HI	2213	M	529	69	66	52	55	52	52	33	36	24	23	26	18	12	6	6
MED	781	A	539	72	49	70	65	44	48	43	32	26	14	25	21	14	7	8
LO	1501	L	534	51	69	52	59	36	36	48	47	43	25	23	19	11	10	5
Total	4495	E	533	63	64	55	58	45	46	40	39	31	22	25	19	12	7	6
HI	1968	F E	471	67	39	46	47	41	49	33	29	21	28	22	21	12	7	7
MED	668	M	461	52	41	43	52	42	40	29	34	30	23	22	21	11	10	12
LO	1310	A	466	42	58	52	50	22	36	32	48	32	20	17	22	12	10	11
Total	3946	LE	467	56	45	48	49	35	43	32	36	26	25	20	21	12	9	9
				ABSENT MEMBERS OF THE ECONOMIC FAMILY — PERSONS PER 1000 POPULATION														
HI	68	M	16.3	0.7	0.2	0.2	2.6	4.8	2.9	1.2	2.2	0.2	0.5	0.2	0.2			0.2
MED	104	A	71.8	0.7	0.7	7.6	12.4	11.7	15.2	11.0	8.3	2.8	0.7				0.7	
LO	197	L	70.1			2.8	15.7	14.6	12.1	9.6	8.9	2.8	1.4	0.7	0.4	0.7	0.4	0.0
Total	369	E	43.7	0.5	0.2	2.4	8.6	9.2	8.1	5.7	5.4	1.5	0.8	0.4	0.2	0.2	0.2	0.1
HI	16	F E	3.8			0.2	0.2	0.5	1.4	0.5	0.2		0.2	0.2				0.2
MED	13	M	9.0		0.7		1.4	1.4		3.5	1.4				0.7			
LO	4	A	1.4					0.4	0.7				0.4					
Total	33	LE	3.9		0.1	0.1	0.4	0.6	0.9	0.8	0.4		0.2	0.1	0.1			0.1
				ABSENT MEMBERS OF THE ECONOMIC FAMILY - PERCENT OF COHORT														
HI		M	3%	1%	0%	0%	5%	9%	6%	4%	6%	1%	2%	1%	1%			4%
MED		A	13%	1%	1%	11%	19%	27%	31%	26%	26%	11%	5%				10%	
LO		L	13%			5%	26%	40%	34%	20%	19%	7%	6%	3%	2%	7%	4%	0%
Total		E	8%	1%	0%	4%	15%	20%	18%	14%	14%	5%	4%	1%	1%	2%	3%	2%
				SEX RATIOS FOR MEMBERS OF THE ECONOMIC FAMILY WHO ARE PRESENT														
HI	MALES		110	101	170	111	113	115	103	99	116	115	81	119	85	96	77	86
M&LO	PER 100		102	130	119	118	96	87	75	123	77	101	87	119	94	101	79	59
Total	FEMALES		105	112	140	110	103	105	90	110	92	111	88	120	88	95	81	66

Appendix C Age & Sex Distributions for Localities Ranked by HI, MED, or LO Economic Status — Buck 1930, Chinese Farm Economy

EAST CENTRAL CHINA — EIGHT LOCALITIES, ABSENT MEMBERS REPORTED FOR FAMILIES IN THREE

Economic Status	N of Persons		Total	Age 0-4	Age 5-9	Age 10-14	Age 15-19	Age 20-24	Age 25-29	Age 30-34	Age 35-39	Age 40-44	Age 45-49	Age 50-54	Age 55-59	Age 60-64	Age 65-69	Age 70+
ALL MEMBERS OF THE ECONOMIC FAMILY — PERSONS PER 1000 POPULATION																		
HI	1744	M	545	69	73	53	62	52	59	48	35	31	21	23	12	7	2	1
MED	1087	A	522	49	73	55	60	44	55	30	49	30	33	27	11	2	2	0
LO	873	L	488	37	99	69	48	27	30	30	35	32	40	23	11	6	1	2
Total	3704	E	524	55	79	57	58	43	50	38	39	31	29	24	11	5	2	1
HI	1456	F E	455	58	32	19	38	58	65	42	30	26	32	16	21	9	5	3
MED	994	M	478	42	56	47	38	42	49	34	49	22	37	22	23	4	9	5
LO	916	A	512	67	92	83	40	30	30	31	35	31	24	18	16	7	6	3
Total	3366	LE	476	56	54	43	38	46	51	37	37	26	31	18	20	7	6	4
ABSENT MEMBERS OF THE ECONOMIC FAMILY — PERSONS PER 1000 POPULATION																		
HI	93	M	29.1			0.3	4.7	6.9	7.2	4.7	1.9	0.9	0.6	0.3	0.3	0.9		0.3
MED	39	A	18.7			1.4	6.7	6.2	2.4	1.0	1.0							
LO	14	L	7.8		0.6		2.2	0.6	1.7	1.1		0.6	1.1					0.0
Total	146	E	20.7		0.1	0.6	4.7	5.1	4.4	2.7	1.1	0.6	0.6	0.1	0.1	0.4		0.1
HI	1	F E	0.3						0.3									
MED	8	M	3.8			0.5	1.0	1.4	1.0									
LO	2	A	1.1						0.6		0.6							
Total	11	LE	1.6			0.1	0.3	0.4	0.6		0.1							
ABSENT MEMBERS OF THE ECONOMIC FAMILY - PERCENT OF COHORT																		
HI		M	5%			1%	8%	13%	12%	10%	5%	3%	3%	1%	3%	13%		25%
MED		A	4%			3%	11%	14%	4%	3%	2%							
LO		L	2%		1%		5%	2%	6%	4%		2%	3%					0%
Total		E	4%		0%	1%	8%	12%	9%	7%	3%	2%	2%	1%	1%	8%		13%
SEX RATIOS FOR MEMBERS OF THE ECONOMIC FAMILY WHO ARE PRESENT																		
HI	MALES		113	119	225	274	151	77	80	101	108	117	64	137	56	67	31	27
M&LO	PER 100		100	79	116	95	128	93	104	88	101	117	117	126	56	76	21	27
Total	FEMALES		106	99	146	131	139	84	91	95	104	117	91	130	56	70	25	26

Appendix C Age & Sex Distributions for Localities Ranked by HI, MED, or LO Economic Status — Buck 1930, Chinese Farm Economy

EAST CENTRAL CHINA — THREE LOCALITIES REPORTING ABSENT MEMBERS OF THE ECONOMIC FAMILY

HI: Kiangning(S), Kiangsu MED: Wuchin, Kiangsu LO: Kiangning(T), Kiangsu

Economic Status	N of Persons		Total	Age 0-4	Age 5-9	Age 10-14	Age 15-19	Age 20-24	Age 25-29	Age 30-34	Age 35-39	Age 40-44	Age 45-49	Age 50-54	Age 55-59	Age 60-64	Age 65-69	Age 70+
ALL MEMBERS OF THE ECONOMIC FAMILY — PERSONS PER 1000 POPULATION																		
HI	627	M	496	62	57	70	35	40	51	46	23	39	24	24	14	9	1	2
MED	782	A	518	50	71	62	60	47	51	34	43	30	34	22	10	3	2	0
LO	678	L	471	28	99	62	46	28	31	26	36	29	45	24	10	4	0	1
Total	2087	E	495	46	76	64	47	38	44	35	35	33	35	23	11	5	1	1
HI	638	F E	504	87	33	21	33	63	54	47	19	37	35	24	31	13	6	2
MED	727	M	482	43	54	59	37	42	45	36	48	21	34	21	22	4	9	7
LO	763	A	529	65	101	96	43	26	30	30	35	33	24	18	16	6	4	1
Total	2128	LE	505	64	64	60	38	43	42	37	35	30	31	21	23	7	6	4
ABSENT MEMBERS OF THE ECONOMIC FAMILY — PERSONS PER 1000 POPULATION																		
HI	93	M	73.5			0.8	11.9	17.4	18.2	11.9	4.7	2.4	1.6	0.8	0.8	2.4		0.8
MED	39	A	25.8			2.0	9.3	8.6	3.3	1.3	1.3							
LO	14	L	9.7		0.7		2.8	0.7	2.1	1.4		0.7	1.4					
Total	146	E	34.6		0.2	0.9	7.8	8.5	7.4	4.5	1.9	0.9	0.9	0.2	0.2	0.7		0.2
HI	1	F E	0.8						0.8									
MED	8	M	5.3			0.7	1.3	2.0	1.3									
LO	2	A	1.4						0.7		0.7							
Total	11	LE	2.6			0.2	0.5	0.7	0.9		0.2							0.0
ABSENT MEMBERS OF THE ECONOMIC FAMILY - PERCENT OF COHORT																		
HI		M	15%			1%	34%	43%	36%	26%	21%	6%	7%	3%	6%	25%		33%
MED		A	5%			3%	16%	18%	6%	4%	3%							
LO		L	2%		1%		6%	3%	7%	5%		2%	3%					
Total		E	7%		0%	1%	17%	22%	17%	13%	5%	3%	3%	1%	2%	14%		25%
SEX RATIOS FOR MEMBERS OF THE ECONOMIC FAMILY WHO ARE PRESENT																		
HI	MALES		84	71	171	322	69	36	61	72	96	98	64	97	44	56	14	100
LO	PER 100		87	44	97	65	100	105	98	84	104	85	180	135	65	67		50
HI&LO	FEMALES		86	59	116	111	87	56	74	76	101	92	111	113	51	60	8	77

Appendix C Age & Sex Distributions for Localities Ranked by HI, MED, or LO Economic Status — Buck 1930, Chinese Farm Economy

A L L C H I N A — SIXTEEN LOCALITIES, MOST WITH INFORMATION ON ABSENT MEMBERS OF THE ECONOMIC FAMILY

Economic Status	N of Persons		Total	Age 0-4	Age 5-9	Age 10-14	Age 15-19	Age 20-24	Age 25-29	Age 30-34	Age 35-39	Age 40-44	Age 45-49	Age 50-54	Age 55-59	Age 60-64	Age 65-69	Age 70+
			ALL MEMBERS OF THE ECONOMIC FAMILY — PERSONS PER 1000 POPULATION															
ALL	5917	M	529	60	71	56	58	44	48	39	39	31	26	24	16	9	5	4
ALL	5334	F	471	56	50	46	44	40	47	34	37	26	28	20	21	10	8	7
			ABSENT MEMBERS OF THE ECONOMIC FAMILY — PERSONS PER 1000 POPULATION															
ALL	515	M	33.2	0.3	0.2	1.5	6.8	7.3	6.4	4.3	3.5	1.1	0.7	0.3	0.2	0.3	0.1	0.1
ALL	44	F	2.8		0.1	0.1	0.3	0.5	0.8	0.5	0.3		0.1	0.1	0.1			0.1
			ABSENT MEMBERS OF THE ECONOMIC FAMILY - PERCENT OF COHORT															
ALL		M	6%	0%	0%	3%	12%	17%	13%	11%	9%	4%	3%	1%	1%	4%	3%	3%
ALL		F	1%		0%	0%	1%	1%	2%	1%	1%		0%	0%	0%			1%
			SEX RATIOS FOR MEMBERS OF THE ECONOMIC FAMILY WHO ARE PRESENT															
ALL	M/100F		106	106	143	119	117	94	90	102	98	114	90	124	74	87	60	56

Data Source: John Lossing Buck, Chinese Farm Economy, 1930,
Table 10, pp. 337-9. Age and Sex Distribution of Farm Population
Table 14, p. 347. Absent Members of the "Economic Family"
Numbers do not include hired labor or servants who are present in household.

Comparison of Farm Economy, Food Intake, and Population Age-Sex Distribution, with County Samples Organized by Geographical Region and HI/LO Economic Well-Being

Locality: County, Province grouped by Geographical Region (Crop Regions)	Rank	FARM AND FOOD SURVEYS Product/ Capita less40% Rent	Daily Calories All Food	Daily Calories Animal	Animal Units on Farm	% w/ Savings in Loans Out	Population Density /sq km
NORTHWEST (WINTER WHEAT-MILLET, SPRING WHEAT)							
Paotow, Suiyuan SW	1	2613	5573	90	1.64	19%	85
Hancheng, Shensi WM	2		3937	9			
Fowping, Hopeh WM	3	316	3842	66	1.78	7%	502
Chowchih, Shensi WM	4	306	3025	6	1.08	9%	449
Anyi, Shansi WM	5	295	2973	7	0.99	1%	315
Showyang, Shansi WM	6	274	2671	12	0.69	1%	287
Weinan, Shensi WM	7	138	3264	14	0.55		422
Tsiyuan, Honan WM	8	253	2558	4	1.71		396
Tsingyuan, Shansi WM	9	119	3099	20	0.46	1%	1165
Lingpao, Honan WM	10	160	2868	4	0.67		470
Tsincheng, Shansi WM	11	230	2265	6	0.62	6%	563
Taiku, Shansi WM	12	200	2369	18	0.6		355
Yulin, Shensi SW	13	104	2775	21	1.36	0%	287
Tsinglo, Shansi SW	14	194	1879	11	2.32		160
Tingpien, Shensi SW	15	179	1914	27	9.62	1%	152
HI PRODUCT &FOOD		657	3612	29	1.12	7%	343
LO PRODUCT & FOOD		233	2593	16	2.05	3%	432

Rank	Notestein Archives Region,Area	N of Persons	Age-Sex Distribution of Population Standardized to 1000 Persons per Locality: Age 0-4	Age 5-9	Age 10-19	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Age 60+
NORTHWEST (WINTER WHEAT-MILLET, SPRING WHEAT)										
1	7 55	M	503	49	54	122	124	109	79	20	4
		F	392	27	42	113	93	86	59	15	3
2	6 108	M	1717	61	62	112	94	69	67	43	16
		F	1555	59	56	108	95	52	57	28	20
3	6 141	M	326	65	51	122	107	45	65	43	21
		F	303	79	52	105	83	41	54	49	17
4	6 109	M	1587	59	75	154	130	71	50	33	11
		F	1136	35	31	73	94	57	69	41	16
5	6 154	M	719	65	55	90	78	58	72	59	30
		F	700	66	49	82	90	62	75	32	36
6	7 157	M	830	66	51	80	79	68	93	48	43
		F	740	52	50	97	81	57	56	29	49
7	6 69	M	882	44	68	111	122	73	57	39	11
		F	803	52	50	99	110	62	59	33	11
8	6 86	M	1136	73	57	119	95	72	53	21	23
		F	1085	71	62	91	82	67	51	33	32
9	7 81	M	1036	78	59	86	66	76	84	46	53
		F	839	67	52	86	71	57	50	21	44
10	6 126	M	1518	66	53	105	87	66	65	31	19
		F	1553	64	49	114	90	68	55	36	28
11	6 153	M	835	74	79	84	87	66	64	36	24
		F	792	75	60	108	77	57	60	21	29
12	7 26	M	607	55	61	83	66	78	91	50	79
		F	470	70	53	72	61	55	50	27	48
13	7 95	M	940	60	74	128	66	55	67	46	26
		F	846	65	65	91	74	56	67	29	25
14	7 78	M	1039	77	58	102	99	71	71	47	28
		F	838	50	47	83	86	53	55	35	37
15	7 152	M	1010	54	78	132	93	79	47	31	13
		F	910	65	76	104	79	74	41	27	9
	HI	M	6564	59	62	116	105	70	67	41	19
		F	5629	51	47	95	94	58	62	32	22
	LO	M	8121	68	64	107	84	70	66	37	30
		F	7333	65	58	96	80	62	54	30	30

Locality: County, Province grouped by Geographical Region (Crop Regions)	Rank	FARM AND FOOD SURVEYS Product/ Capita less40% Rent	Daily Calories All Food	Daily Calories Animal	Animal Units on Farm	% w/ Savings in Loans Out	Population Density /sq km
NORTH PLAIN (WINTER WHEAT-KAOLIANG, NORTH AND SOUTH)							
Changli I, Hopeh WKN	1	631	5651	115	1.38	5%	208
Tung, Hopeh WKN	2	878	5132	80	0.92	21%	195
Hweimin, Shantung WKS	3	899	4721	80	1.66	25%	213
Tsang, Hopeh WKN	4	639	4484	16	1.35	4%	136
Tsing, Hopeh WKN	5	605	4724	78	1.65	23%	240
Changli II, Hopeh WKN	6	490	5290	149	3.13	14%	283
Tangyi, Shantung WKS	7	569	4466	25	0.7		249
Nankung, Hopeh WKN	8	601	4163	42	1.2	26%	295
Wei, Shantung WKS	9	631	3127	22	0.78	44%	378
Linchang, Honan WKS	10	567	3194	29	0.58	19%	358
Sushui, Hopeh WKN	11	425	3407	42	0.83		513

Rank	Notestein Archives Region,Area	N of Persons	Age-Sex Distribution of Population Standardized to 1000 Persons per Locality: Age 0-4	Age 5-9	Age 10-19	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Age 60+
POPULATION SURVEY										
NORTH PLAIN (WINTER WHEAT-KAOLIANG, NORTH AND SOUTH)										
1	6 31	M	748	79	64	108	83	62	49	33	40
		F	698	57	43	80	98	64	56	41	44
2	6 74	M	396	45	38	76	54	65	76	54	35
		F	444	43	55	102	80	83	70	55	39
3	6 139	M	333	59	45	116	71	91	73	25	36
		F	312	53	47	110	73	67	67	36	33
4	6 72	M	1238	65	61	115	91	73	62	37	36
		F	1042	61	48	85	74	59	58	35	37
5	6 71	M	770	70	66	127	102	83	46	32	34
		F	596	72	32	61	80	77	42	38	34
6	6 173	M	612	65	56	108	106	90	70	29	23
		F	504	56	30	84	95	56	56	40	36
7	6 138	M	343	72	47	111	65	66	72	45	25
		F	339	66	54	81	91	67	63	40	35
8	6 77	M	1926	85	72	102	79	58	54	33	36
		F	1786	71	61	77	88	56	63	28	37
9	6 4 + 105	M	3295	69	54	97	90	71	56	48	37
		F	3003	56	48	83	89	60	54	47	39
10	6 12	M	1172	74	61	92	70	72	75	35	21
		F	1165	81	51	71	83	75	61	37	39
11	6 79	M	968	57	70	118	78	79	65	45	36
		F	791	64	51	79	64	56	55	46	35

Locality: County, Province grouped by Geographical Region (Crop Regions)	Rank	FARM AND FOOD SURVEYS Product/ Capita less40% Rent	Daily Calories All Food	Daily Calories Animal	Animal Units on Farm	% w/ Savings in Loans Out	Population Density /sq km
NORTH PLAIN, CONTINUED							
Chi, Honan WKS	12	300	4149	11	1.84		248
Ishui, Shantung WKS	13	341			1.95	8%	82
Chengting, Hopeh WKN	14	336	3122	50	1.58	32%	337
Tsining, Shantung WKS	15	268	2703	40	0.88	9%	468
Su, Anhwei WKS	16	246	2407	3	0.86	0%	241
Yencheng, Honan WKS	17	211	2444	22	0.68		659
Nanyang, Honan WKS	18	216	2352	18	0.86		373
Cheng, Honan WKS	19	188			1.24		331
Taian, Shantung WKS	20	91	1730	29	1.17		823
Kaifeng, Honan WKS	21	121	1406	19	1.33		425
HI PRODUCT &FOOD		630	4396	62	1.29	20%	279
LO PRODUCT & FOOD		232	2539	24	1.24	12%	399

Rank	Notestein Archives Region,Area	N of Persons	Age-Sex Distribution of Population Standardized to 1000 Persons per Locality: Age 0-4	Age 5-9	Age 10-19	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Age 60+
POPULATION SURVEY										
NORTH PLAIN, CONTINUED										
12	6 85	M 846	67	48	116	81	64	64	38	22
		F 847	64	58	99	77	62	83	25	31
13	6 73	M 735	64	53	101	129	54	42	44	39
		F 665	51	40	89	110	44	42	60	39
14	6 140	M 324	79	63	96	96	71	53	51	11
		F 300	72	45	88	91	71	48	34	32
15	6 29	M 682	62	72	90	68	70	63	49	21
		F 697	62	80	86	73	61	75	41	28
16	6 54 + 76	M 2064	70	73	92	80	65	62	46	26
		F 1953	62	60	88	68	62	65	46	36
17	6 131	M 1574	71	52	79	66	68	69	43	45
		F 1618	65	51	94	77	57	70	44	48
18	6 129	M 1611	68	60	115	81	82	81	48	32
		F 1234	38	36	72	70	66	50	50	52
19	6 51	M 3210	81	55	95	78	69	64	32	38
		F 3050	72	44	81	77	65	63	36	49
20	6 88	M 481	40	83	109	79	72	62	41	48
		F 422	38	63	105	59	70	42	52	39
21	6 128	M 1662	80	56	98	59	60	71	41	33
		F 1668	68	57	98	56	63	69	44	45
	HI	M 11801	70	60	104	84	71	60	39	34
		F 10680	63	49	81	84	63	57	40	38
	LO	M 13189	72	60	97	78	68	65	41	34
		F 12454	62	52	88	73	62	63	42	43

FARM AND FOOD SURVEYS

Locality: County, Province grouped by Geographical Region (Crop Regions)	Rank	Product/ Capita less40% Rent	Daily Calories All Food	Daily Calories Animal	Animal Units on Farm	% w/ Savings in Loans Out	Population Density /sq km
LOWER YANGTZE RIVER (YANGTZE RICE-WHEAT)							
Yencheng III,Kiangsu YRW	1	757			0.64	3%	229
Ho, Anhwei YRW	2	738	3962	108	1.63	6%	378
Kunshan, Kiangsu YRW	3	685			1.14	2%	377
Wutsin, Kiangsu YRW	4	640	3919	130	0.77	35%	545
Yunmeng, Hupeh YRW	5	452	4172	130	0.67		358
Chungsiang, Hupeh YRW	6	584	3910	91	2.95	23%	348
Taihu, Anhwei YRW	7	560	3070	150	1.49	61%	618
Liuan, Anhwei YRW	8	334	3732	121	0.70	16%	513
Tai, Kiangsu YRW	9	493	2642	15	0.68	50%	590
Fowning, Kiangsu YRW	10	209	3730	26	0.81	20%	364
Yencheng I, Kiangsu YRW	11	310			2.10	65%	139
Changshu, Kiangsu YRW	12	179	2999	76	0.01	62%	988
Yencheng II, Kiangsu YRW	13	282			0.45	8%	410
Yencheng IV,Kiangsu YRW	14	231			0.34	10%	420
Tehtsing, Chekiang YRW	15	115	2352	57	0.12	46%	735
HI PRODUCT &FOOD		594	3794	122	1.25	21%	421
LO PRODUCT & FOOD		260	2931	44	0.64	37%	521

POPULATION SURVEY

Rank	Notestein Archives Region,Area	N of Persons	Age-Sex Distribution of Population Standardized to 1000 Persons per Locality: Age 0-4	Age 5-9	Age 10-19	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Age 60+
LOWER YANGTZE RIVER (YANGTZE RICE-WHEAT)										
1	5 70	M	1700	102	74	102	88	71	45	36	16
		F	1491	76	65	83	81	65	40	35	21
2	5 106	M	2229	77	79	107	93	80	47	27	10
		F	2051	69	67	72	90	78	50	35	18
3	5 2 +	M	3187	60	59	104	87	75	52	38	16
	103	F	3288	66	60	99	86	72	53	41	30
4	5 17	M	703	76	66	118	91	80	51	38	13
		F	617	70	63	79	75	73	50	36	22
5	5 125	M	1482	74	54	98	80	67	72	49	26
		F	1370	60	48	86	77	65	57	50	38
6	5 34	M	823	78	55	116	116	72	50	38	21
		F	683	58	50	79	96	64	39	46	23
7	5 16	M	667	70	66	112	100	84	51	35	18
		F	578	68	47	67	83	71	63	37	29
8	5 134	M	1926	52	74	127	106	93	50	34	18
		F	1545	63	52	67	85	79	48	32	19
9	5 27	M	1663	67	65	131	83	69	49	29	23
		F	1559	65	68	86	73	73	51	37	31
10	5 6 +	M	1073	67	71	129	76	70	50	33	21
	30	F	1002	78	57	93	84	59	51	33	29
11	5 58	M	320	76	80	127	88	71	48	41	12
		F	269	59	56	70	88	58	58	44	24
12	5 24	M	491	75	67	97	77	57	60	42	20
		F	461	66	42	97	74	70	56	39	36
13	5 59	M	1734	77	63	99	96	64	47	35	23
		F	1705	82	67	88	95	52	49	40	23
14	5 75	M	333	81	83	102	91	78	32	33	29
		F	296	76	59	75	89	67	40	30	35
15	5 25 +	M	1802	70	72	105	93	77	62	42	27
	52	F	1480	56	48	87	78	65	48	38	32
	HI	M	12717	72	66	109	93	77	52	36	17
		F	11623	67	58	82	85	72	50	39	25
	LO	M	7416	72	68	113	87	70	52	36	23
		F	6772	69	59	87	82	63	50	37	29

Locality: County, Province grouped by Geographical Region (Crop Regions)	Rank	FARM AND FOOD SURVEYS Product/ Capita less40% Rent	Daily Calories All Food	Daily Calories Animal	Animal Units on Farm	% w/ Savings in Loans Out	Population Density /sq km
SOUTH (DOUBLE-CROPPING RICE, RICE-TEA, SZECHWAN RICE, SOUTHWESTERN RICE)							
Minhou, Fukien RT	1	935			0.35	14%	372
Tsunyi, Kweichow SWR	2	590	4121	186	2.33	18%	1137
Chungking, Szechwan SR	3	885	3520	401		17%	644
Lungki, Fukien DCR	4	438			0.97	49%	439
Shunan, Chekiang RT	5	394	4003	213	0.91	18%	496.5
Kukong, Kwangtung DCR	6	415	3437	119	1.87		590
Fowling, Szechwan SR	7	521	2882	66	1.09	11%	594
Chaoan, Kwangtung DCR	8	225	4878	89	0.32	2%	1070
Mienyang, Szechwan SR	9	333	2935	142	0.89	6%	974
Kityang, Kwangtung DCR	10	258	3534	206	0.98		1551
Tungyang, Chekiang RT	11	332			0.9	10%	751
Tunglu, Chekiang RT	12	290	2807	60	0.73	1%	908
Suining, Szechwan SR	13	298	2758	177	0.78	38%	314
Mien, Shensi SR	14	190	3121	168	1.09	21%	979
Tuchang, Kiangsi RT	15	262	2507	57	0.97		878
HI PRODUCT &FOOD		550	3807	179	1.12	18%	668
LO PRODUCT & FOOD		280	2944	135	0.91	15%	908

Rank	Notestein Archives Region,Area	N of Persons	Sex	POPULATION SURVEY Age-Sex Distribution of Population Standardized to 1000 Persons per Locality Age 0-4	Age 5-9	Age 10-19	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Age 60+
SOUTH (DOUBLE-CROPPING RICE, RICE-TEA, SZECHWAN RICE, SOUTHWESTERN RICE)											
1	1 23		M	346	71	81	137	110	68	59	47	12
			F	245	49	30	69	73	69	66	37	20
2	3 142		M	1666	79	54	122	105	59	46	36	11
			F	1580	80	44	97	92	62	46	47	19
3	4 222		M	949	76	48	104	91	68	66	44	31
			F	852	56	51	83	83	55	59	47	39
4	1 61 +		M	1793	77	67	124	81	63	59	49	20
	91		F	1538	61	56	79	74	62	63	44	23
5	5 57		M	234	61	63	115	101	79	47	34	20
			F	211	70	61	81	97	56	54	29	27
6	1 137		M	1624	73	61	113	83	64	51	36	24
			F	1595	65	48	100	84	69	53	40	37
7	4 221		M	924	77	87	93	68	118	44	45	28
			F	729	59	50	51	62	82	51	56	30
8	1 94		M	348	68	56	161	84	67	34	48	22
			F	298	56	56	87	80	59	40	46	37
9	4 223		M	826	186	82	182	151	150	90	92	65
			F	719	48	25	48	43	44	31	29	21
10	1 93		M	1764	95	99	187	108	94	63	37	26
			F	1556	86	97	121	100	72	52	31	14
11	2 63		M	1153	61	58	72	51	69	55	32	28
			F	1108	40	26	54	66	54	39	31	30
12	5 124		M	2152	76	76	129	108	99	78	61	34
			F	1874	80	85	137	118	105	80	75	58
13	4 224		M	658	32	27	63	54	34	24	17	9
			F	634	37	29	47	48	37	23	18	7
14	6 111		M	1954	65	65	110	94	90	46	25	12
			F	1905	77	62	113	82	74	43	25	17
15	2 133		M	1632	70	51	101	91	73	59	37	28
			F	1573	69	44	88	80	67	54	48	40
	HI		M	7884	73	65	121	90	73	51	42	21
			F	7048	62	49	81	81	64	54	43	29
	LO		M	10139	70	61	109	86	79	54	36	24
			F	9369	67	56	93	82	69	48	38	28

Locality: County, Province grouped by Geographical Region (Crop Regions)	Rank	FARM AND FOOD SURVEYS Product/ Capita less40% Rent	Daily Calories All Food	Daily Calories Animal	Animal Units on Farm	% w/ Savings in Loans Out	Population Density /sq km
ALL CHINA							
HI PRODUCT & FOOD		608	3902	98	1.19	17%	428
LO PRODUCT & FOOD		251	2752	55	1.21	17%	565
Sources			p. 73	p. 74	p. 131	p. 406	p. 423

	Rank	Notestein Archives Region,Area	N of Persons	Age-Sex Distribution of Population Standardized to 1000 Persons per Locality: Age 0-4	Age 5-9	Age 10-19	Age 20-29	Age 30-39	Age 40-49	Age 50-59	Age 60+
ALL CHINA											
HI	M		38966	68	63	112	93	73	57	40	23
	F		34980	61	51	85	86	64	56	39	29
LO	M		38865	70	63	107	84	71	59	38	28
	F		35928	66	56	91	79	64	54	37	33

POPULATION SURVEY

Appendix E Issues in the Recompiliation of the Buck Survey Data

The distortions arising from Buck's methods of compiling area figures from the data for the surveyed localities (Buck 1937), and how they are overcome in this research, are outlined in this appendix.

The problems of the original compilation are (1) idiosyncratic labeling of farm size categories; and (2) simple averaging across farm size categories in an area, without weighting for the number of farms or the land they occupy. The distortions are exacerbated by the compounding of these two problems. Buck divided the farms in each locality into several size groups, based on 0.75 of the standard deviation from the mean of farm size within the locality, for 101 localities, and by inspection in 67 localities (Buck 1964, p. 269). Eight farm size group categories were set, from very small to very very very large. But because these size groups were defined relative to the mean for each locality , a locality composed mostly of large farms could have its actually rather large farms labeled "small", and vice versa.

For most of the tables in the summary volume of Land Utilization in China (1964), the "very small" and "small" categories are combined, and the several "very large" categories are treated likewise, thus eliminating the extremes. A further problem lies in the fact that the size categories for all the localities were averaged by simple average without regard for the absolute size of farms, or even whether every locality was represented. It is necessary to go back to the Statistics Volume to see some particularly egregious examples of this; an effort to minimize the appearance of inequality might be suspected (e.g. Statistics Vol. p. 291; see Arrigo 1986, pp. 347-356).

The main data organized by farm size group in the Statistics volume of Buck 1937 are: (1) number of farms, (2) average size of farm, (3) size of household, (4) percent of farm area rented, (5) man-equivalent per farm, and (6) production per man-equivalent. These were the basic building blocks for my calculations of productivity and landownership inequality. By calculating (5) x (6) / (2) we arrive at production per hectare. Production per capita is (5) x (6) / (3). Additional adjustments to production were made according to current year's production in relation to normal year (Statistics vol. p. 208), to substract farmstead and non-productive land from farm size (p. 65), and to neutralize effects of intensification (if multiple-cropping for the farm size group is greater or lesser than the average for the locality, from p. 295).

Appendix F

CALCULATE LAND RENTED OUT (RO) AND RENT TO SUBSIST (RS) FOR A LANDOWNERSHIP DISTRIBUTION WITH 42% DISPLACEMENT FROM EQUALITY

Inputs: Product per Capita _____ Subsistence_____ Sufficiency Threshold ____
Apply various Rates of Rent to discover maximization for Rate of Rent solution.

Find amount of land owned needed for subsistence: Subsistence/Product per Capita
Locate Population Percentile and Shortfall at Percentile. Shortfall/(1 - Rent) equals RS.
Find amount of land owned needed for leisure: Sufficiency Threshold / (Prod Cap x Rent)
Locate Population Percentile and Cumulative Land. Cumulative Land Owned equals RO.
Population Percentiles allow measure of numbers in Land-Short and Landlord classes.

MAXIMIZE % SURPLUS RETAINED If RO > RS MAX (RO-RS) (1-Rent) / RO
MINIMIZE SUBSISTENCE SHORTFALL If RO < RS MAX RO - RS

Per-centile	Land Owned	Cumulative Land Owned (from top)	Shortfall at Percentile
1	0.01	0.01	0.00
2	0.02	0.02	0.01
3	0.03	0.05	0.03
4	0.04	0.09	0.07
5	0.05	0.14	0.12
6	0.06	0.20	0.18
7	0.07	0.27	0.24
8	0.08	0.36	0.30
9	0.09	0.45	0.36
10	0.10	0.54	0.43
11	0.11	0.65	0.51
12	0.11	0.76	0.60
13	0.12	0.89	0.70
14	0.13	1.02	0.81
15	0.14	1.16	0.93
16	0.15	1.30	1.07
17	0.16	1.46	1.21
18	0.17	1.63	1.37
19	0.18	1.80	1.53
20	0.18	1.99	1.70
21	0.19	2.18	1.87
22	0.20	2.38	2.07
23	0.21	2.59	2.26
24	0.22	2.81	2.44
25	0.23	3.04	2.66
26	0.24	3.28	2.90
27	0.25	3.53	3.16
28	0.26	3.78	3.43
29	0.27	4.05	3.73
30	0.28	4.33	4.05
31	0.29	4.62	4.36
32	0.30	4.92	4.70
33	0.31	5.23	5.06
34	0.32	5.56	5.42
35	0.33	5.89	5.81
36	0.35	6.24	6.21
37	0.36	6.59	6.63
38	0.37	6.96	7.06
39	0.38	7.34	7.52
40	0.39	7.74	8.01
41	0.41	8.14	8.52
42	0.42	8.56	9.07
43	0.43	9.00	9.65
44	0.45	9.45	10.27
45	0.46	9.91	10.90
46	0.48	10.39	11.58
47	0.49	10.88	12.32
48	0.51	11.39	13.11
49	0.53	11.92	13.95
50	0.55	12.46	14.85
51	0.57	13.03	15.84
52	0.59	13.62	16.88
53	0.61	14.22	17.96
54	0.63	14.85	19.10
55	0.65	15.50	20.23
56	0.67	16.17	21.42
57	0.69	16.87	22.59
58	0.71	17.58	23.82
59	0.74	18.32	25.10
60	0.76	19.07	26.43
61	0.78	19.86	27.81
62	0.81	20.66	29.31
63	0.83	21.49	30.86
64	0.86	22.35	32.51
65	0.88	23.23	34.25
66	0.91	24.15	36.08
67	0.94	25.09	38.00
68	0.97	26.06	40.01
69	1.00	27.06	42.12

Per-centile	Land Owned	Cumulative Land Owned (from bottom)
69	1.00	73.95
70	1.03	72.95
71	1.07	71.91
72	1.10	70.84
73	1.13	69.74
74	1.17	68.61
75	1.21	67.44
76	1.25	66.23
77	1.29	64.98
78	1.34	63.69
79	1.40	62.34
80	1.46	60.94
80.5	1.49	59.48
81	1.53	58.73
81.5	1.56	57.97
82	1.59	57.19
82.5	1.63	56.39
83	1.66	55.58
83.5	1.70	54.75
84	1.74	53.90
84.5	1.78	53.03
85	1.82	52.14
85.5	1.87	51.23
86	1.92	50.30
86.5	1.98	49.34
87	2.03	48.35
87.5	2.09	47.33
88	2.15	46.28
88.5	2.22	45.21
89	2.28	44.10
89.5	2.34	42.96
90	2.41	41.79
90.5	2.47	40.59
91	2.54	39.35
91.5	2.61	38.08
92	2.68	36.78
92.5	2.75	35.44
93	2.84	34.06
93.5	2.94	32.64
94	3.06	31.17
94.5	3.22	29.64
95	3.40	28.03
95.2	3.49	26.33
95.4	3.58	25.64
95.6	3.69	24.92
95.8	3.79	24.18
96	3.91	23.42
96.2	4.03	22.64
96.4	4.16	21.83
96.6	4.28	21.00
96.8	4.41	20.15
97	4.54	19.26
97.2	4.69	18.36
97.4	4.83	17.42
97.6	4.98	16.45
97.8	5.14	15.46
98	5.31	14.43
98.2	5.49	13.37
98.4	5.68	12.27
98.6	5.89	11.13
98.8	6.11	9.96
99	6.36	8.73
99.2	6.64	7.46
99.4	6.96	6.14
99.6	7.35	4.74
99.8	7.86	3.27
100	8.51	1.70
Total:	100.00	

Appendix G **FLUCTUATIONS IN RATE OF RENT SOLUTION -- RATE OF RENT AT SUFFICIENCY THRESHOLD**

Landownership distribution generated by computer simulation of partible inheritance, smoothed; displacement from equality = 42%

Product per Capita in Kilograms of Grain-Equivalent -->

Sufficiency Threshold	220	260	300	325	350	375	400	425	450	500	550	600	
800	Legend:			44	46	47	47	48	49	42	37	33.5	800
	48 Rate of Rent Solution			44	45.5	46	46.5	*47.5*	49				
750	*45* Receding		42	44	45	45.5	46	*48*	48	40.5	36	32	750
	55 Crest		42	44	45	45	*46*	*49.5*	46.5				
700			42	43.5	44	45	*46.5*	*51.5*	46	40	34.5	30.5	700
			42	43	44	44.5	*48*	*52*	*45.5*	39			
650			42	43	43	*44*	*49*	**54.5**	*48*	38.5	34	29	650
		38	41.5	42	43	*44.5*	**56**	53	**49**	38	33		
600		38	41	41.5	42	*45*	54.5	51	48	*38*	32.5	28.5	600
		38	41	41	*42*	**55**	53	49	46	**41**	*32*	28	
550		38.3	40	41	*43*	54	51	47.5	44.5	39.5	*32.5*	27.5	550
		38.5	39.5	*40.5*	*49.5*	53	49.5	46	43	38	**34**	*27*	
500	32	38	39	*40*	**52**	51	47.5	44.5	41.5	36.5	33	**29.5**	500
	33.5	37.5	38	*42*	52	49	46	43	40		31	28	
450	33.5	37	*38*	50	51	47.5	44	41	38	34	30	27	450
	34	36	*38*	50	49	45	42	39	36.5			26	
400	34	35	**48**	49	46.5	43	40	37.5	35	31	28	25	400
	33	34.5	47.5	47.5	44.5	41	38	35.5	33				
350	33	*34*	47	46	42.5	39	36	33.5	31	28	25	22	350
	32	**45**	46	43	40	37	34	32	29.5				
300	31	44	44	41	37	34.5	32	30	28	25	22	20	300
	30	42.5	42	38									
250	29	41	39										250
	39	39											
200	37	37.5											200
	220	260	300	325	350	375	400	425	450	500	550	600	

Appendix G **FLUCTUATIONS IN RATE OF RENT SOLUTION -- LAND RENTED OUT AT SUFFICIENCY THRESHOLD**

Product per Capita in Kilograms of Grain-Equivalent -->

Sufficiency Threshold	220	260	300	325	350	375	400	425	450	500	550	600	
800	Legend:			15.1	19.1	21.9	23.8	26.0	28.0	26.8	25.9	25.6	800
	40.5 Land Rented Out (RO)			16.2	19.7	22.2	24.4	26.6	28.8				
750	**34.8** RO at crest		13.0	17.3	20.4	22.9	25.0	27.7	29.2	27.6	26.9	26.1	750
	of Rate of Rent		14.1	18.4	21.3	23.5	25.9	29.6	29.6	Surplus			
700	_| Boundary of		15.3	19.2	22.0	24.3	26.8	31.9	30.0	29.2	27.2	26.6	700
	Deficit/Surplus		16.6	20.0	23.0	24.9	29.0	33.6	31.0	29.5			
650	to Renters' Needs		17.8	20.9	23.4	25.9	30.8	**37.4**	34.2	29.8	29.0	27.4	650
	10.9		18.7	21.7	24.5	27.2	**37.7**	38.0	**36.9**	31.0	29.6		
600	12.3		19.7	22.5	25.2	28.7	38.4	38.1	37.6	32.4	30.4	29.0	600
	13.7		20.8	23.4	26.1	**37.7**	39.1	38.3	38.0	**37.4**	31.3	29.8	
550	Deficit 15.0		21.6	24.6	27.9	39.0	39.6	38.8	38.5	37.8	33.4	30.6	550
	17.2		22.7	25.7	33.9	40.3	40.4	39.5	39.1	38.2	**37.4**	31.5	
500	7.1	18.5	23.7	26.5	**38.5**	40.8	40.8	40.3	39.6	38.5	37.8	**37.1**	500
	10.3	19.2	24.4	29.3	40.9	41.3	41.4	40.9	40.1		38.3	37.3	
450	12.1	21.0	25.8	**38.1**	42.5	42.0	41.8	41.4	40.5	40.2	38.8	37.9	450
	14.6	21.9	27.4	40.8	43.2	42.5	42.3	41.8	41.2	Surplus		38.9	
400	16.6	22.9	**37.9**	42.6	43.6	43.2	42.8	42.6	42.0	41.4	41.1	39.9	400
	17.8	24.3	40.5	44.2	44.4	43.9	43.4	43.2	42.4				
350	20.0	25.8	43.2	45.6	45.3	44.7	44.0	43.6	42.7	42.8	42.0	40.2	350
	21.4	**37.9**	45.4	46.0	45.9	45.6	44.7	44.7	43.7				
300	22.9	40.7	46.8	47.1	46.5	46.1	45.6	45.4	44.9	44.6	43.2	42.8	300
	24.4	43.0	48.3	47.5									
250	26.0	45.5	49.0			Surplus							250
	40.7	47.6											
200	43.6	50.2											200
	220	260	300	325	350	375	400	425	450	500	550	600	

Appendix G FLUCTUATIONS IN RATE OF RENT SOLUTION -- EXTRACTION FROM RENTERS AT SUFFICIENCY THRESHOLD

(EXTRACTION = RATE OF RENT x LAND RENTED OUT)

Product per Capita in Kilograms of Grain-Equivalent -->

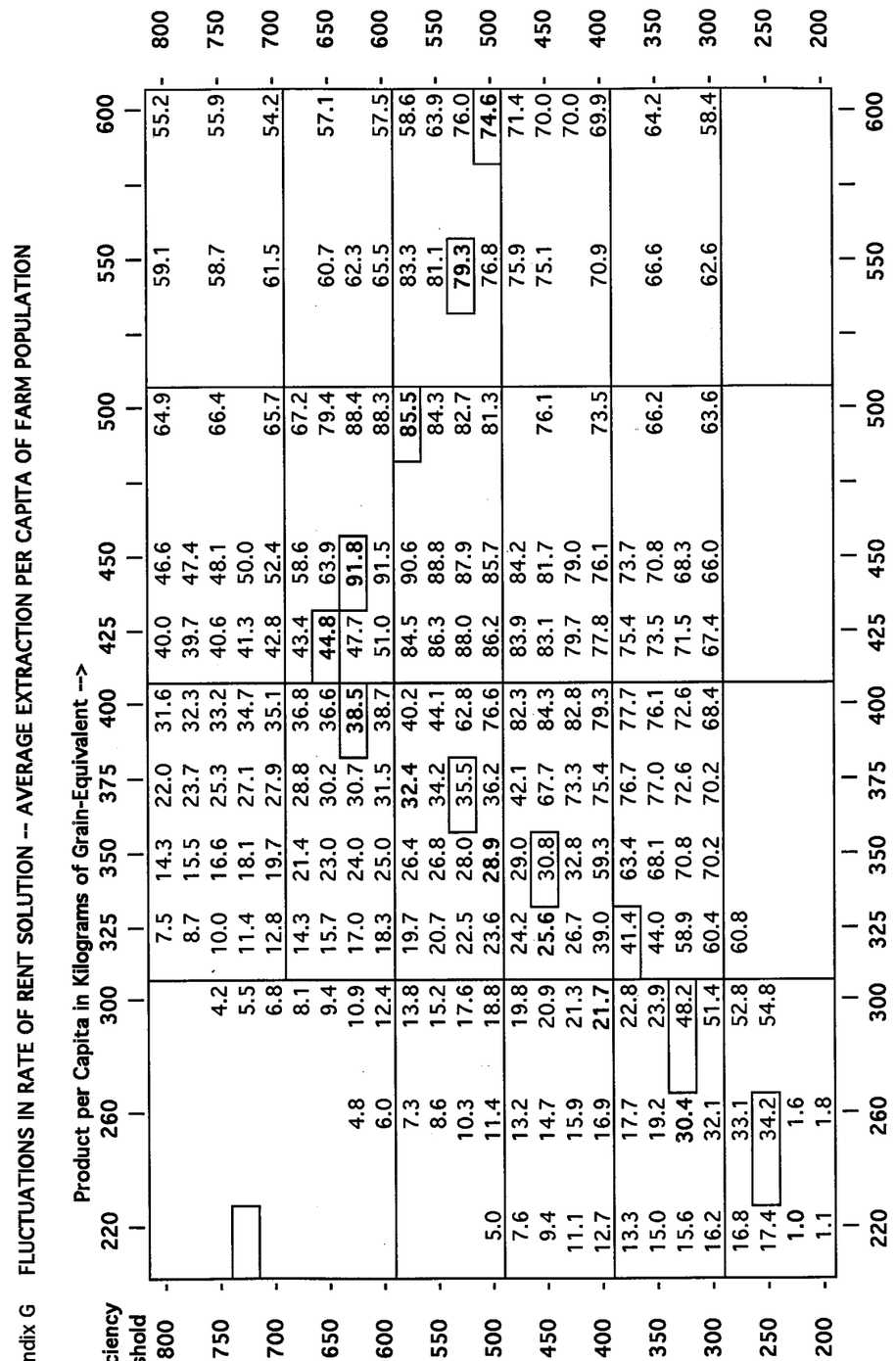
Sufficiency Threshold	220	260	300	325	350	375	400	425	450	500	550	600	
800	Legend:			6.6	8.8	10.3	11.2	12.5	13.7	11.3	9.6	8.6	800
	20.7 Crest of			7.1	9.0	10.2	11.3	12.6	14.1				
750	Rate of Rent		5.5	7.6	9.2	10.4	11.5	13.3	14.0	11.2	9.7	8.4	750
	21.4 Maximum		5.9	8.1	9.6	10.6	11.9	14.7	13.8				
700	Extraction		6.4	8.4	9.7	10.9	12.5	16.4	13.8	11.7	9.4	8.1	700
	from Renters		7.0	8.6	10.1	11.1	13.9	17.5	14.1	11.5			
650			7.5	9.0	10.1	11.4	15.1	**20.4**	16.4	11.5	9.9	7.9	650
		4.1	7.8	9.1	10.5	12.1	**21.1**	20.1	**18.1**	11.8	9.8		
600		4.7	8.1	9.3	10.6	12.9	20.9	19.4	18.0	12.3	9.9	8.3	600
		5.2	8.5	9.6	11.0	**20.7**	20.7	18.8	17.5	**15.3**	10.0		
550		5.7	8.6	10.1	12.0	21.1	20.2	18.4	17.1	14.9	10.9	8.4	550
		6.6	9.0	10.4	16.8	21.4	20.0	18.2	16.8	14.5	**12.7**	8.5	
500	2.3	7.0	9.2	10.6	**20.0**	20.8	19.4	17.9	16.4	14.1	12.5	**10.9**	500
	3.5	7.2	9.3	12.3	21.3	20.2	19.0	17.6	16.0		11.9	10.4	
450	4.1	7.8	9.8	**19.1**	21.7	20.0	18.4	17.0	15.4	13.7	11.6	10.2	450
	5.0	7.9	10.4	20.4	21.2	19.1	17.8	16.3	15.0			10.1	
400	5.6	8.0	**18.2**	20.9	20.3	18.6	17.1	16.0	14.7	12.8	11.5	10.0	400
	5.9	8.4	19.2	21.0	19.8	18.0	16.5						
350	6.6	8.8	20.3	21.0	19.3	17.4	15.8	14.6	13.2	12.0	10.5	8.8	350
	6.8	17.1	20.9	19.8	18.4	16.9	15.2						
300	7.1	17.9	20.6	19.3	17.2	15.9	14.6	13.6	12.6	11.2	9.5	8.6	300
	7.3	18.3	20.3	18.1									
250	7.5	18.7	19.1										250
	15.9	18.6											
200	16.1	18.8											200
	220	260	300	325	350	375	400	425	450	500	550	600	

Appendix G FLUCTUATIONS IN RATE OF RENT SOLUTION -- ESTIMATED LANDLORD POPULATION

Product per Capita in Kilograms of Grain-Equivalent -->

Sufficiency Threshold	220	260	300	325	350	375	400	425	450	500	550	600	
800				0.6	1.2	2.0	2.8	3.6	4.0	4.8	4.8	4.6	800
				0.8	1.4	2.2	3.0	3.6	4.2				
750			0.2	0.9	1.6	2.4	3.2	3.8	4.4	5.0	4.8	4.8	750
			0.4	1.1	1.8	2.8	3.4	4.0	4.6				
700			0.6	1.3	2.0	2.8	3.6	4.2	4.8	5.5	5.0	4.8	700
			0.8	1.6	2.4	3.0	3.8	4.2	5.0	5.5			
650			0.1	1.3	2.6	3.2	3.8	**4.6**	5.5	7.0	5.5	5.0	650
		0.6	1.2	2.0	2.8	3.4	**4.2**	4.8	**8.0**	8.0	5.5		
600		0.9	1.6	2.3	3.0	3.6	4.4	5.0	8.5	8.0	6.0	5.5	600
		1.0	1.8	2.5	3.2	**3.8**	4.6	8.0	8.5	**8.0**	8.0	6.0	
550		1.2	2.0	2.7	3.4	4.2	4.8	8.5	9.0	8.5	8.0	6.5	550
		1.4	2.4	3.1	3.8	4.6	6.5	9.0	9.0	8.5	**8.5**	8.0	
500	0.6	1.7	2.8	3.4	**4.0**	4.8	8.5	9.5	9.5	9.0	8.5	**8.0**	500
	1.2	2.0	2.8	3.5	4.2	5.0	9.5	9.5	9.5	9.0	8.8	8.5	
450	1.4	2.3	3.2	**3.9**	4.6	8.5	10.0	10.0	10.0	9.0	9.0	8.5	450
	2.0	2.8	3.6	4.2	4.8	9.5	10.5	10.0	10.0		9.3	9.0	
400	2.4	3.1	**3.8**	5.9	8.0	10.0	10.5	10.5	10.0	10.0	9.5	9.5	400
	2.6	3.4	4.2	6.6	9.0	11.0	11.0	10.5	10.5			9.8	
350	3.0	3.8	4.6	7.6	10.5	11.5	11.5	11.0	10.5	10.0	10.0	10.0	350
	3.4	**5.7**	8.0	9.8	11.5	11.5	11.5	11.5	11.0				
300	3.8	6.6	9.5	10.8	12.0	12.0	12.0	11.5	11.5	11.0	11.0	10.5	300
	4.2	7.1	10.0	11.3									
250	4.6	8.1	11.5										250
	6.5	8.8											
200	7.0	9.5											200
	220	260	300	325	350	375	400	425	450	500	550	600	

Appendix G FLUCTUATIONS IN RATE OF RENT SOLUTION -- AVERAGE EXTRACTION PER CAPITA OF FARM POPULATION



Appendix H The Effects of Population Density: Approximation of the Empirical Data by Multiple Linear Regression

(The following approximation of the effects of population density by means of multiple linear regression is taken from Arrigo 1990 manuscript; the coefficients of the multiple regressions are applied in the evolutionay scenario in Chapter 10, and more-or-less approximate the non-linear effects analyzed in Chapter 9.)

An estimate for the sufficiency threshold for hiring year labor (the best indicator that the household relies on hired labor to substitute for its own labor, not merely engages in exchange of labor with other households to relieve farming peaks) was extracted from the data by the following procedure: For each region, the farm size groups were arranged in order of amount of land farmed per capita. It was assumed that those farming the most land per capita were those most likely utilizing hired labor. The list was cut at the point that corresponded to the number of farms hiring adult male year-laborers. Then an average was taken of the product per capita, excluding the product of rented land, for several of the farm size groups around the cutoff point. The resulting figures are an underestimate, perhaps by as much as 12%, because the household size figures enumerate year-laborers as part of the household, whereas they certainly do not share in ownership.

Though there is little direct evidence in the survey data of a sufficiency threshold for renting out land, it is possible to deduce one for each region by asking, what threshold would closely approximate, at the observed rate of rent and a landownership distribution that is constant relative to its average, the observed quantity of rented land? The answer can be calibrated using the mathematical model of landownership and land tenure as before.

Population density and the associated friction of transport are represented by two variables, population density on cropland (persons per hectare of cropland), and cropland density in the gross area (percent of the total area that is cropland). Since it is possible to have a plain uniformly strewn with fields of low fertility (Winter Wheat-Kaoliang, North), or far-flung mountain valleys with intensely productive plots (Southwestern Rice Area), these two variables cannot be reduced to one. These are presented in the inverse, such that the larger the number, the more dispersed the population; and after much experimentation the square root of cropland density has been found to work better in linear regression. Then the two variables representing

population density are 1) square root of Cropland Hectares per Person (i.e. the linear distance between persons on the cropland, if equally distributed; this might be envisioned as related to the walk to a market town), and 2) the Gross Area per Crop Area (i.e. total area, including wasteland, relative to cropland. This is perhaps more related to long-distance marketing, and might be envisioned as related to the cost of transporting produce to a central place from market towns in its hinterland).

Two additional variables are constructs derived mainly from the theoretical model, not empirical data: 1) the gap from or margin above subsistence experienced by the land-short, given the actual amount of rented land; and 2) the level of the sufficiency threshold at which the rate of rent is maximized. The use of these two will become apparent below. The relationships among these and other variables have been investigated by multiple linear regression and graphing in all plausible combinations.

The first of these two variables, labelled "subsistence margin", is similar to the RO - RS of the model (land units rented out minus land needed for rent by renters), except that it seeks to avoid influence by the rate of rent. RO here is represented by the actual amount of rented land, divided by (1 - Rent) — the product renters keep on rented land. RS here is similar, the amount of land that the land-short must rent to subsist, likewise divided by (1 - Rent) — the portion of subsistence that is not satisfied by their own landholdings. This is based on the empirical data on the land-short given before in Table 3. The difference between the two, supply and demand, quantifies the gap from or margin over subsistence for the whole population. This variable appears as a negative number for deficit areas, and a positive number for surplus areas; the magnitude indicates the degree of gap or excess. This variable for the most part reflects the product per capita.

Where population is dispersed, the amount of land rented out falls below what it would be based on the product per capita. The most notable case of this effect is the Winter Wheat-Kaoliang Area, North, with product per capita about 550 kg., which would allow over half of all land to be rented out if there were no friction of transport; but instead rented land is less than 10% of the area. It is possible to almost perfectly match the empirically-derived subsistence margin with the following multiple regression on Product per Capita and the measures of population density:

Subsistence Margin =
13.5 + 0.0911 x Product per Capita +
-91.3 x square root of Cropland per Person +
-0.656 x Gross Area per Crop Area [Eq. 1]

In this case R2 (the multiple coefficient of determination, i.e. the portion of the variance accounted for by this equation) equals 0.97, with alpha (the probability that this finding should be rejected) much less than 0.01. Of course the precise values of these coefficients are not magical numbers, but they are carried out to three significant digits for later use.

Examples that show the magnitude of these variables have been calculated for the averages of the two barren, sparsely populated northwest regions, the Spring Wheat and the Winter Wheat-Millet Areas, and of the two fertile but densely-populated southeast regions, the Rice-Tea and Double-Cropping Rice Areas. The total of the terms does not quite equal the empirically-derived subsistence margin because the fit of the equation is, after all, not quite perfect.

	Barren Northwest	Dense Southeast
Constant	+13.5	+13.5
Product per Capita	230 x 0.911 = +20.9	377 x 0.911 = +34.3
Cropland per Person	0.58 x -91.3 = -52.8	0.40 x -91.3 = -36.5
Gross per Crop Area	9.61 x -0.66 = - 6.3	3.39 x -0.66 = - 2.2
Subsistence Margin	-24.7	9.2

The equation means that the higher the product per capita, the more positive the subsistence margin; but the more dispersed the population, the more negative the subsistence margin. It is possible for the two factors to offset each other. Cropland hectares per persons is the most important term, and the gross area per crop area is relatively insignificant.

Where the subsistence margin is negative and large, it may be expected that the extreme pressure of destitution for the majority of the population depresses payments to hired labor. It is certainly the case, as seen in the survey data on wages, that payment to labor is much lower in the areas for which the subsistence margin is negative. If, as seemingly depicted in the data for the Spring Wheat and Winter Wheat-Millet Areas, such a vast majority of the population is so destitute that little more surplus can be wrung

from their production than blood can be squeezed from a turnip, then this is probably an inward-turning economy in which the only further benefit for landowners is to extract more services. The logic is that the poor peasants must be paid for their labor or crafts, or they will be unable to make rent payments. Labor and rough native products may be cheap, but luxury goods probably even more rare and expensive because of the limited market for them. Landowners, even medium-size ones, may as well enjoy leisure rather than additional income. Thus they may choose to become landlords or hire labor, even at an income that is relatively low. However, population dispersal also plays a role in effecting such a feudal social order. It is possible for average product per capita to be well into the surplus condition, and yet the land-short pressed down by lack of rented land, due to population dispersal.

The levels for the sufficiency threshold for hiring labor in each area can be explained with just a few terms, the subsistence margin and the indices of population density. The result of multiple linear regression is:

Sufficiency Threshold for Hiring Labor =
218 + 9.49 x Subsistence Margin +
422.9 x square root of Cropland per Person +
5.61 x Gross Area per Crop Area [Eq. 9]

R2 = 0.94, alpha = 0.01. Examples:

	Barren Northwest	Dense Southeast
Constant	+218	+218
Subsistence Margin	-24.4 x 9.49 = -232	11.2 x 9.49 = +106
Cropland per Person	0.58 x 422.9 = +245	0.40 x 422.9 = +169
Gross per Crop Area	9.61 x 5.61 = + 54	3.39 x -5.61 = + 19
Sufficiency Threshold for Hiring	285	512

These coefficients mean that the more dispersed the population, either on the crop land or over the gross area, the higher the threshold. But the more negative the subsistence margin — i.e. the greater the gap — the lower the threshold, and this is a major influence. In the extreme case of impoverishment, the hire threshold is in fact only a little more than subsistence. It is not possible to substitute product per capita for the subsistence margin in Equation 9, no doubt because of the conflicting effects of population dispersal, both directly raising the sufficiency threshold for hiring, and lowering the subsistence margin, which indirectly lowers it.

The rent-out threshold may also be analyzed in terms of these three variables, but with the necessary addition of a fourth, which I have labelled the "maximum extraction rent threshold". This is a quantity which has been derived entirely theoretically.

When the same series of solutions are calculated for a wide range of product per capita, then Appendix G, pages 1, 2 and 3 are generated: rate of rent, amount of land rented out, and rate of extraction, in the two dimensions of rent-out threshold versus product per capita. It may be seen in Appendix G that there is a point of highest rate of rent for each level of productivity, forming altogether an inverted-V pattern somewhat similar to that of the solution for the rate of rent, but shifted more to the right. The peak values are applied as the Maximum Extraction Rent-Out Threshold.

The precise numbers given in these tables are not important, but the sense of complex, undulating forces of determination set off from a few elemental inputs and relationships is. My mathematics is not adequate to take the quantitative analysis to its logical deterministic conclusion, and I must continue to rely on descriptive tables and graphs; but I trust others can.

Both peak rates of rent for individual landlords and peak rates of extraction for the total social structure provide a plausible rationale for a tendency towards a particular level of rent-out threshold. Since the mechanism for the solution for the rate of rent from the point of the land-short has been found in an aggregate analysis of their demand, it is more intellectually consistent to utilize the aggregate maximization of extraction by landowners in determination of their supply of rented land. However, the supply has a much more uncertain and volunteeristic nature, not a physiological basis like the demand of the land-short. The question as to whether societies organically and inherently tend towards forms that wring out and concentrate the greatest portion of surplus is posed by this analysis, but it must be left for social philosophers to resolve. Here we can only ask a much more circumscribed question, whether the rent-out threshold (itself a theoretical construct) tends toward the level at which a maximum portion of the agricultural produce is transferred in rent payments.

When this factor of maximization is added into the numerical analysis of the rent-out threshold that has been derived from empirical data, a significant portion of the variance is accounted for. In fact, if it is omitted, no correlation is found for the remaining variables. The best result of the multiple linear regression is:

Sufficiency Threshold for Renting-Out Land =
-1893 + 3.42 x Maximum-Extraction Rent-Out Threshold +
-132 x natural log of Subsistence Margin +
1190 x square root of Cropland per Person +
27.2 x Gross Area per Crop Area [Eq. 2]

where the natural log of the Subsistence Margin narrows its range of influence, but its original sign is retained. For Equation 10, R2 = 0.91, alpha < 0.05. Examples:

	Barren Northwest	Dense Southeast
Constant	-1893	-1893
Max-Extraction Rent	255 x 3.42 = + 872	588 x 3.42 = +2010
Subsistence Margin	-3.13 x -132 = + 412	2.41 x -132 = - 317
Cropland per Person	0.58 x 1190 = + 689	0.40 x 1190 = + 476
Gross per Crop Area	9.61 x 27.2 = + 262	3.39 x 27.2 = + 92
Sufficiency Threshold for Renting Out	342	367

Given the complex intercorrelations of the data, it cannot be assumed that this provides the definitive answer concerning the factors determining the amount of land rented out. Multiple linear regression cannot really capture the relationships of the variables, or their causal interaction, even when allowance is made for some nonlinearity by taking the log or square root of some of the variables. Moreover, these coefficients are shaped to the particular data they address, and should not be pushed to service beyond the range of this data. However, the equation also serves as a plausible description of physical and social forces, one that may be relevant in its generality to other environments. The factors in this multiple regression may be described in more common-sense terms. The effect of population density is the easiest to interpret. As before, the more dispersed the population, the higher the rent-out threshold, and the less land that is rented out. But the impact of dispersal of population is greater than for the hire threshold, as would be expected since probably nearly all of the extracted product is transported, not just part. Here it is worth reviewing the coefficients that were seen in the multiple linear regressions:

Variable	Hire-In Threshold	Rent-Out Threshold	Increase
Cropland per Person	423	1190	x 2.8
Gross Area per Crop Area	5.61	27.2	x 4.8

Population dispersal has a much greater impact on the rent-out threshold, and the increase is considerably more marked for the indicator of long-distance transport.

Next, the rent-out threshold tends strongly towards that which would maximize the level of extraction overall. This theoretical factor was constructed just given the product per capita, but without consideration of the actual amount of land available for rent under the conditions of population density. Finally, the subsistence margin factor reflects the actual amount of rented land available relative to needs — incorporating also an indirect effect of population density: it increases the rent-out threshold when population is dispersed, whereas it decreases the hire threshold under the same conditions.

This contrasting effect of the subsistence margin on hire and rent-out thresholds requires more explication. The data may be interpreted to suggest that there is a dynamic relationship in the land/labor market between conditions of hiring-in labor and renting-out land. When population is more dispersed but at the same product per capita, lack of rented land and access to the means of production for the land-short apparently depresses the price of labor, leading to a relative advantage for farming with hired labor over renting-out. Moreover, payment to hired labor is low when the produce cannot be easily marketed, regardless of the productivity of that labor. This supposition is supported by an investigation of interregional correlations:

Product per Man-Equivalent on Large Farms
and Cash plus Grain Wages to Labor, r = .01 (none)
Man-Work to Market Produce per Farm
and Cash Wages to Labor, r = -0.93

(This was calculated from summary data in Buck, reprinted 1964, p. 283, 306 and 349.) Conversely, when population is dense most of the land-short can obtain rented land which allows them some degree of independence; no doubt unattached labor is in short supply and must be paid handsomely. In fact, with very dense populations there may be an emerging division of labor that allows a portion of small owners to ensure

their subsistence from the proceeds of rent, abandoning heavy farm labor while engaging in trade and manufacture. So the rent-out threshold may dip to a level of ownership providing as little as 250 kg. per capita in rents, not very much over subsistence. Then when rented land is so ubiquitous the return to labor in general may be the same as the return to labor on rented land.

Appendix I Mathematical Approximations of the Landownership Distribution

An immediate issue in the calculations of maximization for the solution to the rate of rent, and the one to be discussed first here, is the mechanical mathematics of dealing with the landownership distribution. No doubt the reader, especially if an economist, is irritated to be presented with a lengthy table in Appendix A to find the values of the variables rather than a succinct equation. Since hitting the point of maximization in the market between land and labor is mathematically a matter of rather straightforward calculus, i.e. finding the area under the curve of the landownership distribution, it should be possible to reach an analytic solution, and discard the utilization of computer simulation on bulky spreadsheets, if this landownership distribution can be described by an equation.

But the problem does not yield as easily as would be hoped. The landownership distribution can be described as a frequency distribution: land size versus number of populace owning that size. As a frequency distribution it is a very skewed distribution. However, the mathematics of skewed distributions is even more complex, and the use of a frequency distribution also takes us one step farther away in conceptualization from the phenomenon of inequality as it may be envisioned on the landscape of rural society. Again, it would seem that the landownership distribution in the histogram form that has been used in this article, percentiles of population versus size of land owned, could be described by an equation with geometrical or exponential increase, to match the steep slope of increase in holdings for the last two richest deciles of that population. But the problem again does not yield as easily as would be hoped.

Throughout this thesis I have used a simple measure to quantify degree of inequality in ownership, "displacement from equality". It indicates the percent of land that, if starting again from a condition of complete equality, must be shifted from one portion of the population to another in order to reproduce the observed pattern of inequality. That is, if 30% of the population owns more than the average, and they own 80% of the land, displacement from equality is 50%. Likewise, if only 15% of the population owns more than the average, and they own 65% of the land, displacement from equality is 50%. This is obviously a rather quick and dirty index, easily computed but poor in differentiating between situations such as the above two. It is, however, easier to conceptualize in physical terms and much easier to compute than the Gini coefficient.

The greatest advantage of the histogram depiction of the landownerhip distribution and measurement of inequality direct from that is that the

It is possible to create a series of curves with an equation of the form

$$y = C * Ax^2 / (A - x^2) , \qquad \text{[Eq. 7]}$$

where x = population percentile ($0.01 < x < 1.00$), and y = land owned,

with a gradually increasing slope, such that the peak of the landownership distribution is fairly well matched with empirical examples, and the total of land is 100 units. (Appreciation is extended to N. Amondson, Mathematics Dept., Mesa College, San Diego, for this solution.) For example, for C = A = 1.215, 30% of the population, those with more than the average, own a total of 81% of the land, for a displacement of 51%. The holdings for the 100th percentile are 6.9 units of land. C = 4, A = 2.504 yields 40% displacement, and C = 1.03, A = 0.6307 yields 60% displacement.

Such a curve with gradually increasing slope, however, even if matched in percent of displacement with the landownership distribution estimated from the empirical data, differs in important characteristics that much affect the solution of the rate of rent, the unevenness of the slope of the curve.