The evolution of farmland inequality in China：facts and mechanism

——An Empirical study based on a nationally representative survey data

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Abstract: This paper uses a nationally representative survey data, respectively from the perspectives of the contract right and the use right,to estimate the Gini coefficient of farmland inequality from 1996 to 2013 and explore the mechanism of the evolution. We find: A.Whether from the point of the contract right or the use right, the farmland inequality in China has been gradually expanding. Moreover, there has been a tendency to accelerate in recent years. And the trend of concentration of use right is more obvious. B.For the widening inequality of contract right, the reallocation has been almost prohibited since the second round of the contract, which is the most important institutional factor.And the more frequent farmland taking also has been promoted the extend of farmland inequality in recent year. C.For the widening inequality of use right, it is mainly contributed by the distribution of contract right. The farmland transfer based on market motivation is also improved the centralization of use right.However, it has not been very effective so far and new institutional changes are needed to support it. D. In the long run, the concentration of use right is still subject to the distribution of the contract right and less influenced by other economic factors. The evolution process will be gradual for a long time.

Key words: farmland Reallocation, farmland inequality, second round of land contract

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I. Introduction

The trade-off between equality and efficiency is the core issue of economics, especially in developing countries (Udry, 1999). For those living in rural areas, the farmland is the most important resource of income(Udry,1996), and plays multiple roles (yao, 2000), so the allocation of the farmland is extremely important (Benjamin&Brandt, 2004).

Looking at the development of farmland management system in China, every important milestones contains considerations for the trade-off of equality and efficiency. The earlier land reform and subsequent collectivization were due to the state of serious unequal farmland distribution and the concerns about the deterioration of inequality in individual owned farmland[2]. However the Household Responsibility System is a response to the inefficiency of collectivization (Lin, 1992). Under the new regime, the periodical reallocation of farmland reflects the importance of equality (Zhou, 2004, Bai et al., 2014). Since the second round of the contract, extending the farmland tenure and limiting the occurrence of reallocation have been the perspective of paying attention to efficiency again (Jacoby et al., 2002). Since the 18th CCP national congress,the confirmation of farmland right has intended to solidify the allocation state of contract rights after the second round and clarify the border of contract rights and the management rights to promote farmland investment and circulation,realizing the improvement of farmland use efficiency (Hongyu Zhang,2017).As for the arrangement of farmland regime,it is difficult to generalize that which is more important between equality and efficiency.It varies according to external circumstances and conditions. This can be seen as a logical basis for understanding our country's farmland system arrangement, which is biased towards fairness or efficiency at different times in different regions. Generally speaking, when inequality is serious and the potential efficiency loss is not significant,allocation effect should be emphasized , especially the basic welfare protection (Jing Li, 2002). When inequality is slight and the potential efficiency loss is serious, the growth effect of property right protection should be emphasized (jocaby et al., 2002; Bai et al., 2014). Accordingly, the empirical judgment on the unequal

[2] There are different explanations for this historical event. For example, Cao and Li (2013), Cao et al. (2013) believed that land reform was a tool to serve the civil war; Wang (2006) and Li (2013) argued that the farmland inequality before land reform was still a bit serious: Lin et al. (2012) pointed out that the logical starting point of collectivization is to accumulate resources and implement the development strategy of large-scale industry priority.

condition of farmland allocation is extremely important and is also the basis for formulating appropriate policies. Unfortunately, relative research is relatively scarce. This paper attempts to

use a new tracking survey data to study the inequality of farmfarmland allocation in China and its evolutionary path.

From the authors` perspective, the main reason for the lack of relevant researches is that it is difficult to obtain appropriate research data. According to the research purpose, the appropriate research data should at least meet the following three conditions: 1.Nationally representative; 2.Microscopic survey data:;3. Can reflect the dynamic change of long period.

Fortunately, based on the above three considerations, our research team designed and implemented the survey, and collected and sorted out a set of data sets met the requirements. Based on this data, we would like to answer: 1. The current situation on inequality of farmland allocation in China ; 2.How the changing trend of this inequality has changed since the second round of the contract; 3. What is the incentive system that affects the change of farmland inequality?

The remainder of the paper is organized as follows.In the second section,we show the resource of data and related instructions. In the third section,we introduce the empirical judgment of farmland inequality in China in the past two decades.In the fourth section,we discuss the dynamic mechanism of the evolution of farmland inequality.In the fifth section,we re-examine the changing trend of the management rights in the long run.Finally,it is the summary of the full text.

II. Data sources and related instructions

In order to master the allocation of national farmland, the Center for Chinese Agricultural policy at the Chinese Academy of Sciences tracked questionnaire interviews among 1200 farmers in 60 villages of 30 townships of 15 counties of 5 provinces throughout the country in 2014 March[2]. The selection process adopted the combination of the stratified sampling and random sampling method.The national agricultural area was divided into five pieces and made Jiangsu, Sichuan, Shaanxi, Jilin and Hebei province as samples respectively.Then chosen sample counties,towns and administrative villages according to the level of economic development.Finally, the village of each sample was randomly selected 20 households[3].

Given the need to study farmland inequality, we need detailed farmland allocation

[9] There are many studies linking the size of farms to the efficiency of farming. Even scholars have further linked it to food security (Jianguo Xu,2016).

information, which needs to match the agricultural farmland and population information of each household from the data level. Additionally, we also want to illustrate the trend of farmland allocation over time, thus we need to trace back to form the panel data structure. Based on the understanding of the farmland regime and considering the realistic background and feasibility of farmland confirmation, we take two rounds of contract as an important node. Previous studies have revealed that most of the second round of contracts in the whole country were conducted between 1996 and 2000. In order to complete the data, we have collected all the information since 1996.

Our questionnaire interviews were designed three parts :1. Population information. In this part, firstly,we recorded the current population of each household and asked information of each individual, such as gender, age, household registration, education and so on. Secondly, we also recorded the population changes since 1996, including birth, death, marriage and adoption etc.. Combined with two parts of information, we can get the population of households from 1996 to 2013. 2.farmland information. We first recorded the information of all farm plots that farmers now operate[4], including area, irrigation, distance from home, year of operation, etc. Secondly, we also recorded the information of farmland that the family had received from the village collective but operated by other farmers. That is to say, we have collected information about all the plots in the level of the contract right and the management right respectively. 3. farmland change information. As with population information, we need to construct a panel data structure of household farmland stock and we also need to capture farmland changes over the years. Along the lines of Brandt et al. (2017), we divide farmland changes into four types: farmland allocation;farmland expropriation;farmland individual transfer and farmland collective transfer[5]. We collated and collected four types of farmland change events between 1996 and 2013 and recorded all plots involved in each event. Starting from the farmland stock in 2013, we estimated the two dimensions of the contract right and the management right in farmfarmland stock in the years since 1996 by calculating the annual flow of agricultural farmland changes.

III. Empirical estimation of farmland inequality in China

Based on the population and farmland information among 1200 households we

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surveyed,we can sum up to get each household every year of farmfarmland quantity (including the management right and the contract right of the household respectively) ,then divide by the annual population of the household,which equals to farmland quantity that everyone owns in that year[6].We will rank all the population among 1200 households according to their farmland quantity, and then we can respectively calculate the Gini coefficient of the contract right and the management right of national farmland by using the Gini coefficient equation[7].

图 1 全国农地承包权和经营权的不平等状况（1996-2013）

Figure 1 shows the calculation results obtained from the survey data. We have found that in the past two decades, the inequality of farmfarmland contract right has been expanding, with only a small reduction in 2004.The Gini coefficient of contract right is 0.54 in 1996,but that is 0.58 in 2013. On average, the annual increase is less than 0.002. Definitely, if from the point of absolute value,the Gini coefficient which is more than 0.5 means that the inequality of the farmland contract right is in serious condition. Similar to the situation of contract right, the inequality of farmland management right in China has been expanding too. Only in 2004 and 2006, there was a slight decline and then rapidly increased[8]. In 1996, the Gini coefficient of management right was 0.54, basically the same as the contract right.In 2013 ,however,it reached 0.67. On average, it increased annually by about 0.008 and it increases about 0.015 per year after 2006! If from the point of absolute value, the Gini coefficient of 0.67 in 2003 implies one of the extremely serious inequality.From the point of practical policy guidance,however,it is a goal related to farmland policy to facilitate the concentration of farmland management right so as to enlarge the scale of the farmfarmland[9]. The question raised may be whether 0.67 is high enough and whether it is quickly enough to increase 0.015 per year. So the corresponding judgment

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depends more on the future specification study.

The above for the calculation of the Gini coefficient will cause a lot of controversy because it ranked among 1200 households all over the nation. We know the nationwide regional difference is so great that the corresponding per farmfarmland is so different, such as Jilin province and Sichuan province. It is difficult for people to feel the inequality caused by regional differences.What is more,there are differences in the production conditions of farmland in the different areas.Thus it seems inappropriate to compare them directly. As the smallest administrative unit in rural China, the village is also the holder of farmfarmland ownership, whose internal homogeneity is high and the inequity in the village is more concerned by villagers. Therefore, we ranked the population of 20 households in each village according to the farmland area they own and then calculated the Gini coefficient on the village level. Figure 2 shows the average Gini coefficient of 60 sample villages.

图 2 1996-2013 年全国农地承包权和经营权的不平等状况（村级平均）

Figure 2 shows that, as we expected, the Gini coefficient of recalculation is greatly reduced, reflecting the data in the villages is more homogeneous and less unequal. The Gini coefficient of farmland contract right and management right changes in U shape. It was at the bottom in 2000 and has been in the stage of inequality expansion since then. Before 2000, in the left half of the U shape, the decline in farmland inequality was caused by two rounds of contracting in various sample

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Villages in this period and reallocation of farmland contract right.In other respects,similar to the information shown in figure 1[10],the speed of the inequality of management rights rises faster than that of the contract rights, and the trend of increasing inequality has accelerated since 2007.

The Gini coefficient of figure 1 and 2 is just a single indicator, which can not greatly describe the whole allocation of farmfarmland. In figure 3, we further extracted data of all 60 villages in 2000 and 2013 and estimated the distribution of farmfarmland contract right and management right in this two years using nuclear density method. It can be clearly found that the two kinds of farmland rights in 2003 are more left than that in 2000, showing the deepening of inequality and the left degree of management right is more obvious.

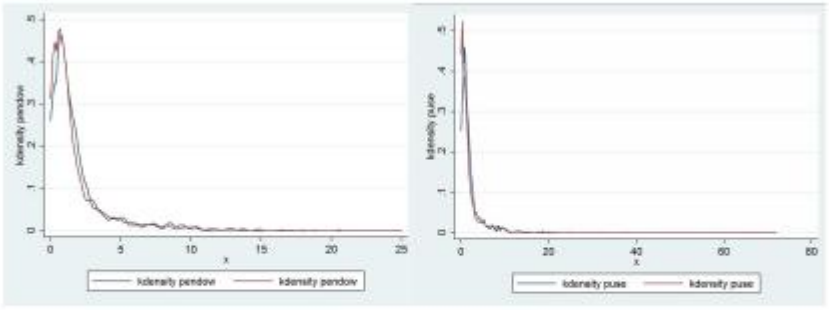

图 3 2000 和 2013 年农地承包权和经营权分布的核密度估计结果

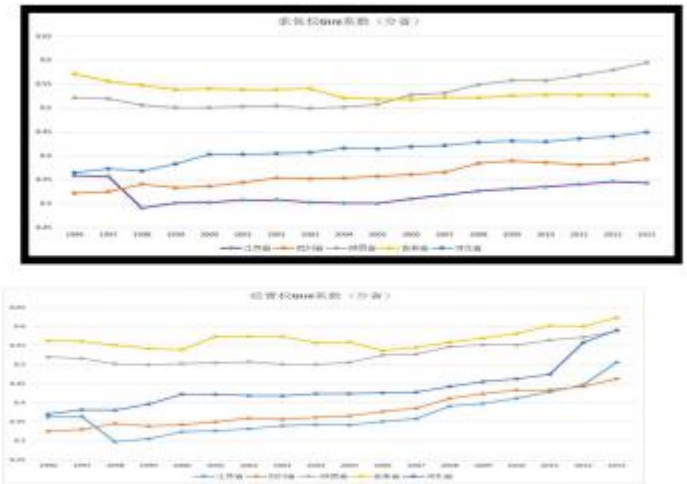

图 4 各省农地承包权和经营权的不平等状况（1996-2013）

In figure 4, the farmland inequality of the five sample provinces was calculated respectively

[10] The fact that is similar to figure 1 also confirms that the trend revealed by our institute is stable.

along the lines of figure 1, so as to demonstrate the geographical differences more clearly. In accordance with the theoretical expectation, the level of farmfarmland inequality in the provinces is between the country (figure 1) and the average (figure 3) of the villages and the change trend is more gradual. In general, the level of farmfarmland inequality in the provinces is positively correlated with the abundance of farmfarmland resources and the situation of contract right and management right is vitally similar. The inequality in Jilin province is the most serious, followed by Shaanxi province、Hebei province and Sichuan province, and Jiangsu province is the most average.What is more, the first two provinces and other provinces are significantly different. In figure 4,when it comes to contract right,it is worth noting that in Jilin province, inequality has always been declining, suggesting that regular farmland allocation may never really be banned. The inequality in Jiangsu province had a very significant reduction in 2000 because the second round of contracting was implemented in the whole province to reallocate farmland. In terms of management right, Hebei province in 2011 and Jiangsu province in 2012 both experienced a significant increase, which is likely to be the result of these two provinces promoting the whole village farmland transfer.

IV. The impetus regime of the evolution of farmland inequality

After being able to measure the level of agricultural inequality accurately, we further analyzed which factors were the driving force behind it. According to the data generation process introduced in the previous section, there are two main sources of farmland inequality.1. Population change.Since the second round of contract, a series of policies including farmland confirmation have intented to fix the result of farmland allocation.The number of households,however, is affected by the natural changes such as births, deaths and marriage (Tonglong Zhang and lin-xiu zhang, 2017). At this point, even if the distribution of farmfarmland among farmers remains unchanged, the farmland inequality measured will still change[11]. 2. farmland changes. As mentioned above, a significant difference between the four types of farmland change, Brandt (2017) viewed them as four kinds of farmland management mechanism or regime.So the discussion of these four farmland change impact on inequality is very meaningful and also has a lot of policy implications, which could answer a series of questions

[15] We do not distinguish between the big allocation and small allocation for the sake of simplicity.

[16] Contrasting the third with the fourth column, the annual fixed effect absorbs half of consequences of the farmland expropriation.

widely concerned. Among them,farmland allocation and expropriation can be regarded as non-market or administrative activities.Therefor,we can discuss:whether it is effective that farmland allocation is treated to settle the population change so as to ensure equal allocation[12].How much the effect of reducing inequality of farmland adjustment if it works? Thus, it can be used to estimate the cost of prohibiting farmland adjustment as well as what policies should be provided for the "brake" system to eliminate the worsening of the contract right. Similarly, how has the increasing frequency and the controversial farmland expropriation in recent years[13] affected the inequality of farmfarmland contracting rights? Secondly, how will farmland transfer based on market motivation affect the inequality of farmland management right? Will it tend to balance the allocation of management right among the households or to facilitate the concentration of management right to form scale operation? If the policy objective is to promote concentration by farmland transfer,will the function of the farmland transfer under the existing system be sufficient to achieve the goal? What is the difference between the individual transfer and the collective transfer of village organizations?

In order to solve this series of problems quantitatively, we use econometric model to estimate the panel data of village level (60 villages *18 years). Table 1 reports the results of the regression analysis of the contract right. The dependent variable is the Gini coefficient of the village contract right after the logarithm. In order to avoid the problem of inverse causality[14], the independent variables are the farmland allocation and farmland expropriation that one year lagged behind. In this village survey data used here,farmland allocation happened in the previous year is numbered as 1, otherwise 0.farmland expropriation,as the same as above,which happened in the previous year is numbered as 1,otherwise 0. Given that as a village of action, farmfarmland allocation and expropriation are influenced by many characteristics in the village, such as economic factors, history, geography, endowment ect.These factors may also affect the village farmfarmland contract right inequality. Ignoring these factors can lead to the existence of omitted variable bias in the estimation results of the model.The control of village fixed effect can effectively solve such problems. At the same time, we added the annual fixed effect in order to prevent the impact of the omission of public policy over time.

Table 1 shows that the estimation results of the models with different settings are not very

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different and they are robust. The following uses the results of the fourth column to interpret its economic implications. farmland allocation can significantly affect the unequal status of farmfarmland contract right,which can make the contract right Gini coefficient decline by 2% next year[15].That is to say,there is a fall in the Gini coefficient of 0.007,which is a tremendous effect. Not only is the equality effect of farmland allocation confirmed, but also it usually acts as argument when many scholars analyze the negative effects of farmland confirmation etc system reform,so that we need to focus on the relative research. Contrary to the farmland allocation, the farmland expropriation promotes the expansion of the inequality of the contract right.Each farmland expropriation would result in a 1 percentage point increase in the Gini coefficient of the contract right in the next year. This is also a enormous effect and statistically significant[16].Given the increasing frequency of farmland expropriation, the effect of increasing the inequality of farmfarmland contract right should be taken seriously.

表 1. 农地调整、征占和承包权分配不平等

	(1)	(2)	(3)	(4)
L.农地调整	-0.02***		-0.02***	-0.02***
	（0.01）		（0.01）	（0.01）
L.农地征占		0.02***	0.02***	0.01***
		（0.00）	（0.00）	（0.00）
村庄虚拟变量	yes	yes	yes	yes
年度虚拟变量	no	no	no	yes
常数项	0.24***	0.23***	0.24***	0.23***
	（0.01）	（0.01）	（0.01）	（0.01）
样本数	1020	1020	1020	1020

资料来源：作者调查

[15] We do not distinguish between the big allocation and small allocation for the sake of simplicity.

[16] Contrasting the third with the fourth column, the annual fixed effect absorbs half of consequences of the farmland expropriation.

According to the same measurement strategy, we also analyzed the evolution logic of the inequality of farmland management right.In the estimation of table 2 , the dependent variable is the Gini coefficient of village management right after taking the logarithm and the independent variables are the Gini coefficient of village management right after taking the logarithm which logging for a year,the number of households who turn in or turn out among the village sample households(20)、 whether the village collective farmland transfer happened (happened in 1, otherwise 0). Our estimation results illustrate that the distribution state of the contract right of the village has a significant impact on the inequality of management rights and the elasticity of contracting right to management rights is 0.7. That is to say, more than 70% of the farmland use we have seen is the result of the distribution of the contract right. The individual transfer of farmland based on market motivation will lead to the concentration of farmfarmland management rights instead of balancing the consequences of the distribution of the contract rights. Specifically, each additional household participates in the farmland transfer market (namely market participation rate by 5%, 1/20), whether turn in or turn out,the Gini coefficient of management rights will increase nearly 1%. Given the current lower participation rate in transfer market, there is a lot of policy space to "transfer to concentrate". On the other hand, we found that the collective circulation advocated by many village cadres also had a significant impact on the concentration of management rights, but its size was also one percentage point,which is lower than expected.

表 2. 农地流转和经营权分配不平等

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
L.承包权基尼系数	0.73***				0.73***	0.73***	0.73***	0.68***
	(0.03)				(0.03)	(0.03)	(0.03)	(0.03)
L.个体流转		0.01***		0.01***	0.01***		0.01***	0.01***
		(0.00)		(0.00)	(0.00)		(0.00)	(0.00)
L.集体流转			0.03***	0.02*		0.03***	0.01*	0.01*
			(0.01)	(0.01)		(0.01)	(0.00)	(0.00)
村庄虚拟变量	yes	yes	yes	yes	yes	yes	yes	yes
年度虚拟变量	no	no	no	no	no	no	no	yes
常数项	0.07***	0.24***	0.23***	0.23***	0.07***	0.06***	0.06***	0.11***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
样本数	1020	1020	1020	1020	1020	1020	1020	1020

资料来源：作者调查

表 3. 影响长期农地经营权分配不平等的因素

	(1)	(2)	(3)	(4)
是否为贫困村	0.13*	0.1	0.01	0.05
	-0.07	-0.06	-0.05	-0.07
总户数	0	0.00*	0	0
	0	0	0	0
村内小组数	-0.02***	-0.01***	0	-0.01**
	0	0	0	0
纯农户占比	0	0	0	0
	0	0	0	0
人均净收入	0.07	0.03	-0.01	0.02
	-0.05	-0.05	-0.03	-0.05
人均耕地面积	-0.00*	0	0	0
	0	0	0	0
劳动力外出务工比例	0	0	0	0
	0	0	0	0
劳动力文盲比例	0	0.00***	0.00**	0.00***
	0	0	0	0
村内企业数	0	0.01***	0.01***	0.01***
	-0.01	0	0	0
离最近的国道距离	0	-0.00*	0	0
	0	0	0	0
离乡镇政府的距离	0	0	0	0
	0	0	0	0
是否是平原	-0.00**	-0.00**	0	-0.00*
	0	0	0	0
2013 年承包权基尼系数			0.71***	
			-0.1	
1996 年承包权基尼系数				0.31**
				-0.14
常数项	-0.04	0.18	0.21	0.13
	-0.34	-0.34	-0.23	-0.32
样本数	60	60	60	60

资料来源：作者调查

The above part used a relatively strict measuring strategy to study the short-term dynamics of farmfarmland inequality evolution.However,it cannot reveal long-term trends. Considering the promotion of the transfer and concentration of management rights, the expansion of farmland operation is the political goal that has been underlined in China recently. The following table 3 used the basic information of the sample villages in 1996 and the Gini coefficient in 2013 to carry out the regression analysis and try to explore the long-term factors affecting the concentration of farmfarmland management rights. The results indicated that the endowment effect of farmfarmland contracting right is huge.The distribution of contracting rights happened 18 years ago impacts the elasticity coefficient of inequality of management rights in 2003, which can still

reach 0.31, suggesting that the farmland regime reform not changing the contracting rights is difficult to achieve drastically farmfarmland scale operation in a short time. In addition, the significant statistically factors also includes that when the number of administrative villages is increased by one, the gini coefficient would decrease by one percentage point,reflecting the group (or natural village) is the range that households own and transfer,and the more the number of division, the more detrimental it is to concentrate the management rights.;When it comes to the human capital in the village,the higher proportion of illiteracy, the more obvious the concentration of management rights; The development of industry and commerce in the village can significantly improve farmfarmland management rights concentration.When increasing a enterprise,the gini coefficient of management rights will increase by 1 percentage point;It is easier to concentrate the management rights if the geography condition is plain.

V. Conclusion

By analyzing meticulously on the nationally representative household survey data and exploring dynamically four types farmland changing regime which effect farmland allocation,we found that: 1. Whatever from the point of the contract right or management right, farmfarmland allocation inequality in China has been slowly expanding. What is more,there has been a tendency to accelerate recently, especially in the concentration of management rights. 2. In the background of the widening inequality of farmfarmland contract right, since the second round of the contract, the most important institution factor is that agricultural farmland adjustment has been almost banned.Additionally,in recent years, the increasingly frequent farmland expropriation also promoted the expansion of the contract right. 3. Behind the unequal expansion of farmland management rights, it is mainly the influence of the distribution of contract right endowment. The farmland transfer based on market motivation is also intensifying the centralization of management rights.However, it has not been very effective so far and new institutional changes are needed to support it. 4. In the long run, the concentration of management rights is still subject to the distribution of the contract power endowment and is less influenced by its economic factors. The evolution process will be gradual for a long time.

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