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The micro administrative mechanism of land reallocation in land consolidation: A perspective from collective action

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ABSTRACT

The implementation of land reallocation is stagnant in China for many reasons, among which the non-cooperation of farmers is a critical one. Although extensive research has been conducted to promote land reallocation, it is mainly confined to macro administrative or technical aspects, leaving studies on the micro administrative mechanism still absent. This paper deeply investigates incentives of farmers to participate in land reallocation, based on which we novelly analyse the interactions among farmers under two different scenarios. The results show that the number and heterogeneity of households involved in land reallocation make significant differences on achievement of collective action, and local governors should choose their strategies according to structure of the stakeholders group. Specifically, in land consolidation projects which involve a large-size group of small households, reducing costs incurred by the endowment effect is imperative. In projects which involve a small group of heterogeneous households, strategy that combines granting priority to small households in choosing land and constructing a farmland relative value system helps to reach agreements among households. In addition, an illustrative case study of Pengze project in Jiangxi province shows that introduction of land transfer in land consolidation projects can change structure of the stakeholders group, thereby facilitating implementation of land reallocation. Hence, a combination of land transfer and land consolidation projects can be a good solution to the stagnation of land reallocation.

1. Introduction

Agricultural sector in China plays a critical role not only to China itself but also to the whole world because there is the largest population in the world demanding food supplies. However, it is precisely the largest population, plus the egalitarian principles of land distribution in 1980s and land inheritance (Tan et al., 2006), that leads China to become one of the severest land fragmented countries in the world (Demetriou, 2012, p21): The average holding size in China is only 9.8 mu (a Chinese unit of land area, equals to 0.067 ha) with the average number of land parcels per household more than 5, and parcels within a household are usually spatially dispersed (Gu et al., 2017). Land fragmentation can have beneficial effects like facilitating risk management through diversification or making full use of labor by enabling households to spread their labor over the seasons (Bentley, 1987; Blarel et al., 1992). Nevertheless, as a new form of land degradation, it is more often believed to be one of the major problems existing in rural land management, especially in developing countries (Sklenicka et al., 2014). News has been reported that farmers in Gansu province had to work day and night in busy season to water the fields, because scattered parcels caused much trouble and many workloads to farming (Wu and Lu, 2016). Quantitative research also showed that production costs of corn, wheat and rice had a significantly negative correlation with the average parcel area in sample area of China (Nguyen et al., 1996), and a reduction of parcels number from 4 to 1 would increase total factor productivity by 8% (Fleisher and Liu, 1992). Tan et al. (2008) also proved that the average distance among parcels had significant positive impacts on all cost categories except seed, and land fragmentation limited application of modern technologies in China.

Therefore, land consolidation, as one of the major land management approaches for mitigating land fragmentation Demetriou et al., 2012, was introduced to China in 1980s, and has been vigorously developing since 2008. From 2006–2010, 124085 land consolidation projects with total area of 110,600 km^2 funded by the national and provincial government were approved, providing 20,800 km^2 farmland to China (Zhang et al., 2014). Despite the successful promotion of land

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consolidation, the implementation of land reallocation is rather stagnant. Land reallocation, also known as land tenure reallocation in China, is usually defined as the rearrangement of land parcels in terms of size, shape, location and land rights (Demetriou et al., 2012). It often provokes disputes and dissatisfaction due to the inevitable redistribution of property and interests among stakeholders, making land reallocation the most time-consuming and trouble-inviting stage (Cay et al., 2010). On the other hand, local governors are supposed to complete land consolidation projects as soon as possible because the scale of land consolidation projects completed in a given year has been incorporated into local governors' appraisal system since 2006 (Land Consolidation Center of Ministry of Land Resources, 2014). Therefore, unlike local governors in other countries such as Germany and The Netherlands, who usually endeavor to carry out a land reallocation plan for years, those in China are inclined to simply skip land reallocation stage and only focus on infrastructure construction to expedite the procedure of land consolidation.

We use the term "land reallocation" or "land reallocation in land consolidation" interchangeably in this study, but it should be noted that there is another type of land reallocation in China, which is not the topic of this paper, refers to a practice where village officials reallocate land area across families on an ongoing basis due to demographic changes to guarantee each member in a village has approximately the same area of land (Scott and Guo, 1998). It has been forbidden since the enactment of Rural Land Contract Law in 2002 because it is widely accepted to damage the stability of property right, ultimately hindering the investment on agriculture (Wang et al., 2011). However, the prohibition causes an unexpected side effect on land reallocation in consolidation: Many farmers and even local governors believe it is also forbidden by law, which further holds back the promotion of land reallocation in consolidation

The distorted incentives of local governors result in a low ratio of land reallocation in China: From 1998–2008, 50.89% of land consolidation projects funded by government involved land reallocation, accounting for only 14.92% of the total area of land consolidation projects (Cadastral Management Division of Ministry of Land and Resources, 2010), and land tenure of most part in projects area remained unchanged. This has greatly reduced the effects of land consolidation on improving agricultural production and hindered the realization of large-scale farming. Consequently, extensive studies have been done to propel land reallocation. From administrative aspects, Han and Wang (2016) argued that mismatches between regulations and practice cause stagnation in land reallocation. Furthermore, lack of formal and comprehensive law in addition with widely accepted standard on land reallocation makes it hard for governors to disabuse the incredulity from farmers (Hu and Wu, 2009). Therefore, clarifications of property right, jurisprudence basis and legislation with improved organization settings are requisites for the construction of a well-functioning institutional environment for land reallocation (Yu and Wu, 2003; Meng and Gao, 2008). A refined governance structure is also necessary to the exertion of sound institution efficiency. Generally, the paradigm of the implementation procedure should be modified from top-down to bottom-up (Lu et al., 2012; Zhang and Wang, 2013). Specifically, the initiation of land consolidation is supposed to be based more on farmers' agreements and applications rather than local governors' selections (Haldrup, 2015), while full public participation should be incorporated into the process of land reallocation to guarantee farmers' consent (Shi, 2015; Hartvigsen, 2015). On the whole, community based land consolidation is gradually becoming an efficient alternative to government-led ones in terms of land reallocation promotion (Liu et al., 2016).

In the meantime, researchers have also been dedicated to improve the efficiency of land reallocation process from technical aspects since 1970s (Essadiki et al., 2003; Demetriou, 2012, p79). Liu (2013) and Demetriou (2016) applied multiple criteria decision analysis and geographical weighted regression respectively in construction of a farmland relative value system to facilitate the exchange of parcels in land reallocation. Kupidura et al. (2014) added that public perceptions were critical factors that must be included in the determination of land value. These studies focused on the farmland appraisal in land reallocation because countries with comparatively short history of land consolidation are devoid of standard procedure and massive comparable data of farmland value. In many other studies, land reallocation is commonly divided into two steps: land redistribution and land partitioning. Land redistribution comprises the preparation of a preliminary plan involving the general land tenure restructuring in terms of the number of new parcels and their approximate location, while land partitioning subdivides land into smaller 'sub-spaces' and generates new parcels in terms of definite location and boundaries (Demetriou et al., 2012). A number of algorithms, from simple optimization ones like transportation simplex (Avci, 1999; Ayranci, 2007) and stepping stone (Lemmen and Sonnenberg, 1986) to heuristic ones such as genetic algorithm (Akkus et al., 2012), have been developed to provide technical support for land redistribution. Recently, more exquisite methods such as fuzzy expert system (Cay and Iscan, 2011), LandSpaCES, an expert system based on no-inference engine theory (Demetriou et al., 2011) and spatial decision support system (Uyan et al., 2013) have also been designed to include more variables like related regulations to ensure models of land redistribution to be more realistic. Buis and Vingerhoeds's research (1996) was one of the first studies applying knowledge-based systems and GIS to help with land partitioning. After that, studies have explored the application of simulated annealing (Touriño et al., 2003), spatial genetic algorithm (Demetriou et al., 2013) and binary search with Delaunay triangulation (Haklı et al., 2016) in this stage, turning out that in terms of efficiency and accuracy, computer-aided land partitioning significantly outweighed traditional trial-and-error procedure. Rosman (2012) also compared two automation approaches of land boundary design under different topographical limitations. In addition, Comprehensive system supporting planners in all technical steps as a whole has also been constructed. After generations of evolvement, TRANSFER is operational now in the Netherlands' Kadaster as basic reallocation algorithm (Lemmen et al., 2012), while Demetriou (2012) have also developed an integrated planning and decision support system as a rival of TRANSFER, which internalize parcel related, land owner related, legislative, economic, social, environmental and local variables.

Previous work related to administrative aspects fundamentally helps to clarify the institutional environment and governance structure, and studies which focus on technical issues also enable planners to handle more intricate projects with mass information and diverse data. However, notwithstanding some studies involves variables about farmers' preferences and satisfaction (Cay and Uyan, 2013; Lisec et al., 2014; Wu et al., 2016), research which provides insight about incentives of farmers and interaction among farmers in land reallocation is still absent. The non-cooperation from farmers is one of major obstacles curbing the promotion of land reallocation, yet few studies address behavior of and interactions among farmers. This paper mainly concerns incentives of farmers in land reallocation, based on which we investigate the interactions among farmers from the perspective of collective action, to explain how agreements can be reached in land reallocation. The structure of the rest of the paper is as follows: Section 2 gives an overview of the development as well as the type and procedure of land reallocation in China, which are the basis of the following theoretical analysis. Section 3 provides costs and benefits analysis of farmers involved in land reallocation. Then in light of game theory, we elaborate the interactions among farmers seeking to maximize individual interests under two different scenarios. An illustrative case study in Jiangxi province is presented to test the validity of the theoretical models, and to explain how land transfer (or land tenancy) can significantly change the structure of stakeholders' group, thereby facilitating the achievement of agreement in land reallocation. Finally, conclusions and recommendations for further research are contained in