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Land Tenure Arrangements, Factor Market Development and Agricultural Production in China: Evidence from Henan Province

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Abstract

Rural off-farm labor markets and land rental markets in China face many institutional obstacles and remain largely underdeveloped. The current land tenure system is the most crucial hindrance. This study uses data collected from 479 randomly selected farm households in Henan province to explore the impact of land tenure arrangements on off-farm labor markets and land rental market development and the combined effects of land institutions and factor market development on agricultural production.

Based on the notion of tenure security and transferability as the main ways through which land tenure affects behavior, this study uses four variables to measure land tenure arrangements. Two variables have been chosen to represent tenure security: the number of reallocations that have taken place in a village since the HRS was established and household expectations of land reallocation in the next few years. The share of households with certificates in a village and land transfer rights possessed by a household are used to indicate household land transferability.

The determinants of off-farm employment participation, off-farm employment labor allocation, as well as its duration were analyzed using probit, poisson and tobit models. Factors affecting land rental market participation and the transaction amount were analyzed using Cragg's double-hurdle model with the assumption that the decision to participate in land rental markets precedes the decision on its transaction amount. Simple Ordinary Least Square (OLS) regression was used to investigate the impact of land tenure, off-farm employment and land rental participation on land and labor productivity. Finally, a one-step Stochastic Frontier Production model was employed to examine the determinants of technical efficiency.

The empirical analyses indicate that land tenure security and land transferability provide incentive for household off-farm labor market and land rental market participation, while migration could facilitate land rental market development by increasing land rental supply, and finally, the development of land rental markets improves the efficiency of land allocation, agricultural productivity, as well as technical efficiency.

Based on the empirical results, a number of policy options can be formulated as follows. Firstly, further reform the land tenure and Hukou systems. Secondly, build local institutions that facilitate land transfer and off-farm employment. Thirdly, promote rural industry. Finally, invest in infrastructure construction and social services. These policy measurements are likely to facilitate land rental market development and stimulate off-farm employment, thereby increasing agricultural productivity and rural household incomes and reducing rural-urban income inequality.

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Acronyms and Abbreviations

CAD	Comprehensive Agricultural Development Program
ETLR	Evolutionary Theory of Land Rights
FAO	Food and Agriculture Organization of the United Nations
FFTC	Food and Fertilizer Technology Center for the Asian and Pacific Region
GDP	Gross Domestic Product
HRS	Household Responsibility System
Hukou	Household Registration System
LAL	Land Administration Law of China
LDCs	Less Developed Countries
MoA	Ministry of Agriculture of China
MLRC	Ministry of Land and Resources of China
NBS	National Bureau of Statistics of China
NELM	New Economics of Labor Migration
OLS	Ordinary Least Square
PRS	Property Rights School
RLCL	Rural Land Contract Law of China
SFM	Stochastic Frontier Models
SOEs	State-owned Enterprises
SFPF	Stochastic Frontier Production Function
SFA	Stochastic Frontier Analysis
TFP	Total Factor Productivity
TVEs	Township and Village Enterprises
5YP	Five year plan
Yuan	Chinese currency, 1 Euro=7.96 (volatility according to the official daily report)
Mu	1/15 hectare

1 INTRODUCTION

1.1 General Background

Economic reform in China since 1978 has led to two important results: rapid economic growth and tremendous structural change. From 1979 to 2011, China's real gross domestic product (GDP) grew at an average annual rate of nearly ten percent (Morrison, 2012). The proportion of the labor force employed in the agriculture sector decreased from 69 percent in 1980 to 36 percent in 2011 (NBS, 2012). China's economic reforms started with agriculture. During the period 1979-1984, agriculture was the driving force of economic growth, showing an average annual growth of 7 percent. Despite this, the relative importance of agriculture in the Chinese economy has decreased, in 2011 agriculture still contributed ten percent to overall GDP and the rural population stood at 49 percent of the total (NBS, 2012).

While improved technology created the preconditions for rural growth, institutional changes, especially the emergence of the Household Responsibility System (HRS) that closely linked farm household income to their own performance, were the key factors that induced rapid growth in agricultural productivity (Fan, 1991; Lin, 1992; McMillan et al., 1989). With economic development, rising agricultural productivity decreased the demand for labor in agriculture, providing strong incentive for rural labor to shift to off-farm employment (Feng, 2008). The growth of rural Township and Village Enterprises (TVEs) in the 1980s and private enterprise in the 1990s were the main factors in absorbing a huge amount of surplus rural labor (Shi, 2007).

Rapid growth in agricultural productivity and rural industry has been an important engine for China's economic growth and a key reason for rapid poverty reduction in China. In 1981, China was the sixth-poorest country in the world, with a poverty headcount of 84 percent. Growth in the primary sector, mainly in agriculture, was four times more effective in reducing poverty than growth in the secondary and tertiary sectors (Ravallion and Chen, 2007); this helped reduce the poverty headcount to 16 percent by 2005, well below the developing world average of 26 percent (Ravallion, 2009).

The growth of TVEs, however, was not sufficient to fully employ the labor surplus from agriculture. The slower growth of TVEs in the second half of the 1990s and the increasing demand for labor in coastal regions, which experienced industrial growth, triggered the migration of rural labor to private enterprises in these regions. As they responded to employment prospects and income differences (Lin et al., 2004), migrants contributed to rising rural incomes and

well-being and the success of coastal export industries (Liu et al., 1998; Zhai and Wang, 2002). The magnitudes are immense, there were more than 279 million rural laborers that worked off-farm in 2008 (Huang et al., 2010). At the household level, the difficulty of getting a residence permit in cities and the implied high risk of moving out of agriculture and abandoning land leads to temporary migration and part-time farming.

Chinese agriculture is characterized by scarcity of land, abundant labor and small-scale production using little mechanization (OECD, 2005a). There are currently 200 million farm households, cultivating an average of 0.5 hectares of land each (NBS, 2012). Future increases in agricultural productivity and rural incomes and a slowing or reversal of the trend in the rural-urban income gap are likely to depend on further structural change of the economy and within the agricultural sector itself. This means a smooth movement of labor out of the agricultural sector and for farmers remaining in the agricultural sector, an increase in farm size to achieve economies of scale. However, institutional factors still pose enormous challenges to labor and land resource mobility.

1.2 Problem Statement

China is a large developing country with its economy in transition. Over the past decades, marketization, urbanization, and modernization are taking place at a dizzying pace (HART, 2012). However, economic growth has not benefited the country equally. There are large disparities between rural and urban areas leading to some major issues in contemporary China. The development of the agricultural sector is far behind the development of the second and tertiary industries. Wage differences result in a massive movement of labor away from the agricultural sector to seek higher incomes. However, lack of basic social security arrangements makes it hard to settle in cities, the large floating population becomes a potential threat to social stability. There are also land issues related to labor mobility and urbanization. Today, these issues are major concerns of both government and academia.

China had a huge urban-rural divide before the economic reform due to many policy biases in favor of urban citizens in the central planning era. In 1978, China's per capita income of urban residents was about 2.56 times of that of rural residents (NBS, 2012). In the early years of the economic reform, overall urban-rural inequality declined following the institution of the HRS. In more recent years however, the urban-rural divide has widened (ZHONG, 2011). In 1985, the per capita income ratio between urban and rural households had decreased to 1.86, however in the 2000s, income growth for urban households was far more dramatic than that for rural households. By 2011, the per capita urban-rural income ratio

escalated to 3.13 (NBS, 2012) which is extremely high by international standards (WORLD BANK, 1997). Moreover, the consumption gap between the urban and rural populations is also wide. In 2011, per capita consumption of an urban resident was 2.9 times of that of a rural resident (NBS, 2012).

In addition to income and consumption disparity, rural-urban inequality is also reflected in the quantity and quality of infrastructure and public services (ZHONG, 2011). The cost of infrastructure and public service provision is significantly higher in the countryside than in cities because of the former's lower population density and its inability to realize economies of scale in service provision. Urban residents are also better covered by social safety nets, while the rural Hukou population, including rural migrant workers in cities, has to mainly rely on their own devices (for example, rural land) or on rural collective enterprises of various levels of profitability for social protection (ZHONG, 2011).

There are a large number of rural migrants, the total number of rural to urban migrants reached 139 million in 2011, about 30 percent of the total rural labor force (NBS, 2012). Restrictions on migrants' ability to achieve residency at the destination imply that virtually all migration is temporary (FLEISHER AND YANG, 2003). Consequently, migrants in cities are treated differently than their urban registered counterparts. They often obtain lower-end jobs and are not entitled to social welfare and social services which are available to urban Hukou people. As such, migrants and their families have no access to unemployment, health care, or pension support in cities and their children only have limited access to urban public schools (MENG, 2012).

There are many explanations for China's widening urban-rural disparity. Income differences between urban and rural population is not unique to China as labor productivity in manufacturing and services is generally higher than that in agriculture (SICULAR ET AL., 2005). Regional economic development theories suggest that under perfect market conditions, productivity gaps across localities will propel migration and help narrow the income gap over time. However, the productivity gap only explains a minor proportion of China's urban-rural inequality (SICULAR ET AL., 2005). Most researchers believe that a set of discriminating institutional arrangements is the core reason for the large rural-urban disparity (MENG AND ZHANG, 2001; WHALLEY AND ZHANG, 2007; LU AND SONG, 2006).

According to AU AND HENDERSON (2003), China's urbanization lags far behind its industrialization and national economic development. The Hukou system, though much less restrictive than before, still limits labor mobility and population redistribution across regions and between urban and rural areas. At the same time, destination governments are under great financial pressure to provide social

security for an increasingly enlarged body of laid-off workers, State-Owned Enterprise retirees and urban poor with Hukou designation. Provision of social security, housing and children's education for migrants is still not the top priority on local government agendas.

Lack of social security, housing and children's education arrangements makes it impossible for rural migrants to cut the linkage to their lands. Once the migrants lose their jobs in cities, rural lands become their last resort for employment and income (TAO AND XU, 2007). On the other hand, land tenure arrangements characterized by small farm size and frequent reallocation due to the egalitarian distribution principle, make it risky to migrate for a long time because the migrants may lose their land in the next session of land reallocation.

Despite the importance of land to the livelihood of the rural population, land is frequently grabbed by urban governments to fuel urban economic growth because it is the most important financing vehicle for China's large scale urban development (TAO AND XU, 2007; DEININGER AND JIN, 2009; ZHONG, 2011). In the process of accelerated urbanization and industrialization, land requisition in which local governments purchase agricultural land from farmers and turn it to industrial and commercial uses become more and more frequent. However, since land use change from rural to urban in China can only be carried out through government requisition (monopolized purchase) under the current legal framework, insufficient compensation to farmers in land requisition has led to millions of farmers losing land, resulting in bitter complaints and even social unrest (DEININGER AND JIN, 2009). Therefore, in recent years, disputes related to land requisition have become a contributing factor to the uneasy urban-rural relationship and social instability (XIE AND SHAN, 2011).

To solve the problems of administrative land reallocation and land grabbing, many scholars argues that more clear recognition of land-use rights and resource reallocation through a market system is the way out (YANG, 2003; TAO AND XU, 2007; DEININGER AND JIN, 2009). However, land rental transactions were seldom evident in the 1990s, as leasing activity reportedly occurred on a mere three to four percent of the arable land (TURNER ET AL., 2001). After the implementation of encouragement policies for land transfer (e.g. Rural Land Contract Law), land rental activity started to expand. According to farm survey results, 18.1 percent of households rented land and 12.6 percent of households rented out land from such markets in 2005 (TU AND HEERINK, 2006). Nevertheless, DEININGER AND JIN (2007) find that contracts remain informal and unwritten, and are frequently made with relatives. Therefore, the land rental market in China is underdeveloped.

Problems related to income, land, infrastructure and public services are

interconnected with one another and part of China's unique institutional framework, a vicious cycle can form if things go wrong in one aspect (ZHONG, 2011). Loss of land can depress rural economic development (both in agriculture and rural industries) and hence household incomes. Low levels of economic development also lead to funding shortages in infrastructure and public services when transfer payment is limited. While poor infrastructure further retards economic development, public service deficiencies cause the deterioration of human capital (e.g. low education levels, poor health), which will eventually compromise labor productivity and economic efficiency in the long term.

Although migration helps uplift the living standard of many rural households both in cities and back home (FAN, 2008), labor mobility is restricted by both Hukou and land institutions (MULLAN, GROSJEAN AND KONTOLEON, 2011). Therefore, a better understanding of how these institutional factors affect the shifting of labor out of agriculture, to bring about rural structural transformation and productivity growth, will be important in light of a number of recent concerns. These include rising rural-urban inequality, the challenges posed by a gradual exhaustion of the pool of cheap labor in the country's interior, an aging rural population, and a need for continued agricultural productivity growth to overcome land and water scarcity (DEININGER ET AL., 2012). Hence, this study analyzes how one of these institutions, the land tenure arrangement, affects market-based land and labor transfer and agricultural productivity.

1.3 Research Objectives

The major focus of this research is to explore the impact of land tenure arrangements on the development of labor and land rental markets and the combined effects of land institutions and factor markets development on agricultural production. Specifically, this study intends to address the following objectives:

To investigate the impacts of land tenure arrangements on the off-farm labor market development.

To examine the impact of land tenure arrangements and off-farm employment on the development of land rental markets.

To analyze the combined effects of land tenure arrangements and factor markets development on agriculture productivity and technical efficiency.

To provide useful information to policy makers on how to improve land and labor policy.

1.4 Organization of the Study

The short introduction presented in this chapter is followed by an overview of the agriculture reform and related policies in chapter two. This chapter focuses on the major reforms in agriculture and its achievements, land tenure arrangements and related policies as well as labor mobility policies. General land problems and labor mobility situations in China will also be addressed in this chapter.

Chapter three consists of definitions of key concepts used in the research followed by the theoretical review of the major structural change, labor mobility and land property theories developed over the years. The theories considered of which this study based on are explained in detail along with the main conceptual framework of the study.

Chapter four presents a brief overview of the study area followed by the survey design including methods of data collection and the general approach for analyzing the collected data. It also describes some selected socioeconomic characteristics and important variables for econometric analysis.

Chapters five, six and seven form the core of this study, presenting the main results. These chapters stand as "independent" chapters each consisting of an introduction, analytical framework, empirical results and discussion, and a chapter summary. Chapter five specifically deals with the determinants of the household off-farm employment decision, including migration and local off-farm work. Chapter six analyses the determinants of land rental market participation and its intensity, the impact of land tenure arrangements and labor market development are specific concerns. Chapter seven dwells on agricultural productivity and technical efficiency analysis.

Finally, chapter eight summarizes the problem statement and major findings, followed by conclusions and potential policy implications. Additionally, the limitations of this study are highlighted.

2 OVERVIEW OF AGRICULTURAL, LAND, AND LABOR POLICY IN CHINA

The aim of this chapter is to provide an overview of the agricultural reform in China, which is one of the main driving factors of Chinese agricultural growth (FAN, 1991; CHEN ET AL., 1997; 1997; LIN, 1992; ZHONG ET AL., 1999). Additionally, follows a brief history of land tenure system and labor policy before and after reform with particular focus on current policy issues are presented in the last two sections.

2.1 Agricultural Reforms and Related Policies

Agricultural reforms have played an important role in China's economic resurgence over the past three decades (ROZELLE AND SWINNEN, 2004). Re-establishing household agricultural production was the spark that ignited the process of establishing markets and relinquishing direct government control over the economy (LOHMAR ET AL., 2009). The impact was dramatic, productivity and incomes in the country soared (LIN, 1992; MCMILLAN ET AL., 1989). The reforms lifted hundreds of millions of rural households out of dire poverty (WORLD BANK, 2000). Hence, reviewing a comprehensive range of issues related to the agricultural reform will help to understand the clear picture of the associated problems and possible entry points for improvement.

At the establishment of the People's Republic in 1949, China was still an agricultural economy in an industrializing and urbanizing world (LOHMAR ET AL., 2009). In the 1950s, the government started to spur industrialisation by adapting Soviet-style collective agriculture. Consequently, collective farming under the Commune system was introduced in 1958 (CHOW, 2004). Hundreds of millions of farmers were organized into a hierarchy of about 24,000 "People's Communes"[1] (LOHMAR ET AL., 2009). Communes were divided in turn into production brigades and production teams. Agricultural operations were organized in the production team. Each team consisted of about 20-30 neighboring households (LIN, 1992). Except for limited cash crop production on small plots of land near individual households in some areas, all agricultural production decisions were made by local leaders in accordance with a production plan established by higher level leaders (LOHMAR ET AL., 2009). Local leaders were obligated to deliver their quota of agricultural production to local stations run by state-owned marketing bureaus. Marketing bureaus made planned transfers of products from surplus to deficit areas at prices determined by the central government (SICULAR, 1988; LOHMAR ET AL.,

[1]People's Communes were a type of large rural organization introduced in China in 1958. Communes began as amalgamations of collective farms; later, they become multipurpose organizations for the direction of local government and the management of all economic and social activity (Yang, 1996; Chow, 2004; Lohmar *et al.*, 2009).

2009). Agricultural prices were set low and industrial prices high to extract resources from agriculture to invest in urban and industrial development (LOHMAR ET AL., 2009; SHEA, 2010). Such a system existed for nearly 30 years, until the late 1970s, when the economic reforms started.

2.1.1 Agricultural Production System Reform

China's agricultural reform was started spontaneously by poor farmers in Anhui in 1978. To link production team members' income with their work performance, farmers introduced a contract system between the production team and individual members or households. Among various forms of contract systems, the boldest reform was a full contract system, under which households became completely responsible for inputs and output as well as their tax and sales obligations (WU, 1997). Land and other separable production means, such as farm tools and draft animals, were equally distributed among the households within a village. The village's elected committee, representing the village community, was responsible for the maintenance and use of indivisible fixed capital and infrastructure. At the early stage, the state still had production plans, but the plans were now implemented through the contract system (HUANG, 2012).

The full contract system was later officially named the Household Responsibility System (HRS) and adopted in 1980 as one of the contract systems to replace the collective farming system. However, because of its immediate positive effect on output and hence on household income, and more importantly, because it was *de facto* privatization, the HRS soon was adopted throughout the country (WU, 1997). In China today there are more than 200 million farms, the legacy of an HRS policy that gave the primary responsibilities for farming to the individual households (ROZELLE AND SWINNEN, 2004).

At the beginning, in lieu of rent, farm households were obligated to deliver a fixed quota of their production of "strategic crops"[2] to the State and the farm households were paid a predetermined price (LOHMAR ET AL., 2009). Whereas, households could make their own production decisions and could consume or sell their products after they fulfilled the quota. Most importantly, farmers could produce cash crops and livestock products and sell their surpluses in rural markets. Later the government initiated the rural tax and fee reform in 2000. By 2006, agricultural tax had been eliminated in China (WANG, 2011).

[2] Strategic crops included grains, oilseeds and cotton, but farmers were primarily obligated to deliver grain quotas, as well as quotas for cotton and oilseeds in some areas (Sicular, 1988; Lohmar*et al.*, 2009).

2.1.2 Price and Market System Reform

While the institutional transformation from collective to household-based farm production and management systems was essentially completed by 1984, the process of price and marketing system reform had just started. In 1979, the Chinese government gave incentive to farmers to sell their products to the state by lifting state procurement prices for 18 major farm products (WU, 1997). Later, a marketing system was implemented, while the Government still maintained pricing and marketing controls over strategic products. With the gradual reform in the united procurement and marketing system, initial restrictions on marketing activities were eventually relaxed and interregional markets developed throughout the reform period (LOHMAR ET AL., 2009).

More liberal policies were intermittently reversed when they were blamed for bursts of inflation and perceived grain shortages (LOHMAR ET AL., 2009). Following those criticisms, government introduced a set of adjustment policies, starting in 1989 (OECD, 1995). Apart from constraints put on the development of rural industry, the government implemented further reform in the grain sector (BRÜMMER ET AL., 2002). In the 1990s, government resumed administrative controls over grain production and marketing through a newly introduced "governor responsibility system" (WU, 1997). Under this system, the provincial level governments were charged with full responsibility for their province's grain economy, including financial responsibility for grain procurement, ensuring that land stayed in grain production, encouraging investment to increase yields, maintaining stocks, balancing supply and demand and stabilizing the market (WU, 1997; DI, 1999).

The introduction of the "governor responsibility system" has finally terminated the centralized control of grain production, which facilitates grain production suited to local conditions. In 2001, market-oriented reform of grain purchasing and marketing was carried out across the nation. In the same year, the cotton market was fully opened. Up to this point, the agricultural products market system is basically set up (RCRE, 2012).

The market system in other agriculture-related sectors also developed, by the end of the 1990s, the expansion of traders, greater marketing freedoms for private traders, and investment into transportation and communication infrastructure led to the integration of domestic markets (LOHMAR ET AL., 2009). As marketing shifted, peasants were able to switch to higher value-added activities such as industrial production and service provision (HUANG, 2012). Township and village enterprises played a vital role in this process. They raised rural income, absorbed rural surplus labor, and contributed to a decline in the rural urban income gap in

the 1980s (NAUGHTON, 2007). This process broke the monopoly of state-owned enterprises in both product and factor markets (HUANG, 2012).

2.1.3 Agricultural Trade Reform

Agricultural trade was long dominated by state-owned trading enterprises, monopolies for strategic products that imported and exported at the behest of state planners (LOHMAR ET AL., 2009). To complement reforms of domestic production and marketing, China also liberalized trade policies to become more integrated with the world economy.

A number of institutional reforms were introduced in the administration of foreign trade (CHOW, 2004). Since the late 1980s, foreign-trade reform has aimed at fully implementing the trade contract responsibility system and introducing a more market-oriented trade regime in the economy (HUANG, 2002). Throughout the 1990s, China lowered tariffs and other trade barriers to many agricultural products. By the end of the 1990s, China had rescinded state-trading companies' monopolies on the import and export of some strategic products, such as soybeans and cotton (LOHMAR ET AL., 2009). However, after nearly 20 years of reform, China's foreign trade regime continue to have major inefficiencies, and international trade in agricultural products still remained largely monopolized (HUANG, 2002).

The situation changed in December 2001 when China became a member of the World Trade Organization (WTO). The government undertook another big dose of liberalization in line with its WTO commitments, which lowered tariffs further, ended the remaining state monopolies on imports and exports of agricultural products and locked in an open trade regime along with the reformed economic policies (LOHMAR ET AL.,2002; ERIXON, MESSERLIN AND SALLY, 2008). The simple average bound tariff for agricultural products was reduced from 17.9 percent in 2001 to 15.2 percent in 2008 (NI, 2009). China also implemented tariff quotas on wheat, corn, rice and cotton as a replacement for the former planned management of foreign trade, and expanded the share of quotas distributed to non-state trading enterprises (CARTER, ZHONG AND ZHU, 2009) and committed to ensuring that no single agricultural product benefited from export subsidies (TIAN, 2009). After over a decade of effort, China is now considered one of the most liberalized global economies in general, and in terms of agriculture in particular (HUANG ET AL., 2011).

2.2 Economic Impact of Agricultural Reforms

2.2.1 Agricultural Production

China's agricultural sector is a key to the country's astounding growth (SHANEAND GALE, 2004). The reversal of collectivization of agriculture and marketing reforms were followed immediately by record-breaking harvests for grain and other major farm products (WU, 1997). After reforms, grain production jumped from 305 megatons in 1978 to 571 megatons in 2011, an increase of 87 percent. Meanwhile, the population increased from 963 million to 1.35 billion, or 41 percent. The growth rate of grain outputs not only overtook population growth, but also overcame the obstacle of continuous reduction of grain acreage due to land degradation, desertification, urbanization and other reasons (BROWN, 1995; ROZELLE ET AL., 1997). According to NBS (2012) grain acreage reduced from 120.6 million hectares in 1978 to 110.6 million hectares in 2011, decreasing 8.3 percent.

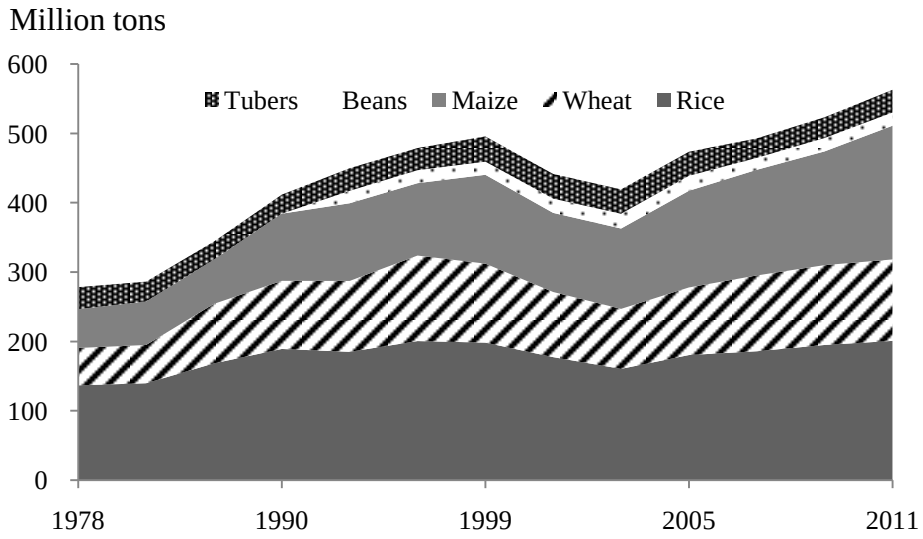


Figure 2.1: China's grain production, 1978-2011
Source: China Statistics Yearbook, (2012)

Despite having only nine percent of the world's arable land, China successfully feeds 20 percent of the world's population (Carter, 2011). Obviously, the improvement of yields is the only means to break the constraints of land resources and achieve sustainable agricultural growth in China. As table 2.1 shows, the yields of wheat almost tripled, and the yields of rice and maize almost doubled in China from 1978 to 2011. China is currently one of the countries with the highest yields in the world, more than double of those in African countries (YU AND ZHAO, 2009). Maize production grew faster than that of other grains to maintain exports for hard currency and to feed the growing livestock sector (LOHMAR ET AL., 2002).

Livestock production increased in the reform period, primarily for meat (mostly pork) and eggs, but in recent years, dairy production has taken off. For many products, China's share of world production exceeds its share of world agricultural land, and for some products, its share of world production exceeds its share of world population (figure 2.2).

Table 2.1: Yield of major crops (ton/ha)

Year	Rice	Wheat	Maize	Cotton	Peanuts	Rapeseeds
1978	3.98	1.84	2.80	0.45	1.34	0.72
1980	4.13	1.91	3.12	0.55	1.54	0.84
1985	5.26	2.94	3.61	0.81	2.01	1.25
1990	5.73	3.19	4.52	0.81	2.19	1.26
1995	6.02	3.54	4.92	0.88	2.69	1.42
2000	6.27	3.74	4.60	1.09	2.97	1.52
2005	6.26	4.28	5.29	1.13	3.08	1.79
2010	6.55	4.75	5.45	1.23	3.46	1.78
2011	6.69	4.84	5.75	1.31	3.50	1.83

Source: China Statistics Yearbook, (2012)

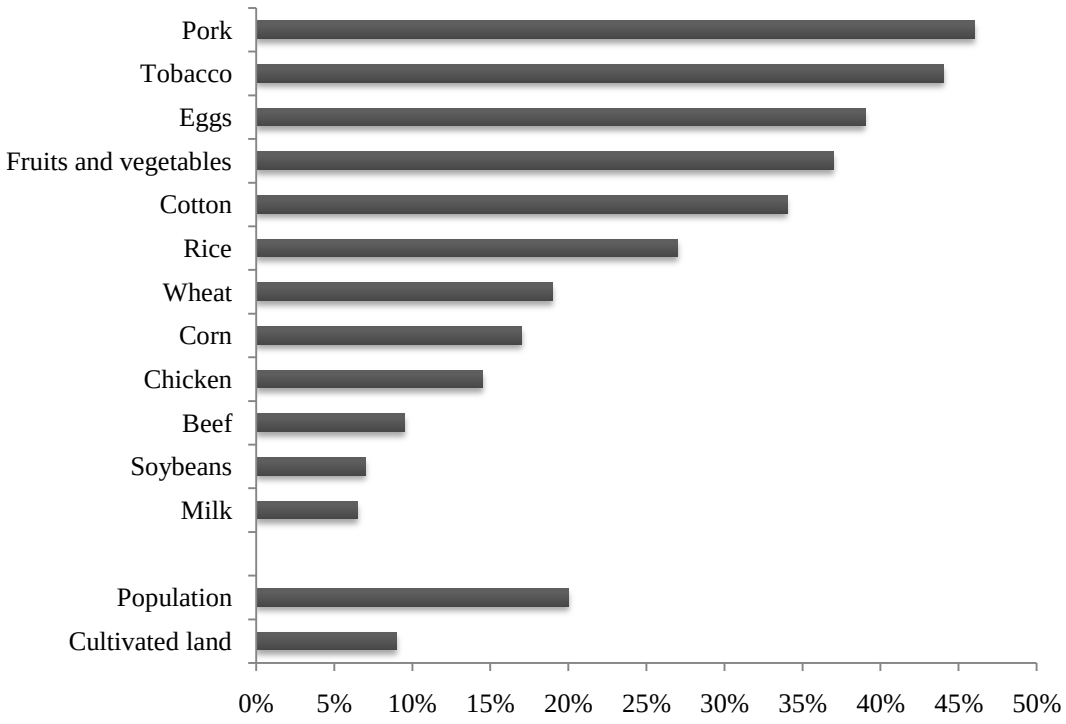


Figure 2.2: China's share of world agricultural production 2010
Source: CARTER, 2011

2.2.2 Poverty Reduction

Agricultural growth has also created a huge rural market for consumer goods and generated a reservoir of savings that funds investment in rural enterprises. Growth

of the rural economy has been a key reason for rapid poverty reduction in China. The poverty rate in rural China has been substantially decreasing in the past three decades (FAN ET AL., 2004). Table 2.2 shows the changes in income and the poverty rate in rural China since 1978. The nominal net income for farmers increased from 133.57 Yuan in 1978 to 2622.20 Yuan in 2003, an increase of about 20 times in 25 years. When considering inflation, net income also increased by more than four times. The population in poverty and the poverty rate, respectively, decreased from 250 million and 30.7 percent in 1978 to 23.6 million and 2.5 percent in 2005. Economic growth in rural China does not only change poverty figures in China, but also changed the poverty map of the world (WORLD BANK, 2008).

Table 2.2: Rural income and poverty in China (1978-2005)

year	Poverty Line (Yuan)	Poverty Rate (percent)	Population blow poverty line (million)	Net Income (Yuan) Current price	Net Income (Yuan) 1978 price
1978	100	30.7	250	133.57	133.57
1980	130	26.8	220	191.33	186.46
1990	300	9.4	85	686.31	324.45
2000	625	3.4	32	2253.42	517.42
2005	683	2.5	24	3254.90	708.71

Source: YU AND ZHAO (2009)

2.2.3 Market Liberalization

As a result of price and market reforms, the structure of agricultural prices facing peasant producers has changed, greater liberalization of markets is allowed and state-owned marketing bureaus no longer monopolize agricultural marketing (WATSON, 1988; LOHMAR ET AL., 2009). Many small private traders and agribusinesses, as well as local and government-owned companies have entered the grain market. This situation induced state marketing companies to compete directly with private traders, but with preferred access to government-owned storage facilities and also charged with purchasing grain under recently established price support programs (LOHMAR ET AL., 2009). Recent surveys show that combined grain marketing systems including state grain trading companies, grain processing factories, grain wholesalers, private traders and grain retailers have emerged (CHEN, 2007). Grain marketing channels vary from region to region. Many farmers prefer to sell grain to small traders who come into villages to pick up grain, saving them time and transportation costs. In some regions, large feed mills or processing factories are the main purchasers (CHEN, 2007; LOHMAR ET AL., 2009).

With respect to horticultural and livestock products, most of them are marketed by a vast army of small traders and private marketing companies that sprang up as the production of these products grew (HUANG ET AL., 2008). Produce is typically purchased directly from farmers, often just after harvest and on the roadside, by hundreds of thousands of private traders who cruise villages and the surrounding countryside in small trucks (BAGRIE ET AL., 2012). These traders then sell their load to larger traders or deliver it to wholesale markets where it is typically aggregated onto larger trucks for transport to faraway markets (LOHMAR ET AL., 2009).

Markets for inputs are largely free and lightly regulated, except with land and capital. Seeds are supplied by thousands of small seed companies that often repackage seed purchased in bulk and then sell it under their own label through small seed and input supply stores located in villages and townships throughout the countryside. The pesticide industry is similarly atomized and difficult to regulate. Fertilizer is typically supplied by larger companies, but is frequently sold by private traders with shops in the county seat, rural townships, and villages or by itinerant traders who visit villages and sell from the backs of their trucks (LOHMAR ET AL., 2009). For agricultural machinery equipment, farmers can buy tractors, harvesters, transplanters and other field machinery from companies in townships or cities (DAVIS ET AL., 2010).

2.2.4 Agricultural Trade

China's agricultural imports and exports were relatively low over most of the reform period, but have risen rapidly since WTO accession (figure 2.3). China became a net importer of agricultural products in 2003, and this trade deficit is likely to persist as future growth in food demand, driven by rapidly rising per capita income, is expected to outpace increases in domestic production (BONARRIVA, 2011). China ranked as the world's second-largest agricultural importing country behind the United States as its agricultural imports increased five times between 2002 and 2009 (HUANG, 2012).

On the other hand, China's agricultural exports have grown as well, but not as dramatically as imports. In 2009, China was the fourth leading global agricultural exporting country (behind the United States, Brazil, and Canada). Agricultural exports rose from 13 billion (U.S. dollars) in 2002 to 36 billion (U.S. dollars) in 2009 (BONARRIVA, 2011). Moreover, the composition of agricultural trade has changed. Over much of the reform period, China exported corn and imported wheat, but imported only limited amounts of cotton and oilseeds. Today, China is largely self-sufficient in wheat, corn and rice, but it imports large amounts of soybeans and

cotton (LOHMAR ET AL., 2009). Consistent with its natural resource endowments of abundant rural labor and limited agricultural land on a per capita basis, China's agricultural exports are concentrated in labor-intensive products, such as fresh and processed fruits and vegetables (BONARRIVA, 2011; CHEN, 2006).

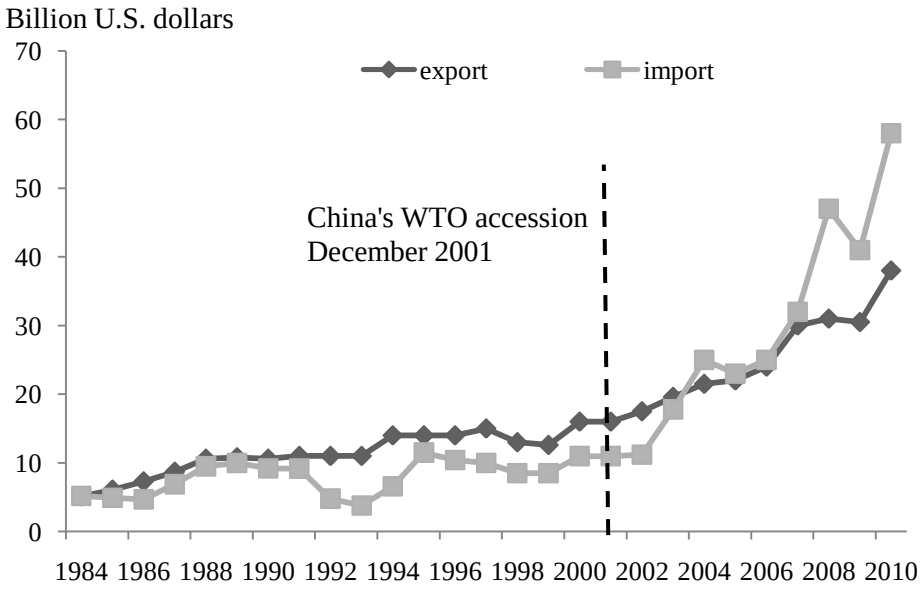


Figure 2.3: China's agricultural imports and exports (1983-2010)
Source: HUANG (2009)

2.3 Land Tenure System in China

Land tenure is the way in which people have access to land and natural resources. A more detailed definition, as stated by BRUCE ET AL. (2010), is that land tenure is "the institutional (political, economic, social, and legal) structure that determines (1) how individuals and groups secure access to land and associated resources including trees, minerals, pasture, and water and (2) who can hold and use these resources-for how long and under what conditions". The land tenure system in China, as in most transition countries, is not simply an economic issue. It also has political, social and cultural dimensions and hence it is an asset of crucial importance, especially in rural areas of the country. In this section, the major issues of land tenure in rural China will be reviewed.

2.3.1 Land Tenure System in the Pre-reform Era

China's land tenure system prior to the socialist revolution of 1949 reflects the deep antagonism that existed in traditional rural Chinese society, which was comprised of four classes. Landlords, who held usufruct rights and imminent rights to large tracts of land, earned profits by renting to peasants. Rich peasants and middle peasants, distinguished largely on the basis of the size of their land leases,

cultivated the land and paid rent, sometimes in kind, to landlords. Poor peasants lacked any land of their own and earned a wage by cultivating land held by the higher classes (FEI, 1939).

In 1949, China became a socialist country following the abolition of the feudalistic system. The Chinese government deprived landlords of land and distributed it to farmers. After the Community Party took power in 1949, about 700 million mu of land were redistributed from landlords to landless peasants and tenants, who totaled more than 300 million (ZHAO, 2010). By 1952, a system of small-scale family farming was successfully formed. This system lasted until 1955-1956, when it was replaced by collective farming (BRAMALL, 2004). Like other socialist countries, China shaped its farmland policy from the well-known model of the Soviet Union, which was characterized by collective ownership and unified collective operation. To reach this target, China carried out a campaign of collectivization in the mid-1950s. During the process, individual farmers were compelled to join collectives. The collectivization finally developed into an institution called the People's Commune. In 1958, about 800 million rural people were organized into 52,000 People's Communes (WU, 1997). With centrally controlled property rights and a misapplied egalitarian principle of distribution, the communes destroyed farmers' operational freedom and their enthusiasm for production (CHEN AND DAVIS, 1998).

Much literature illustrates the poor performance of the commune system (e.g. STAVIS, 1982; CHEN, 1994; WU, 1997). The most severe problem with collective farming was inefficiency. The communes' income distribution system provided no work incentives to farmers because it did not reward adequately individual effort. On one hand, assessing team members' performance was difficult and costly. Self-assessment of the quantity and quality of work was unlikely to produce an accurate measure of actual effort. Mutual assessment by team members could take up an enormous amount of time and lead to great tension among families because some would inevitably feel they were unfairly treated. Assessment by team leaders could involve unbearable monitoring costs because of the nature of farm work often involves shifting between many different tasks on a very irregular basis (LIN, 1988). Ultimately, egalitarianism became the only acceptable reward system because while no one had incentive to work, everyone had incentive to claim his or her rights to collective property as a collective member (GUO ET AL., 1993). Most team members presented themselves in the field to obtain work points but did not make a serious effort (LIN, 1988).

Resource allocation was also inefficient under the collective farming system since capital, labor and land mobility were heavily restricted. The planning system

restricted free resource movement because it was seen as a threat to that system. As most surplus was extracted from agriculture there was no additional capital to improve productivity, so keeping land and labor in grain production was crucial to maintaining grain output. Restriction on resource mobility also reduced the opportunity cost of both land (rents) and labor (wages) in grain production, thereby reducing the cost of grain (WU, 1997).

2.3.2 Land Tenure System after Reform

At the end of the 1970s, China launched economic reform, pioneered by rural reform. The Household Responsibility System (HRS) replaced the commune system in the late 1970s and early 1980s. The HRS was created by the peasants but spread nationwide with the support of the central government. It was first an experiment in selected villages in Sichuan and Anhui provinces. These experiments were met with initial success, and agricultural collectives throughout China were rapidly dismantled. By 1984, more than 99.5 percent of production teams had adopted the system (YANG, 2004). Under this system, land officially remains under collective ownership, but is allocated among village households to cultivate what they decide. LIU ET AL. (1998) reported four aspects of land rights that can vary among Chinese villages: residual income rights, unencumbered use rights, rights to secure possession, and transfer rights. Under the HRS, farmers are free to make crop selection decisions and sell crops on the market for profit, after fulfilling basic grain procurement requirements set by the state and contributing to the local collective's accumulation and administrative funds. These were the so-called residual income rights. However, after elimination of the agricultural tax during 2004-2006, farmers got full access to the income from agriculture production. Moreover, the HRS resolves work incentive problems of the collective system by tightening the link between labor effort and income (LIU ET AL., 1998).

When the HRS was initially introduced, land-use rights were contracted to the farmers for a short period of one to two years; land could not be transferred between households, and it was subject to periodic reallocation at the discretion of the village leader. Reallocations were intended to account for household demographical changes. However, by 1984 the rights were extended to periods of 15 years. In 1984, the government issued Rural Work Document No.1, which urged local officials to "prolong the time period of the contracted land" to 15 years or more in order to "encourage the farmers to increase their investment to foster the fertility of the soil and practice of intensive farming". After expiration of the 15 year contract period, in 1998, the government extended the contract for another 30 years, and disallowed large-scale reallocations of land, limited small-scale re-adjustments and permitted transfers of land between households (PING LI,

2003).

Land tenure arrangements relating to collective forest land in the south and southwest of China are similar to those concerning agricultural land, while forestland in the northeast of China is almost entirely state-owned (WANG ET AL., 2004). The HRS was applied to collective forest land in the mid-1980s, a few years after it was introduced in the agricultural sector. Households were allocated plots of forestland or wasteland on which trees could be planted, as well as areas of forested land. Both of these land types were held under contract, and individual households had the rights to manage the land for timber. Any trees planted by the household belonged to them, but trees planted previously by the collective did not, and the revenue from harvesting the latter was shared between the household and the collective (LIU, 2001). In addition, the majority of villages retained some forestland that was collectively owned and managed (MULLAN ET AL., 2012).

2.4 Land Problem in China

2.4.1 Limited Land Resources

China has a large population but limited resources per capital as well as insufficient reserves, which poses severe problems. The total area of China is 960 million hectares (9.6 million km^2), of which there are only 121.72 million hectares of arable land, which accounts for 12.68 percent of total land area (Table 2.3). Moreover, current per capita cultivated farmland is about 0.092 hectares, which is only about 40 percent of the global average. The country faces great challenges in continuing to feed its large population.

Table 2.3: Land resource in China

Land type	Area (in million ha)	percent of total land area
Cultivated Land	121.72	12.68
Garden Land	11.79	1.24
Forests Land	236.09	24.83
Area of Grassland	261.84	27.54
Other Land for Agriculture Use	25.44	2.68
Land for Inhabitation, Mining and Manufacturing	26.92	2.83
Land for Transport Facilities	2.50	0.26
Land for Water Conservancy Facilities	3.65	0.38

Source: China Statistics Yearbook, 2012

Even more alarming is that these limited resources are constantly diminishing.

According to statistical data released by the Ministry of Land and Resources of China (MLRC), total cultivated land decreased by approximately 8.35 million ha (about six percent) between 1996 and 2008, due to rapid urbanization and natural disasters. The Chinese government estimates they need to maintain 120 million hectares for crop production by 2020 in order to be self-sufficient in grain production. While some institutions, such as Bank of America estimate, that China's arable land has already fallen below the 120 million hectare threshold and could decrease to 117 million hectares by 2015. Therefore, there is great pressure on the government to protect the arable land resource from continued shrinkage.

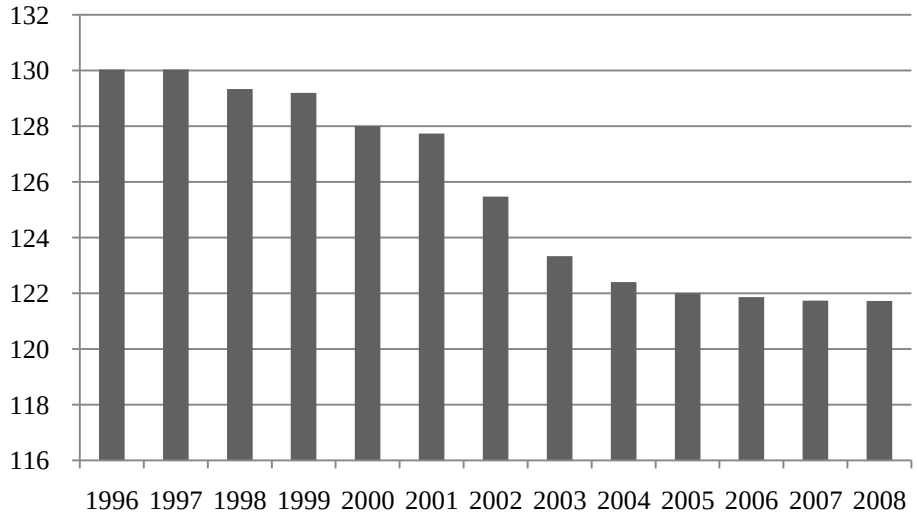


Figure 2.4: Arable land in China
Source: Communique on Land and Resources, 1997-2011

2.4.2 Small Farm Size and Fragmentation

At the beginning of the HRS, land was distributed mainly on the basis of household size, and due to the scarce arable land resource and large population, each household got a small piece of land. Reallocations and readjustments were intended to account for changes in population and the formation of new households. With demographic change, farm size over time showed a declining trend. In 2008, the average farm size of a Chinese household was around 0.5 hectares, the average land holding per capital was 0.09 hectares (Figure 2.5 and 2.6). Besides, the situation varied by region. The central region, which is considered the most agriculturally productive, has the largest per household and per capita landholdings, followed by the western region, while the eastern region has the smallest per household and per capita landholdings, due to its high population density and rapid economic development.

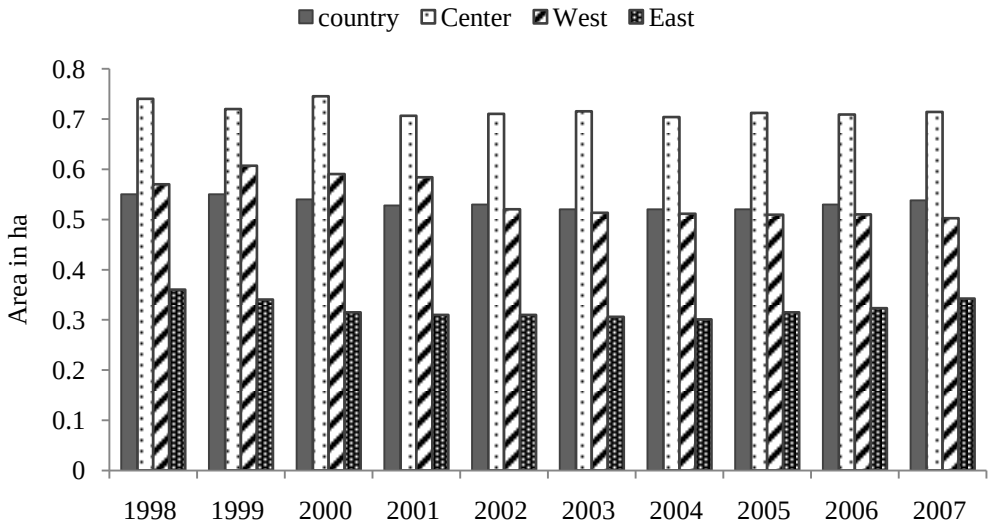


Figure 2.5: Average farm size per household in China
Source: China Statistics Yearbook, 1996-2009.

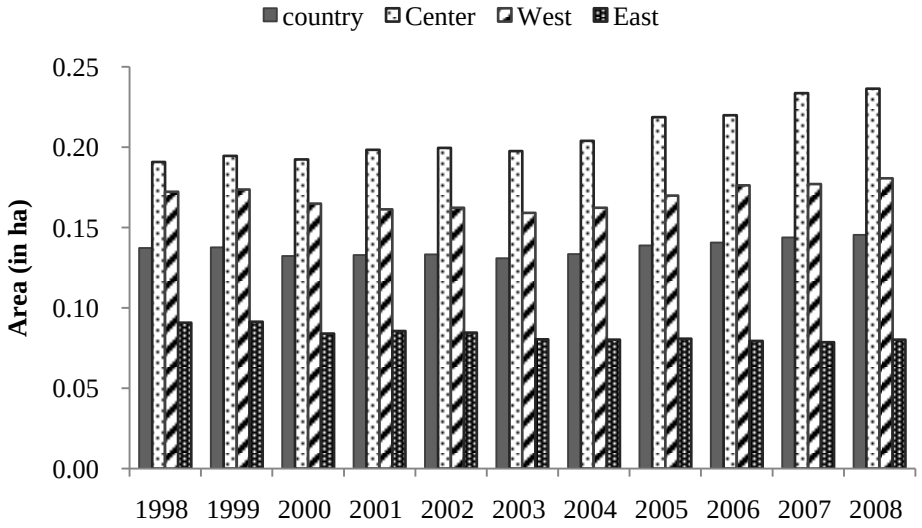


Figure 2.6: Average farm size per capita in China
Source: China Statistics Yearbook, 1997-2012.

In addition to the small holding size, land fragmentation has also become a key problem of farming in China. Because of egalitarian principles, each household got several plots allocated based on soil fertility, irrigation conditions, location, etc. The average number of parcels owned by a farm household in 2007 was about six, with an average parcel size of only 0.085 hectares (FFTC, 2008).

Such small farm size and fragmentation made it difficult to use advanced mechanical equipment. Thus, increasing productivity was difficult, due to the lack of economies of scale. In this situation, it is also difficult to invest in infrastructure like roads and irrigation systems, and to implement regional agricultural policies

such as the assignment of specific zones for commercial agricultural production. As a result, regional or national output is affected negatively (TAN, 2006).

Table 2.4: Land fragmentation in China

year	Average plot size (ha)	No. of plots per household	Farm size (ha)
1929-1933[1]	0.38	5.6	2.13
1986[2]	0.07	9.0	0.61
1999[2]	0.09	6.1	0.53
2007[3]	0.085	6	0.54

Sources: [1]TAN (2006); [2] TAN (2001); [3] FFTC (2008)

For individual households, land fragmentation may be detrimental to agricultural production by causing physical problems, operational difficulties and foregone investment. Physical problems may include the labor time lost in traveling; the land lost in marking the borders or constructing access roads, and higher costs for fencing or border construction (AWOTIDE AND AGBOLA, 2010). Operational difficulties include the moving of heavy equipment, use of tractors and other machinery, pest control, and so on. Moreover, it is more difficult to manage the farm and to supervise labor. Plots at relatively large distances from the homestead are therefore more likely to be abandoned. Finally, due to the existence of scale effects and externalities, investments in improved agricultural facilities, soil and water conservation, and on the like are less profitable on farms with severe land fragmentation (TAN, 2005).

2.4.3 Tenure Insecurity

Under the HRS, households are allocated land-use rights, but ownership to land remains in the hands of village collective authorities. When the HRS was initially introduced, land transfer was prohibited between households and subject to periodic reallocation at the discretion of the village leader. Many policy-makers and scholars have focused their discussion on the lack of clarity of rural land ownership as the key to the failure in economic and sustainable land use and chronic poverty (ZHAO, 2010). The currently predominant ownership of land by the collective is claimed to be the fundamental hindrance to scaling up agricultural development in China, since it is ambiguous in nature and often leads to local elite rent-seeking and corruption through illegal land expropriations (WANG, 2005; HO, 2001; ZHAO, 2010). Local and regional land-use plans are easily manipulated by the local government in pursuit of lucrative deals in land sales (ZHAO, 2010).

2.4.3.1 Unsustainable Use of Land

As HU (1997) points out, the current land tenure system has encouraged

short-sighted decisions and irresponsible use of land resources by peasants. Peasants pursue immediate and short-term gains, and this is exacerbated by land fragmentation. The latter hampers irrigation and drainage and leads to the degradation of China's agro-ecological environment. Local governments do not function effectively in organizing agricultural production and overall rural development due to a lack of resources and democratic governance. On one hand, the lack of resources and good governance has hindered their role in sustainable rural development. On the other hand, slow agricultural development has generated insufficient resources for local governments to deliver basic rural services and thus win the support of the peasantry. Moreover, the Chinese peasantry has to a large extent not been organized in a way that their land can be better utilized and managed. As a result, they have not managed to gain substantial benefits from their land except for the purpose of subsistence.

The situation is even worse in forest and grassland. County governments have made the forest a fundamental natural resource to be preserved and to be free from illegal logging. Tree plantation and preservation are regarded as crucial to ecological restoration. However, lack of linkages between tree planting and direct benefits from it offer no incentives for peasants in sustainable use of forest. Grassland left open to communal use for grazing results in the severe problem of land degradation from over-grazing. The rationale for the grassland management is based on the calculation of its carrying capacity. Accordingly, the number of livestock allowed for grazing was set. However, the administration of grassland protection is too costly and difficult to manage, even when there is a Grass Land Protection Program, the peasants can still find ways to enter the land (ZHAO, 2010).

2.4.3.2 Land Expropriations

Tenure insecurity with agricultural land under the HRS is exacerbated by the risk of land expropriation for urban expansion and infrastructure development (TAO AND XU, 2007). Rapid economic development, combined with high population density, has created high demand for rural land to be used for urban expansion and infrastructure projects. This has resulted in the widespread use of compulsory land acquisition (CHAN, 2003), with what many argue to have been insufficient compensation (GUO, 2001). Since 2004, the Chinese constitution has in fact had a clause stating that private property may be expropriated, but that it must be for "public use" and that "just" compensation must be provided (LIU, 2005). However, in practice, local governments have the authority to determine how "public use" is defined, while at the same time they have strong incentives to expropriate land for urban development because of the high prices at which the land can be sold to private developers once the designation is changed from rural to urban (DEININGER

ET AL., 2007). In addition, in most full-fledged market economies, the concept of "just" compensation is related to the market value of the land; but in rural China, the lack of well-defined property rights or functioning land markets makes this difficult, if not impossible to achieve (DING, 2007).

2.4.3.3 Lack of Transferability

In addition to the problem of tenure insecurity, the egalitarian principle used in distributing and reallocating land is the main driving factor for small farm size and land fragmentation (TAN, 2006). The Chinese agricultural economy is based on 200 million farms, each with fewer than 0.5 hectares of cultivated land that is fragmented into 6 or more non-adjacent plots. Land rental is one of the main ways in which operational landholdings are supposed to be expanded (CAI ET AL., 2008). Nevertheless, China's land transfer market is in an emerging stage. The appearance of land rental activity was evident in the late 1990s (GAO ET AL., 2012). According to Rural Land Contracting Law, land transfers that do not affect the underlying contract with the village collective are technically permitted, subject to notification of the village leader (MULLAN ET AL., 2011). However, based on their investigation, DEININGER ET AL. (2007) found that only 21 percent of village leaders were aware that land transfer was permitted. According to a nationwide survey, HUANG ET AL. (2012) found that only 17.2 percent of households rented-out their cultivated land and 17.2 percent of households rented-in land in the year 2008.

2.4.5 Current Change in Land Policy

2.4.5.1 Land Protection Policy

In response to conversion of farmland to industrial and residential uses as the main threat to the nation's food security, the Chinese government has introduced a number of measures aimed at protecting farmland, especially farmland with the greatest production potential. Two principal laws govern farmland preservation efforts in China: the Basic Farmland Protection Regulation, passed in 1994, and the New Land Administration Law, enacted in 1999.

The Basic Farmland Protection Regulation applies only to land used to grow major food grains, feed grains, soybeans, and tubers. Not included is land that is used in other kinds of food production; in particular, the Basic Farmland Protection Regulation does not apply to tree fruits, viticulture, or fish ponds. The law requires governments at or above the county level to designate a basic farmland protection zone in every village or township. There are two kinds of basic farmland protection districts. The first level consists of high-quality land with high productivity; the law

prohibits converting such land to nonagricultural uses. The second level consists of good-quality land with moderate productivity; the law permits conversion of such land to nonagricultural uses under some circumstances, usually after a planned period of 5 to 10 years (LICHTENBERG AND DING, 2008).

The 1999's New Land Administration Law is intended to protect environmentally sensitive and agricultural lands, promote market development, encourage citizen involvement in the legislative process, and coordinate the planning and development of urban land. The law reinforces farmland preservation efforts by requiring an approval from the State Council for any conversion of basic farmland. It states that urban development must be coordinated through planning to eliminate redundancy and duplicated construction, rationalized in layouts so that land use is efficient, and provided with sufficient infrastructure (DING, 2004).

In the case of forest and grass land, various protection projects have been introduced, such as the Natural Forest Protection Program, the Green to Grain Program, etc. The former prohibits harvesting of timber on forestland. It was intended to apply only to state-owned land. However, it has been expanded to cover collectively owned land, which many describe as equivalent to a "taking" of the property rights of the collectives and the households with land-use rights (KATSIGRIS, 2002; MIAO AND WEST, 2004; ZUO, 2002). The latter, also known as Sloping Land Conversion Program, aimed at dramatically increasing forest and grass coverage to combat ecological degradation, over-cultivation of sloping land and soil erosion. The program was initiated in 1999 and expanded to be nationwide in 2002. By 2008, 8.22 million hectares of cropland had been converted to forestland (LIU AND WU, 2010). The program has made a positive contribution to over 2.5 million rural households' income growth as the subsidies they received were higher than the net profits from sloping cropland cultivation. However, there was also a negative effect as the enlargement of income disparity between participants and nonparticipants. Therefore, a more complete program that involves more participation of farmers, and subsidies that should be varied according to the net profits from their crop production should be implemented (LIU AND WU, 2010).

2.4.5.2 Land Consolidation Program

In order to promote land consolidation by encouraging transfer of land-use rights between farm households, improve farming infrastructure, and adjust the agricultural production structure, a comprehensive agricultural development (CAD) program was introduced in 1988 (WU, 2005; LIN, 2009). The major part of the CAD program is land consolidation measures, including trunk irrigation

construction projects. Land consolidation may be broadly defined as measures to improve land quality that include: (i) expanding irrigated area and improving plot, irrigation and drainage conditions; (ii) improving farm plot configuration, including the plot size, shape, and layout through a suitable merging of smaller and irregular-shaped plots into larger ones of regular size and shape; (iii) improving farm road systems to provide better access to plots for both workers and machinery; (iv) reducing fragmentation of farmers' land into many small, noncontiguous plots scattered across many locations (WU, 2005).

The coverage of the program included land consolidation (land reclamation and consolidation, construction of trunk irrigation networks, and technical extension) and investment for diversified economic development. The latter also covers projects related to government concerns about poverty alleviation and environmental improvement. CAD is funded by four sources: the central government, local governments, bank loans, and farmer contributions. In 2007, total CAD investment was 36.3 billion Yuan, with the greatest share coming from farmer contributions at 38 percent, followed by 33 percent from the central government, 22 percent from local government, and seven percent from bank loans (LIN, 2009). Since the application of land consolidation in 1999, it is estimated that at least 2.5 million ha of cultivated land have been saved through land consolidation, and the increased grain production is equal to the output of 2.7 million ha of cultivated land. However, China's land consolidation with the primary purpose of saving farmland is still at a low level (HUANG ET AL., 2011).

Because the rural population in China will continue to grow while the total farmland area will diminish, the typically small operational scale of farms will, of course, remain an important feature of Chinese agriculture in the longer term. The CAD program is unlikely to change this significantly. Nevertheless, it is possible that through these land consolidation measures, land productivity and possibly also total factor productivity of farm households will improve (WU, 2005).

2.4.5.3 Policies for Tenure Security

When the HRS was initially introduced, the contract period was only 15 years, which mostly started in 1984, and land transfer between farm households was strictly prohibited. The duration of farmers' land-use rights was addressed again nearly ten years later, when the Chinese Communist Party Central Committee and the State Council issued Document No. 11 in 1993, stating that contracting land may be extended for another 30 years upon the expiration of the first 15-years. Later, this was further guaranteed by the revised Land Administration Law in 1998. Farmers' land contracting rights were finally protected by law with the issuance of

a written land-use contract. Indeed, a survey by the Rural Development Institute in 2005, found that just 45 percent of polled farmers had been issued written land-use contracts specifying the duration of use or other important privileges and obligations associated with their land rights (DUBOSE, 2011).

The Rural Land Contracting Law (RLCL), implemented in 2002, aimed at strengthening the households' rights of secure possession. It stipulates that the village collective should compose written land contracts with individual households and the duration of the land contract should be 30 years (FENG AND HEERINK, 2008). The RLCL focuses on three areas, namely (i) a more strict definition of land rights as property rights rather than just private contracts; (ii) a ban on large-scale reallocations of land and limiting small-scale readjustments with clear conditions; (iii) permitting land transfer between households, and (iv) a commitment to issuance of land documents (DEININGER ET AL., 2012). This system of land-use rights are also granted under the 2007 Property Law. These landmark laws represent the most important legal breakthroughs for securing 30-year land rights for China's 210 million farm households since the adoption of HRS (LI, 2003). To some extent, this new law was followed up on by the Central Party Committee's October 2008 report, which stated a further call for farmland transfer, lease, exchange and swap based on market-oriented mechanisms and peasant consent and willingness to enhance scaled farming and peasant incomes (ZHAO, 2010).

2.5 Labor Mobility Policy in China

Like land policies, China's labor policies also changed dramatically before and after the economic reforms.

2.5.1 Labor Mobility Policy in Pre-reform Era

In the pre-reform era, rural labor were not allowed to work in off-farm activities or out of collective farms (CAI ET AL., 2009; MAURER-FAZIO ET AL., 2009). Labor markets were replaced by a centrally planned job allocation system, while food supply, housing, education and health care were brought under tight planning controls through a strict household registration (Hukou) system (ZHANG, 2009).

The Hukou system in China originated in 1951. In principle, each individual in a household must be registered with a committee. In rural areas, these committees are called villager committees, in urban areas they are called resident committees. This registration not only documents the place of residence, it also classifies the household by function. This functional classification determines the individual's social and economic rights and privileges. Each household is classified either as

agricultural or as non-agricultural. In the case of villages, it involved rights for land, farming, and housing. In the case of cities, it involved rights to a welfare package, including access to guaranteed employment plus state-subsidized food and housing (WORLD BANK SYNTHESIS REPORT, 2007). By assigning the urban resident status, the administration can essentially control migration and assign economic and social privileges.

It is valuable to point out that at the time of the introduction of the Hukou system, it was not intended to control the mobility of the people. It was thought that the government started to intensify the Hukou system and to strictly restrict the mobility of the population, including rural to urban migration, in the 1960s, following the collapse of the Great Leap Forward and the devastating famine of that decade. The main reason cited for this government action was food shortage (WU, 1994; ZHAO, 2000). But as argued by LIN ET AL. (1996), the government needed to tie the farmers to the land so as to provide cheap agricultural products to the industrial sector. In this sense, the segregation of rural and urban populations was caused by more profound factors than food shortages (ZHAO, 2005). It is worth noting that the Hukou system deprived both rural and urban residents of their freedom of mobility. Migration between rural and urban areas was strictly controlled, essentially excluding rural people from urban employment and social security arrangements (WU, 1997).

As a result, there was no voluntary migration in China during that period. Only forced migration or floating population occurred at times due to particular political purposes. For example, to build up the third front in the 1960s and 1970s, many people were moved to central and western China together with industries. Another example is the reeducation movement during the Cultural Revolution, which sent millions of urban graduates to the countryside (CAI ET AL., 2009).

2.5.2 Labor Mobility Policy after Reform

Pre-1978 policies built up a reservoir of underutilized human resources in rural China with bans on labor movement and entrepreneurial activity, low farm prices, and farmer income not influenced by effort or output (LOHMAR ET AL., 2009). Decollectivization released a flood of rural workers, fuelling industrial growth while simultaneously boosting agricultural production to meet the food needs of a large population with rising living standards (WU, 1997). CAI ET AL. (2009) divide the evolution of migration policy after reforms into five stages. In the first period, 1979 to 1983, the government still prohibited migration. In the second period, 1984 to 1988, the government started to allow farmers to enter the urban areas on the condition that food was provided by the farmers themselves. The third period

was from 1989 to 1991, the government slowed down rural to urban migration to protect the work opportunities for urban citizens. During the fourth period, from 1992 to 2000, the central government, to some extent, encouraged rural-urban migration. The fifth period includes some evolution of migration policy after 2000.

2.5.2.1 Strict Restriction: 1979-1983

In this period, from 1979 to 1983, the government prohibited migration and limited recruiting workers from rural areas to prevent the rural population from working in the cities. In addition, local governments removed the employees from rural areas who were hired by urban employers. Some other complementary policies were also implemented. For instance, the domicile control and food distribution in urban areas based on Hukou were enforced. Those policies are evidenced by the Notice to Strictly Control Rural Labor to Work in Urban Areas issued by the State Council in 1981.

In order to ease the pressure of labor mobility out of rural areas, rural industries were encouraged to provide local off-farm employment opportunities for rural labor forces. The so-called labor policy of leaving the land without leaving the village stimulated the development of Township and Village Enterprises by provision of plentiful labor resources, which also led to a unique way to industrialize rural China.

2.5.2.2 Permission to Migrate: 1984-1988

In the second stage, from 1984 to 1988, to meet the labor demand from TVEs in coastal areas and construction in urban areas, it was necessary to allow labor mobility between rural and urban areas and between regions. As a result, the government encouraged labor mobility in rural areas and implemented a new set of policies. For example, rural migrants who worked or were self-employed in towns could register their Hukou in towns under the condition of making their own grain rations. Farmers were also allowed to sell some agricultural products and to have their own businesses.

Under economic development, the migration restriction was further relaxed over time. To encourage the integration of rural and urban economies, the service and transportation sectors were opened to farmers. In 1985, rural migrants were permitted to have a temporary urban Hukou (CUI, 2012). The State Owned Enterprises were permitted to hire rural migrants in 1986 (CAI ET AL., 2009). As an approach to poverty reduction for some rural areas, the government formulated policies facilitating rural labor transfer from the central and western regions. Those

active migration policies resulted in a fast growing migration flow in that period.

2.5.2.3 Slow down the Blind Flow: 1989-1991

The term "rural migrant wave" was coined in 1989 to describe the enormous number of rural migrant travelers during the Chinese New Year period in that year. However, following the "rural migrant wave" of 1989, serious inflation caused by the overheated economy triggered macroeconomic adjustment in China (ZHAO, 2004). To protect the employment opportunities for urban residents, many migrant workers were fired and local governments were required to remove the rural labor forces from rural areas. The restrictive policy is evidenced by Emergency Notices on Strict Control with Farmers to Move out of Rural Areas issued by the State Council in 1989. That was the first time rural migration flow was defined as a blind flow.

Furthermore, the government reemphasized the pattern of "leaving land without leaving village" for rural labor transfer and encouraged local governments to provide employment opportunities for rural surplus labor locally. However, the deteriorating macroeconomic situations formed a shock to TVEs. As a result, employment in TVEs began to decrease. Due to the strict control for rural migration, the total size of migration shrank during the period. In 1989, the number of migrants who lived in cities was significantly less than the number in 1988.

2.5.2.4 Guiding the Migration Flow: 1992-2000

During the fourth stage, from 1992 to 2000, the government sensed that migration was inevitable because of income disparities between regions and between rural and urban areas triggering by economic development, to some extent they started to encourage rural-urban migration. The first practice was to establish 50 experimental counties developing rural human resources from 1991 to 1994, and then the pilot was extended to eight provinces from 1994 to 1996. At the same time, the government started emphasizing strengthened administration of rural to urban migration.

Meanwhile, reforms of the Hukou system were piloted in various regions. In 1997, the state council approved suggestions from the Ministry of Public Security and allowed some of the migrants to become permanent residents of the towns and small cities on the condition that they had a regular job in the town or small city and had stayed there for more than two years. In 1998, this regulation was further applied to large cities. However, the enforcement of the regulation varies across cities. In particular, big cities where local residents were subsidized by local finance were reluctant to accept new comers, so the pace of reform in big cities was

very limited. In 2000, the state council made some new suggestions, which eliminated some requirements in the previous conditions and asked the local government to give equal rights to migrants.

2.5.2.5 The Evolution of Migration Policy after 2000

Since 2000, the government has been reforming the Hukou system to allow greater mobility. There were chiefly two types of reform related to the Hukou system. The formal award of permanent residency rights was made easier and non-Hukou migrants were enabled to access many public services from which they were previously excluded. In addition, the government started addressing the training of migrant workers. In 2003, the State Council issued Training Plans for Migrant Workers: 2003-2010, which proposed that central and local governments should finance the training programs for migrant workers. The trend of this policy was clearly written into the 10th and 11th Five-Year Plans published in 2001 and 2006 respectively. By approaching the flow of labor with encouragement, moreover, by creating fair conditions to improve migrants' employment, accommodation, children's education, and social security, these policies have gradually became enforceable measures.

Passage of the Labor Contract Law in 2007 indicates the great importance that the government attaches to protection of the rights and interests of ordinary workers, including migrants. The same year the "Employment Promotion Act" directly targeted barriers to employment faced by rural migrant workers, the arose further emphasis to treat migrant workers equally. In addition, in 2008 the Ministry of Human Resources and Social Security announced that the measures to implement transferable pension for migrant workers would be taken by the end of 2008 (YIN, 2008).

In recent years, local governments have made much greater efforts in reforming the Hukou system. One common practice in this reform area is the attempt to establish a unified Hukou regime integrating rural and urban population registration, by abolishing the distinction between agricultural and non-agricultural Hukou identities and integrating them into a unified residential Hukou. Such a reform however has failed in some cities because of fiscal constraints (CAI ET AL., 2009).

2.5.3 Migration and Labor Market Development in China

Starting in the mid-1980s, a large number of rural workers began to seek employment in rural off-farm work. Figure 2.7 shows the employment shares of rural agricultural workers, workers in TVEs, and workers in rural private and individual enterprises. In the late 1970s, more than 90 percent of rural employment

was engaged in agricultural work. The proportion of rural workers in agriculture started its long-term decline in 1984 when the government encouraged farmers to leave agricultural production and work in nearby small towns. By 2010, the percentage of rural employment in agriculture had already dropped below 50 percent. The share of TVE workers rose from ten percent in 1978 to more than 35 percent in 2010. Today, around ten percent of rural workers are employed in rural private and individual enterprises.

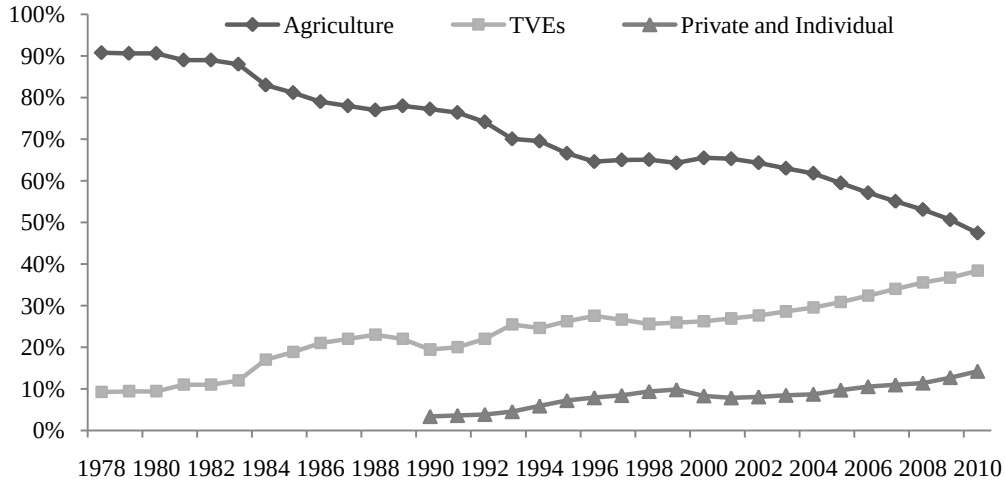


Figure 2.7: Distribution of rural employment, 1978-2010
Source: China Statistical Yearbook, 2008-2011

However, most of them are temporary migrants. MENG (2012) found from a migrant survey in 2009 that of the 5,214 migrant household heads, around 56 percent were married, and of these only 63 percent had their spouse with them. Among the children of migrants below the age of 16, 56 percent were left behind in rural villages. Moreover, most rural migrants come back to their homes in the countryside, after some years spent working in urban informal labor markets (MURPHY, 2002). Migration thus seems to be a stage in the lives of rural people. From a survey, DE LA RUPPLE ET AL. (2009) found among all of the interviewed migrants that 39 percent intended to go back to their hometown as soon as they had accumulated enough savings. Rural migrants also tend to move back and forth between home villages and destination areas.

After the deregulation of rural-urban migration in the late 1980s, the amount of rural migrants in cities increased rapidly. In 1983, the number of rural to urban migrants was only two million and after more than ten years, by 1993, ROZELLE ET AL. (2009) estimated that 154 million rural individuals worked off-farm in 1995, including 54 million long-term migrants. Migration has become the most prevalent form of labor supply for off-farm activities since the late 1990s. Rural to urban migration has exploded in recent years. Despite maintaining a slow pace during the period of the East Asian financial crisis and China's deepening of state-owned

enterprise reform in the late 1990s, the total number of rural to urban migrants reached 139 million in 2011, accounting for about 40 percent of total urban employment in China (table 2.5). The expansion of rural off-farm work and rural-urban migration has played a critical role in facilitating the integration of rural and urban labor markets in China.

Table 2.5: Migrant workers and urban employment

Year	Migrant workers (million)	Urban Employment (million)	Ratio (%)
2000	78.49	212.74	36.9
2001	83.99	239.4	35.1
2002	104.7	247.8	42.3
2003	113.9	256.39	44.4
2004	118.23	264.76	44.7
2005	125.78	273.31	46.0
2006	132.12	283.1	46.7
2007	136.49	293.5	46.5
2008	135.38	307.55	44.0
2009	136.16	318.89	42.7
2010	134.87	332.64	40.5
2011	139.12	344.42	40.3

Source: China Statistical Yearbook (2001-2012)

3 CONCEPTUAL AND THEORETICAL FRAMEWORK

This chapter starts with brief definitions of key concepts used in the study such as farm land, land property rights, migration and then proceeds with review of related theories including structure change theory, migration theory and land rights theory. Finally, conceptual framework that this study is intended to assess is presented.

3.1 Definition of Key Concepts

3.1.1 Farm Land

Farmland generally refers to agricultural land, or land suitable for agricultural production, both crops and livestock (UNITED NATIONS, 1997). It is one of the main resources in agriculture. The standard classification divides agricultural land into the following components: Arable land, land under annual crops such as cereals, cotton, other technical crops, potatoes, vegetables, and melons; and also includes land left temporarily fallow; permanent cropland, orchards and vineyards (e.g., fruit plantations); pasture, areas for natural grasses and grazing of livestock, such as meadows and pasture (OECD, FAO). The first two components arable land and land in permanent crops constitute so-called cultivable land. The part of arable land actually under crops is called sown land or cropped land. The term farmland is ambiguous in the sense that it may refer on the one hand to agricultural land and on the other hand to cultivable or even only arable land (FAO STATISTICS DIVISION).

According to Land Administration Law of the People's Republic of China (2005), agricultural land refers to land that is directly used for agricultural production, including cultivated land, forestland, grassland, land for irrigation and water conservancy and water surfaces for aquaculture. Rural Land Contract Law (RLCL) further clarifies that land in rural areas includes the arable land, forestlands and grasslands owned collectively by the peasants and by the State and used collectively by the peasants according to law, as well as other lands used for agriculture according to law, shall adopt the system of contracted land management. Land contracts in rural areas shall take the form of household contracts within the village collective.

It is important to have a clear definition of farmland in this study, since China's rural land system is quite unique and complex. Concerning the requirements for simplification of the econometric model, farmland in this study refers to the land that households contract from the village collective.

3.1.2 Land Property Rights

In economics, property usually refers to ownership, the right to possess something, to control it, to determine its use, to receive the benefits from its use, and to dispose of it (ALCHIAN, 2008). It is the owner's exclusive authority to determine how a resource is used, and who owns that resource. The related concept of property rights (which could be called "ownership rights") refers to the specific content and extent of the rights possessed by property owners, particularly the limitations that may exist on the exercise of those rights and the nature of enforcement of those rights (KOTZ, 2006).

There are four basic categories of property rights: none (or open access), communal property, private property, and state (or crown) property. Under open access, rights are left unassigned. The lack of any exclusivity implies the lack of an incentive to conserve, and therefore often results in degradation of scarce resources. Under communal property, exclusive rights are assigned to a group of individuals. Under state property, management of the land is under the authority of the public sector (FEDER AND FEENY, 1991). In private property, an individual is assigned the rights. These four categories are ideal analytical types. All or some of these categories of property rights may exist in a single society for different tracts of land. Furthermore, because of the multifaceted nature of property rights of land, the same tract of land can be categorized under more than one regime (FAO, 2002).

However, the concept of property rights in this study is understood in the Demsetzian or common law tradition as a "bundle of rights" (HO, 2005). Instead of the civil law definition of "ownership" as an absolute and all-inclusive right, property can include-with temporal and geographical variations-such rights as use, alienation, usufruct, access, management, and right of way (HO, 2005).

Therefore, various rights in land can be pictured as consisting of a bundle of sticks, each of which represents a different right associated with land (FAO, 2010). For example, a bundle of rights existing on a piece of land can be disaggregated into: the right to derive benefit from the land (e.g. through cultivation or grazing, which is a use right); the right to decide how to use the land and to decide who shall be permitted to use it and under what conditions (management right); the right to derive income from the use of the land (income right); the right to transform it (capital right); the right to convey the land to others (e.g. through intra-community reallocations) or to heirs (i.e. by inheritance), to sell it or to give it away (transfer right); and the right to exclude others from using the land or otherwise interfering with it. In this context, "property" refers to all these different rights and does not necessarily mean "owning" (FAO, 2010).

According to Land Administration Law, in China, land in rural and suburban areas is owned by village collectives, but exclusive use rights are given to individuals under a contractual arrangement with the village collective. Farmers actually have partial property rights to their land. They have the rights to use the land for agricultural production, to reap the yields and to transfer the land to other farmers, as well as the right to obtain appropriate compensation when their contracted land is expropriated. They do not have the rights to sell the land, or mortgage it, or change it to non-agricultural use (Property Law of People's Republic of China, 2007). If these use rights are transferable with few limitations, and if the contract is sufficiently long-term (for example, ninety nine years), then for most of the contract's duration there would be very little difference between possession of use rights and full property rights.

3.1.3 Migration

The concept of migration is rather broad. Migration is defined by many authors, organizations and disciplines to suit their particular objectives. Therefore, there is no universally agreed-upon single definition of migration. However, some of the key definitions of migration in use at present are:

According to the United Nations Multilingual Demographic Dictionary-Migration is a form of geographic mobility of spatial mobility between one geographical unit and another general involving place of departure to the place of destination or place of arrival.

According to LEE (1996) migration is a permanent or semi-permanent change of residence with no restrictions upon the distance involved and the nature of the act involved in the movement.

Also migration is categorized into various types depending on various aspects of migration such as time period (Permanent, Temporary and Seasonal), purpose (labor migration, forced migration), location (internal and international), process involved (legal and illegal migration) etc.

The concepts of permanent migration and temporary migration, in the context of China, are rooted in the institution of household registration. Temporary migrants refer to individuals whose place of residence differs from their place of registration. Permanent migrants, in contrast, refer to migrants who have changed their registration to the place of residence. It is where individuals are registered, rather than the duration of stay, that defines them as permanent or temporary migrants (GOLDSTEIN AND GOLDSTEIN, 1991).

For the purpose of this study, household migration behavior in 2008 refers to a

household having at least one individual who has declared work out of his usual place of residence for more than three months. The restriction put on this definition is that not only the workplace of the migrant must be out of their home county, but also the duration of his migration must be more than three months, in order to rule out commuters and keep only genuine migrants. Another related definition also important in this study is local off-farm employment that refers to any household member pursuing non-agricultural work within their county, either part or full time.

3.2 Theory of Structural Change

Development, almost by definition, involves a transfer of labor from agriculture to manufacturing and services. Standard economic theory on development predicts that in a country with a large pool of surplus labor occupied in low-productivity agriculture, rapid growth and industrialization result in the relocation of agricultural labor into the non-agricultural sectors, where employment increases rapidly (KUIJS AND WANG, 2005). It was postulated that, as the economy grows, production shifts from the primary to the secondary to the tertiary sector (FISHER, 1939; CLARK, 1940; KUZNETS, 1966; CHENERY AND SYRQUIN, 1975). It is also notably argued that the economy passes through various stages of development from the traditional stage to the take-off stage to the mass consumption stage (ROSTOW, 1960). The basic shift in distribution of economic activity within a country, from primary production to manufacturing, and later to services, is related to other types of structural change, of which the most notable are migration and urbanization. These changes can be interpreted as the set of structural changes that are deemed essential to continued growth. They both contribute to and are affected by economic growth (KUIJS AND WANG, 2005).

3.2.1 Fisher Clark's Division of Sectors and Structural Change Theory

Two economists, FISHER (1935) AND CLARK (1940), put forward the idea that an economy would have three stages of production: Primary production is concerned with the extraction of raw materials through agriculture, mining, fishing, and forestry. Low-income countries are assumed to be predominantly occupied with primary production. Secondary production concerns industrial production through manufacturing and construction. Middle-income countries are often dominated by their secondary sector. Tertiary production is concerned with the provision of services such as education and tourism. In high-income countries the tertiary sector dominates. Indeed, having a large tertiary sector is seen as a sign of economic maturity in the development process (CHENERY AND SRINIVASAN, 1989).

Countries are assumed to first pass through the primary production stage then the secondary stage and to arrive at the tertiary stage. As economies develop and incomes rise, the demand for agricultural goods will increase, but due to their low income elasticity, at a proportionally lower rate than income. However, the demand for manufactured goods has higher income elasticity, so as incomes grow, demand for these goods grows at a proportionately higher rate. Hence, the secondary industry will grow along with income. As incomes continue to increase, people start to consume more services, thereby promoting growth and development in the tertiary sector (SOLOW, 1956).

However, this may be misleading. Some developing countries may have a large tertiary sector due to a large tourist industry without having developed a secondary industry. Economists argue that this could be somewhat risky. If the economic base is dominated by an economic activity such as tourism that has a high-income elasticity of demand then a recession in the consuming nations will have a disproportionately large impact on export earnings. A fall in income will bring about a proportionately greater reduction in demand for the service and this will have severe impact on the economy. If it does not have a primary or secondary production to fall back on, then debt might be the only prospect (SOLOW, 1956).

3.2.2 Lewis's Dual Sector Model of Development

Lewis proposed his dual sector development model in 1954. It is also known as the surplus labor model. It focused on the need for countries to transform their structures, away from agriculture, with low productivity of labor, towards industrial activity, with a high productivity of labor.

It was based on the assumption that many developing countries had dual economies with both a traditional agricultural sector and a modern industrial sector. The traditional agricultural sector was assumed to be of a subsistence nature characterized by low productivity, low incomes, low savings and considerable underemployment. The industrial sector was assumed to be technologically advanced with high levels of investment operating in an urban environment.

Lewis suggested that the modern industrial sector would attract workers from the rural areas. Industrial firms, whether private or publicly owned, could offer wages that would guarantee a higher quality of life than remaining in the rural areas could provide. Furthermore, as the level of labor productivity was so low in traditional agricultural areas people leaving the rural areas would have virtually no impact on output. Indeed, the amount of food available to the remaining

villagers would increase as the same amount of food could be shared amongst fewer people. This might generate a surplus which could then be sold generating income.

Those people that moved away from the villages to the towns would earn increased incomes and this crucially, according to Lewis, generates more savings. The lack of development was due to a lack of savings and investment. The key to development was to increase savings and investment. Lewis saw the existence of the modern industrial sector as essential if this was to happen. Urban migration from the poor rural areas to the relatively richer industrial urban areas gave workers the opportunities to earn higher incomes and crucially save more providing funds for entrepreneurs to invest. A growing industrial sector requiring labor provided the incomes that could be spent and saved. This would in itself generate demand and also provide funds for investment. Income generated by the industrial sector trickles down throughout the economy.

However, this model was criticized. The main criticisms were: the idea that the productivity of labor in rural areas is almost zero may be true for certain a time of the year, however, during planting and harvesting the need for labor is critical to the needs of the village (SCHULTZ, 1964; SEN, 1967). The assumption of a constant demand for labor from the industrial sector is questionable. Increasing technology may be labor-saving, reducing the need for labor. In addition, if the industry concerned declines, the demand for labor will fall. The idea of trickle down has also been criticized. Will higher incomes earned in the industrial sector be saved? If the entrepreneurs and labor spend their new-found gains rather than save it, funds for investment and growth will not be made available (RANIS, 2004). The rural urban migration in many developing countries has been far larger than that for which the industrial sector can provide jobs. Urban poverty has replaced rural poverty.

The above theories have contributed more or less to the explanation of economic growth and development as well as structural change during this process.

3.2.3 Main Driving Factors of Structural Change

Structural change is a complex, intertwined phenomenon, not only because economic growth brings about complementary changes in various aspects of the economy, such as the sector compositions of output and employment, organization of industry, etc., but also these changes in turn affect the growth process (MATSUYAMA, 2005). An inherent phenomenon in any growing economy is that economic growth without structural change is not possible in the long term. Additionally, it can be politically delayed, but not prevented. The transformation

from a rural agricultural society to an urban industrial society is one of the main aspects of structural change discussed in the literature. However, there are also other aspects of structural change, such as structural change within a sector (MATSUYAMA, 2005).There is an obvious linkage between structural change of the whole economy and change within one sector (CHENERYA ET AL., 1989).

BAUER AND MICKAN (1997) proposed that the main driving factors for structural change and relative decline of the agricultural sector in developed countries are declining demand for food, technological advancement, the relationship between wage and interest rates, and specialized enterprises for food-processing and input industries. Specifically, by shortly reviewing the agricultural development in industrialized countries, they argued that in developed countries a continuous increase in agricultural production can be observed with potentially decreasing factors of production and growing productivity. They also suggested that as the relationship between wages and interest rates rise over time, mechanization and the use of capital-intensive production techniques are encouraged, as well as the invention of new technologies that aim at rising labor productivity. As agricultural output expands faster than the demand for agricultural products, the supply surplus grows. According to Engel's law, the demand for food stuffs declines relative to overall demand when income rises. Therefore, are relative decline of the agricultural sector in terms of GDP can be anticipated.

Finally, they argued that the continuous specialization of individual farms is another main driving force for the structural change within this sector. It is important to acquire and use special farming and business knowledge for securing economic success with farming activities. Part of this specialization is the externalization of particular activities from the farming sector to specialized input and processing businesses. Besides this specialization at the farm level a geographical concentration of specialized farms can be observed as they often exploit similar comparative advantages that a region offers.

CHENERYA ET AL. (1989) stated the following factors as being relevant determinants for agricultural structure and thus its changes. Firstly, various economic and technical determinants are of importance. They relate to technological and market-connected scale effects, technological developments, and numerous factors impeding factor mobility as well as general economic developments. Secondly, some influence can be attributed to the historical initial situation, e.g. farm-specific characteristics like farmer behavior and attitudes. Thirdly, there are political influences, especially associated with structural policies in agriculture.

REIMUND ET AL. (1977) stated that structural change factors in the agricultural

sector are as follows. Firstly, new production and institutional technology exists and can be implemented. This new technology must be capable of reducing production costs, and meanwhile it develops new information systems that tend to bypass or supplement the traditional ones. The new institutional technology must cope with new risks associated with new methods of production. Secondly, interregional competition tilts in favor of other areas and shifts in the location of production begin to occur. The shift is related to utilization of input resources (including human), which are available in a particular region or area. Thirdly, innovative entrepreneurs, who are generally new entrants into the sub-sector, take advantage of the opportunity to adopt and extend the new technology in the new production areas. Finally, pecuniary economies develop in the new production area, nourishing further growth and development. Production tends to concentrate in new areas as a result of both this and lower combined production and distribution costs.

3.2.4 Adjustments by Farmers to Structural Change

Since the agricultural sector experiences significant pressure as a consequence of all these driving factors mentioned above, there are certain adjustments that farmers need to make to mitigate the negative effects of this transformation.

Traditionally, farm size was increased to realize the required income for sustaining household livelihood. Because of the restrictions in total land availability, individual farm growth by means of acquiring additional land could only be achieved when other farms gave up their farming activities. This is typical for the structural change of agriculture based on family farms. Particularly in rural areas, this simultaneous process of growth and surrender of farming depends very much on the labor market situation outside agriculture (BAUER AND MICKAN, 1997).

The second, rather traditional form of adjustment is that of multiple job-holdings by farmers. Many farms are managed only part-time, so that farmers can spend the rest of their labor hours working outside of agriculture. Alternatively, some family members work on the farm while others take jobs in another economic sector. All these kinds of multiple job-holdings make it possible for farmers to earn some steady and ‘secure’ income in addition to their farm income (BAUER AND MICKAN, 1997).

Moreover, there are further adjustment measures conceivable. As consumers become more and more aware of healthy nutrition, some farmers introduce organic farming practices for which product prices are higher relative to conventionally produced agricultural goods. For other farms, it can be profitable to engage in tourist activities, they might be able to produce agricultural

side-products and special commodities, and they can occupy themselves in private services and handicraft businesses depending on individual interests and talents (BAUER AND MICKAN, 1997).

These different examples of conceivable additional income sources cannot necessarily be generalized. Instead, these activities can only be applied relative to farm and/or regional conditions (BAUER AND MICKAN, 1997).

3.2.5 Structural Change in the Chinese Economy

The Chinese economy has experienced massive structural change over the past several decades. In 1952, agriculture accounted for more than half of GDP (Figure 3.1), while urban industry and services accounted for 35 percent and 14 percent, respectively. The Chinese economy was predominantly agrarian at that time, but by 2011, agriculture's share had declined to about ten percent of GDP.

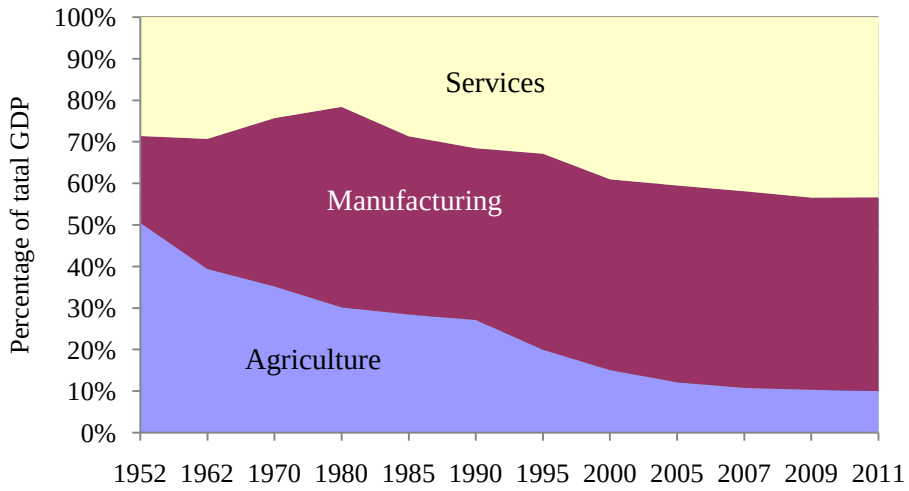


Figure 3.1: GDP Shares by Sector
Source: NBS, 2008, 2012

Labor shifts among sectors in China were also phenomenal. In 1952, more than 80 percent of the national labor force was in the agricultural sector, while only 7 percent worked in urban industry and nine percent in the urban service sector. By 2011, 35 percent of labor was engaged in agricultural activities, about 29 percent worked in the urban industrial sector and 36 percent in the urban service sector (Figure 3.2).

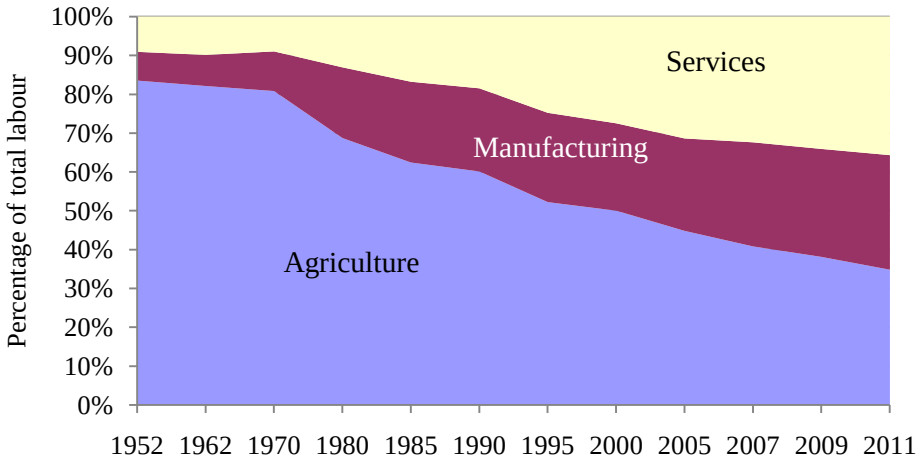


Figure 3.2: Labor employment shares by sector
Source: NBS, 2008, 2012

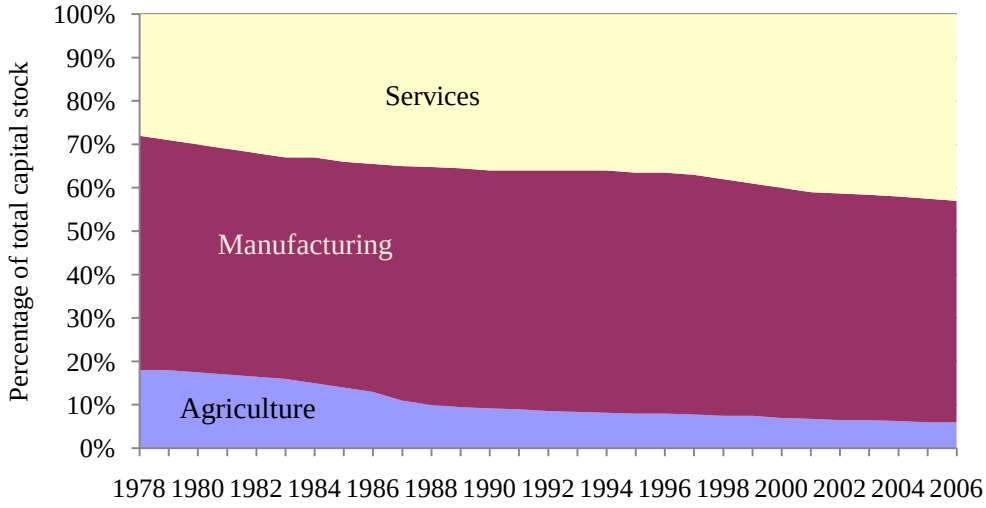


Figure 3.3: Capital stock shares by sector
Source: WU (2009)

Over the years, though declining slightly, the manufacturing sector still dominated the Chinese economy. However, during 1978-2006, the service sector has shown the trend of rapid catch-up. In 1978, agriculture accounted for nearly 20 percent of total capital stock, while manufacturing and services accounted for 53 and 28 percent, respectively. By 2006, given slow growth in agricultural capital investment, the share of agriculture in total capital stock declined dramatically to 6 percent, while industry and services increased their shares to 51 percent and 43 percent, respectively (Wu, 2009).

3.3 Microeconomic Theories of the Labor Market

The last section mentioned structural change involving a large amount of labor moving out of the agriculture sector. In this section, the various labor mobility

theories related to this study will be briefly reviewed. HAGEN-ZANKER (2008) grouped migration theories based on levels of analysis-micro, meso and macro. This study mainly focuses on the microeconomic theories that explain the factors involved in labor migration. To be specific, three of them, LEE's Push-pull, Neoclassical, and New Economics of Labor Migration theories are reviewed in this section.

3.3.1 Neoclassical Micro-migration Theory

The basic assumption in the neoclassical theory of labor migration is that an individual maximizes his/her utility, subject to a budget constraint (SMITH, 1976; RAVENSTEIN, 1889; IN BAUER AND ZIMMERMANN, 1999). The neoclassical assumptions associate migration with lack of economic opportunities at places of origin. As such, the decision to migrate is a decision to maximize individual income. The central argument revolves around wages. This means that economic opportunities, especially wage differentials, are the most important factors for migration (STRAUBHAAR, 1988).

Spatial migration mainly occurs because of geographic differences in the demand and supply of labor markets. Regions with a shortage of labor relative to capital are characterized by a high equilibrium wage, whereas regions with a large supply of labor relative to capital are faced with low equilibrium wages. This wage differential causes a migratory flow from low wage to high wage regions. In response to this flow, the supply of labor in the high wage region increases; subsequently, the wage in this region falls. Similarly, due to migration, the supply of labor in the low wage region decreases and wages in this region rise. The migration flow ends as soon as the wage differential between the two regions reflects the costs of movement from the low wage to the high wage region. As a result, the model argues, labor migration emerges from actual wage differentials between regions, i.e. the larger the wage differential the larger the migration flow. Alternatively, a spatial difference in the demand and supply of labor markets triggers migration of labor (STARK, 1991).

Neo-classical migration theory considers rural-urban migration as a fundamental part of the whole development process, by which surplus labor in the rural sector supplies the workforce for the urban industrial economy (LEWIS, 1954). By postulating that it is a well-known fact of economic history, that material progress usually has been associated with the gradual but continuous transfer of economic agents from rural-based traditional agriculture to urban-oriented modern industry (TODARO, 1969), neo-classical migration theory is firmly entrenched in "developmentalist" modernization theory based on teleological views interpreting

development as a linear, universal process consisting of successive stages (ROSTOW, 1960).

However, the neoclassical assumptions were modified in the Todaro model (TODARO, 1969) where the assumption of full employment was dropped. The influential "Harris-Todaro model" was developed in order to explain the apparently contradictory phenomenon of continuing rural-to-urban migration in developing countries despite rising unemployment in cities. HARRIS AND TODARO (1970) argued that, in order to understand this phenomenon, it is necessary to look at the rural-urban "expected" income differential. The expected income in the destination area not only depends on the actual (or average) earnings at the destination, but also on the probability of employment. Migration occurs when the expected benefits of moving are greater than the expected costs of moving.

Further extension of the model is possible by interpreting it within a human capital framework, in which migration is seen as an investment decision (DE HAAS, 2008). This concept holds that the educational qualifications, abilities, skills and competencies that an individual possesses represent his/ her human capital. This approach explains that individual labor market characteristics in different regions would result in different wage rates. However, there are reasons that some in a country migrate but others in another area do not. This approach also emphasizes migration cost in the form of transportation costs and income losses and psychological costs due to separation from family members and one's familiar environment during migration (BAUER AND ZIMMERMANN, 1999). This model considers migration as a response to regional differences in both demand and supply of labor. Moreover, this theory explains that probability of migration increases with education level, but decreases with increase in age. This is because migrants calculate expected lifetime gains from moving (KENNAN AND WALKE, 2011).

Neo-classical migration theory can be positioned within the functionalist paradigm of social theory, as the central argument of factor price equalization assumes that economic forces tend towards an equilibrium and also because it largely ignores the existence of market imperfections and other structural constraints on development (DE HAAS, 2008). This is hardly realistic, particularly in the context of many developing countries. In most developing countries, factor markets (capital, insurance) are typically far from perfect, making access to financial services and capital difficult or even impossible for marginalized groups (MCDOWELL AND DE HAAN , 1997). This makes it difficult to explain actual migration patterns within a neo-classical framework that mainly focuses on expected income. Neo-classical migration theory is also not able to deal with

constraining factors such as government restrictions on migration.

3.3.2 Lee's Push-pull Theory

LEE (1966) was the first to formulate migration in a push-pull framework on an individual level, looking at both the supply and demand side of migration. In his view, the decision to migrate is determined by the following factors: factors associated with the area of origin; factors associated with the area of destination; so-called intervening obstacles (such as distance, physical barriers, immigration laws, and so on), and personal factors (e.g. how the migrant perceives the factors). Positive and negative factors at the origin and destination push and pull migrants towards (and away from) migration, hindered by intervening factors and affected by personal factors. Lee makes a number of predictions, for example that greater diversity among people leads to more migration and for this reason there are high rates of migration within the United States (HAGEN-ZANKER, 2008).

The push-pull model has gained enormous popularity in the migration literature. However, this theory is barely a theory; it is more a grouping of factors affecting migration, without considering the exact causal mechanisms (HAGEN-ZANKER, 2008). As they are applied in practice, Push-pull models tend to ignore the heterogeneity and internal stratification of societies, while general contextual factors habitually defined as either push or pull factors are likely to work out in a differentiated way at the individual level, and might subsequently encourage some people to leave and others to stay (DE HAAS, 2008).

Additionally, push-pull models are also not able to explain return migration and the simultaneous occurrence of emigration and immigration from and to the same locality or area, nor do they pay attention to the impacts of migration, and the way it may alter the structural contexts both at the destination and origin (DE HAAS, 2008). In other words, the push-pull model is a static model focusing on external factors that "cause" migration that is unable to analytically define migration as an integral part of broader transformation processes, and therefore seems of limited analytical use (DE HAAS, 2008).

3.3.3 The New Economics of Labor Migration

In the 1980s and 1990s, the so-called new economics of labor migration (NELM) emerged as a critical response to, and improvement of, neo-classical migration theory (MASSEY ET AL., 1993). The new economics of labor migration departs from the neoclassical economics principally in two aspects the level of analysis and the consideration of markets other than the labor market (MASSEY, 2003). While in the neoclassical approach the individual is the unit of analysis, as the

migration decisions are believed to be made at the individual level based on the individual cost-benefit calculations, the new economics of labor migration considers the household or family as the unit of analysis. According to NELM, the migration decisions are not made at the individual level but at the more aggregate level of a household or family. And the migration decision reflects the household's strategy of maximizing the expected income, minimizing the risks and loosening the constraints associated with a variety of market failures like private insurance, futures markets, credit markets etc. (STARK AND LEVHARI, 1982; STARK, 1984; KATZ AND STARK, 1986; STARK AND TAYLOR, 1991).

The new economics of labor markets also questions the assumption that income has a constant utility for various people across socioeconomic settings. This theory argues that households make migration decisions not only to improve their expected incomes in absolute terms but also to increase income compared to other households, and hence to reduce their relative deprivation compared to some other reference group (STARK ET AL., 1988; STARK AND TAYLOR, 1989; 1991; MASSEY ET AL., 1993).

3.3.4 Farm Household Model and Labor Allocation

The farm household model has a long history in the development literature and has been frequently applied to the study of household labor allocation (DONNELLAN ET AL., 2012). The model assumes decisions on how much time is divided between labor and leisure, and how hours of labor are divided between farm and off-farm labor to maximize utility are made as a family (D'ANTONI AND MISHRA, 2013).

In deciding how much time to devote to on-farm work, off-farm work and leisure, farm households confronts three kinds of constrains. First, they cannot spend more money on consumption than they earn. Second, neither of the income earners can spend more total time in work and leisure than is available. Third, for a given endowment of owned farm capital, the most important of which being owned farmland and farm-specific human capital, a household's net earnings from farming can not exceed the level obtained by choosing profit-maximizing levels of farm output and input use. These latter will be dictated by relative prices of farm outputs and inputs and the technical relationships embodied in the farm production function and, in particular, the diminishing marginal factor productivity of farm household labor (DEWBRE AND MISHRA, 2007). In theory, the household will allocate labor to participate in off-farmwork as long as their marginal value of farm labor (reservation wage) is less than the off-farm wage rate (BECKER 1965; GRONAU 1973).

The basic ideas of the analysis of labor allocation under the farm household model are illustrated in Figure 3.4. The horizontal axis indicates the amount of time spent working: zero hours on the extreme left to a maximum of T hours on the extreme right. The vertical axis measures total income, traced by the income possibility curve passing through the points A, B, and D; and terminating at Y_{max}. Three categories of income are distinguished. The first is non-labor income and is denoted as Y_0. It is that income a farm household would receive even when zero hours are devoted to work, e.g. pensions, rents. The second category is farm income. The incremental contribution of income from this source is traced by the curve that starts at A and passes through the points marked B and D. Notice that the slope of this curve declines as more hours are allocated to farm work, reflecting the assumption of diminishing marginal productivity of farm labor. Atthe equilibrium depicted in Figure 3.4, farm income is represented on the right hand axis as Y_f-Y_0. The third category is off-farm income, shown as the difference between Y_t and Y_f. Off-farm earnings are determined by the off-farm wage rate represented by the (constant) slope of the income possibility curve over the segment B to Y_{max}.

The indifference curves labeled U1 and U2 show equal-utility combinations of income and leisure. The household maximizes utility by choosing that combination of work time and leisure yielding the highest attainable utility given the constraints. In the absence of off-farm work opportunities, a household would maximize utility by choosing to allocate T_f' hours to on-farm work, and T-T_f' hours to leisure at the tangency point C of the indifference curve labeled U1 with the income possibility curve. This combination of work and leisure hours yields farm income Y_f^{max} the optimal maximum, ignoring off-farm work opportunities. However, the existence of off-farm work opportunities at wage rate W means the household can obtain the higher income Y_t, atthe higher utility associated tangency point D, working only T_f hours on the farm and T_w hours off the farm and spending T-T_w hours in leisure activities. This is because at all points to the right of point B on the income possibility curve, the off-farm wage rate, W, is higher than the marginal value product of farm household labor MVP_f. Notice that under these conditions, the assumption of utility maximization-equating the marginal rate of substitution between income and leisure with the off-farm wage rate-is enough to ensure, that the farm household will allocate less time to on-farm work in the presence of off-farm earning opportunities. Compare T_f'toT_f.

Changes in the off-farm wage rate, in the marginal value product of farm household labor or in the level of non-labor income could all potentially change the location and slopes of the income possibility curve. Any such change will lead to reallocation of a farm household's total time endowment between on and

U^2

off-farm activities and leisure.

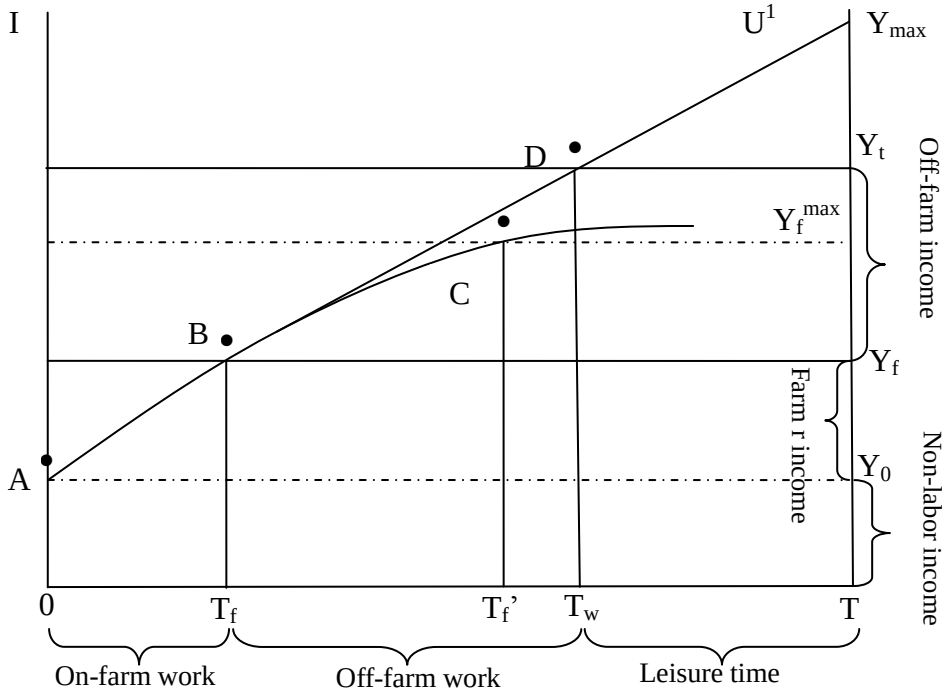


Figure 3.4: Time allocation and farm household income
Source: Adapted from DEWBRE AND MISHRA (2007)

3.4 The Role of Property Rights

The objective of this section is to provide a review of the most important theories linking tenure security, factor markets development and agricultural productivity.

3.4.1 Overview of Property Rights Theory

3.4.1.1 Hardin's "Tragedy of the Commons"

This theory had been among the most famous analyses of communal property. In fact, HARDIN (1968) assumed that common resources lacking ownership are bound for over-exploitation. He argued that each user would harvest the resource as soon as possible, before other users did so. When everybody owns the resource, nobody has incentive to conserve it for future use. Each use imposes an external cost on all other users in terms of reduced resource availability. The consequence is overgrazing, overfishing, clearing of forest and so on, which can in turn endanger the sustainability of a resource.

HARDIN's model has been criticized by a number of writers. CITIACY-WANTRUP AND BISHOP (1975) showed that HARDIN failed to distinguish between forms of open access to common property. They conclude that the tragedy of the commons is really found in an open-access property category where the property rights and

the social authorities that define and enforce the rights are absent, but not necessary with common property per se.

An immediate result of this was that economists recommended specification and enforcement of rights. Even before Hardin's theory, COASE (1960) showed that a clear assignment of rights, together with the market mechanism would solve the problems related to externalities, regardless of to whom the rights were assigned.

However, this point of view was also criticized by a number of writers because it is not valid in the case of a communal property regime where rights are assigned to a well-defined group. In fact, when there is growing competition for the use of land as a result of population growth and growth in production demand, communal ownership becomes unstable and produces harmful effects in the form of mismanagement and/or overexploitation of the valuable resource (PLATTEAU, 1995). Efforts at conserving it are discouraged and social benefits are lost because property rights are not there to guide incentives to achieve adequate internalization of externalities (ALCHIAN AND DEMSETZ, 1972).

Therefore, common property is presumed by many economists to be inefficient. There are three sources of inefficiency. One is rent dissipation, because no one owns the products of a resource until they are captured, and everyone engages in an unproductive race to capture these products before others do (GORDON, 1954). The second is the high transaction cost of enforcement if communal owners try to devise rules to reduce the externalities of their mutual overuse (ALCHIAN AND DEMSETZ, 1972). The third is low productivity, because no one has an incentive to work hard in order to increase one's private returns (NORTH, 1990; YANG, 1987).

3.4.1.2 The Property Rights School

The property rights school argues that private property is the most appropriate way to achieve a greater internalization of externalities (DEMSETZ, 1967). The incentive effect of a private property regime has long been recognized, as attested to by Lloyd: "The common reasons for the establishment of private property in land are deduced from the necessity of offering to individuals sufficient motives for cultivating the ground, and of preventing the wasteful destruction of the immature products of the Barth" (LLOYD, 1833 AS QUOTED IN BALAND AND PLATTEAT, 1996).

The ultimate superiority of private property rights has been expressed by POSNER (1980) as follows: the proper incentives for economic efficiency are created by the parceling out among the members of society of mutually exclusive rights to the exclusive use of particular resources. If every piece of land is owned by

someone, in the sense that there is always an individual who can exclude all others from access to any given area, then individuals will endeavor by cultivation or other improvements to maximize the value of land. The foregoing discussion suggests three criteria of an efficient system of property rights. The first is universality. Ideally, all resources should be owned by someone, except resources so plentiful that everybody can consume as much of them as he wants without reducing consumption by everyone else. The second criterion is exclusivity (BALAND AND PLATTEAU, 1996). The third criterion of an efficient system of property rights is transferability. If a property right cannot be transferred, there is no way of shifting a resource from a less productive to a more productive use through voluntary exchange. (POSNER, 1977 AS QUOTED IN BALAND AND PLATTEAT, 1996)

In short, they argue that private property rights should be established. The property rights school does not however limit itself to bringing out the static gains in efficiency which may be engendered by private property. It also makes the contention that the institution of private property will spontaneously emerge in reality whenever a cost-benefit comparison makes it appear as more desirable than any other system (BALAND AND PLATTEAT, 1994).

In short, efficiency considerations dominate the property rights school arguments. In this respect, private property rights are alleged to be superior. Furthermore, it is claimed that changes in property rights systematically achieve greater efficiency (Baland and Platteau, 1996).

The property rights school theory had been criticized by a number of writers. The Land Tenure Center (LTC) studies questioned for instance, whether formal tenure provided effectively greater security than customary land tenure system. The LTC concluded that the theory of property rights school ignored that the communal arrangements are characterized by multi-tenure systems with different land uses. Thus, individual tenures can exist under such systems and individuals or the proportion of lands held under relatively well-secured rights (MIGOT-ADHOLLA ET AL., 1994).

3.4.1.3 The Evolutionary Theory of Land Rights School

The evolutionary theory of land rights (ETLR) posits that customary land tenure systems, based on common property and extensive practices, are efficient when there is weak pressure on resources (BARNES AND CHILD, 2012). However, under pressure from population growth and the market, there is a gradual move towards individualization of rights and expansion of commercial transaction. The result of this inevitable process is the efficiency of resource allocation.

Property rights formalization, through imparting greater tenure security to landholders, leads to increased incentive to invest in the land, higher land values, more land transactions, and greater availability and use of credit. A dynamic land market, it is argued, will ensure that land is transferred into the hands of more efficient farmers and in the process will consolidate sub-economic land holdings into more viable units. Credit availability and longer investment horizons will improve land stewardship leading to more sustainable forms of development. Finally, property rights formalization will promote peace and harmony by clarifying property boundaries and conflicting interests (BARNES AND CHILD, 2012).

Briefly, this school perceives a gradual but unavoidable move away from common property to individual property rights. Therefore, the task of the Government consists of supporting a change that is under way (RANAIVOARISON, 2004). For this, there is a land titling program where land has become so scarce as to make it a source of strong competition (PLATTEAU, 1996).

Researchers criticized the ETLR mainly focus on its two shortcomings. First, it takes a distinctly western perspective of property rights which views land as a divisible commodity that is mostly held by individuals (BARNES AND CHILD, 2012). This is definitely not the case for land held under customary or indigenous tenure which is mostly held by communities. Proponents of the ETLR argue that it is just a matter of time before these tenures evolve to the privatized model that is predominant in the US and Europe (DE SOTO, 2000). BARNES AND CHILD (2012) acknowledge that customary and indigenous tenures are dynamic, but do not agree that these diverse forms of tenure will naturally converge into a homogeneous private individual system.

Secondly, efficiency and equity considerations are hardly separable in the ETLR. Empirical works in Sub-Saharan Africa shows that only one small part of a population can register their land (RANAIVOARISON, 2004). There is risk that land registration might be manipulated by the elites to turn it to their advantage. Consequently, the situation is characterized by the mistrust of State government and uncertainties surrounding loss of control over land. This problem of legitimacy of land titling leads in turn to high transaction costs, malfunctioning of land markets and other rural factors markets (PLATTEAU, 1996), which will further result in efficiency losses.

3.4.2 Property Rights and Agricultural Productivity

There are three distinct channels through which property rights may influence productivity and efficiency (FEDER AND FEENY, 1991). Property rights influence

productivity through their effect on investment incentives, the way land is allocated across households and use of land as collateral in credit markets.

3.4.2.1 Property Rights and Investment incentives

Property rights provide agents with incentive to use land efficiently and to invest in land conservation and improvement, which are likely to improve long-run productivity (FEDER AND FEENY, 1991). Policies that frequently reallocate land among households or prohibit permanent land bequests may undermine tenure security (BRANDT ET AL., 2002). Short-term tenures or uncertainty over the duration of tenure can lower the household's expected returns to its investment and reduce the optimal level of investment. By contrast, farmers with well-defined tenure rights will be more likely to invest in land saving, productivity-enhancing activities such as irrigation, drainage and terracing. They will also be more likely to convert land to higher-value uses or maintain soil fertility through practices such as the application of organic fertilizers (BRANDT ET AL., 2002; CHIRWA, 2008). The returns to these types of investment are usually insufficient to pay back the initial outlay in a single year but are distributed over a longer period. Freedom to rent out land also enhances investment incentives because it strengthens a household's future ability to capture the returns to its current investment in the land should it later opt not to farm the land (BESLAY, 1995).

Proponents of this viewpoint also argue that insecure rights over land use may discourage households from investing in labor-saving, productivity enhancing farm machinery and other capital goods. This type of investment is particularly important in areas where there are good off-farm opportunities. Insofar as there are technological possibilities for substituting capital for labor and experience elsewhere in Asia suggest that incomplete markets for renting farm machinery or weak incentives to invest may hamper the growth of land and labor productivity, and agricultural growth more generally (BRANDT ET AL., 2002).

Certain factors, however, can dampen the adverse effect of insecure tenure on long-term investment and reduce the imperative to solidify rights. If some supra-household organization, such as a village, makes the investment decisions, the negative impact of poor land rights could be mitigated (DONG, 2000). Indeed, many farm investments require coordination among households, and a collective organization that has its own resource base and/or ability to mobilize households could be effective in making fixed investments in the land (BRANDT ET AL., 2002).

3.4.2.2 Property Rights and Land Rental Markets

The development of land rental markets can enhance agricultural productivity and incomes by facilitating transfers of land to more productive farmers and facilitating the transfer of labor to the non -farm economy (DEININGER AND JIN, 2002; LOHMAR ET AL., 2001; KUNG, 2002; ZHANG ET AL., 2004). Clear property rights activate land rental markets by providing protection in state legislatures and thus facilitating land transfer. Additionally, the clarity increases the efficiency in resources allocation (BESLAY AND GHATAK, 2010).

In China, when productivity differentials exist among households in a village (i.e., when there is allocative or static inefficiency), a reallocation of land toward households with relatively more labor and a greater desire to work the land (i.e., households with a higher marginal productivity of land) and away from those with a lower marginal productivity should lead to higher overall output. This can be done administratively, as when local cadres reallocate land among households, or can occur in a decentralized way if farmers are able to rent their land to other households through local rental markets (BRANDT ET AL., 2002). In a transitional economy, however, where markets are underdeveloped, high transaction costs may limit the number of rentals, and in general, these constraints on rentals will affect productivity (GALIANI AND SCHARGRODSKY, 2010).

3.4.2.3 Property Rights and Credit Transactions

Proponents of land privatization argue that well-defined land rights provide small-scale farmers with a form of collateral that can assist the development of formal and informal rural credit markets. Financial institutions are not frequently willing to offer credit to farmers due to limited information about actual farming conditions and the risk involved. Giving loans against collateral is then the preferred manner in which formal credit institutions reduce uncertainty (HELTBERG, 2002). Land is an asset with a number of characteristics that make it appropriate for use as collateral. It is immobile and it cannot be stolen or destroyed. Consequently, it can remain in the possession of the borrower, to whom it yields a positive expected return (BISWANGER AND ROSENZWEIG, 1986).

Most farm households in China, like those in many other developing countries, are effectively excluded from formal channels of credit (PARK, 1999; LI ET AL., 2011). Although the use of rural land as collateral is not permitted, land can still provide a productive asset that farmers can invest in for their old age. Historically, elderly farmers have been able to maintain their consumption and incomes in old age by accumulating land earlier in life (BENJAMIN ET AL., 2000). As well as being a productive asset for farming, land plays a number of other roles in rural China.

Most importantly, farming provides jobs and security. When credit markets are poor and labor markets underdeveloped, access to land enables families, especially those who are poorer and less educated, to more effectively use their labor, which is often their most abundant resource (BRANDT ET AL., 2002). Moreover, when markets are unreliable and the transaction costs of buying and selling grain and other commodities are high, access to land can provide rural people with a cheap source of food (GILES, 1998).

3.4.3 Property Rights and Structure Change

The literature holds that secure property rights to land can facilitate structural transformation in two ways (BESLEY AND GHATAK, 2010). Increased tenure security and the associated reduction of expropriation risk will increase investment incentives. Formal documentation of rights, e.g. through certificates, makes it easier to unambiguously identify legitimate owners and thereby reduces the transaction cost of market-based land transfers. If other conditions -such as differences in productivity between producers because of availability of other sources of employment or a sufficiently liquid land sales market- are in place, this can facilitate either efficiency-enhancing land transfers to more productive users or use of land as collateral in credit markets (DEININGER AND FEDER, 2009). Adapting these principles to Chinese conditions, where use of rural land as collateral is not permitted, reallocations could threaten those moving out of agriculture, and coverage with certificates is uneven, allows us to derive testable hypotheses (DEININGER ET AL., 2012).

Regarding land reallocation, in China, the risk of dispossession for a resident cultivator who uses the land for agricultural purposes is low. This is one of the reasons why many studies find higher tenure security, defined as reduced probability of administrative reallocation, to have limited investment impact (JACOBY ET AL., 2002; LI ET AL., 1998). At the same time, the danger that renting out of land by somebody exiting agriculture could be perceived as a signal that the land is no longer required and could be transferred by administrative reallocation has long been identified as a potential challenge (BRANDT ET AL., 2004; YANG, 1997). Reallocation may thus discourage exit from the sector at the margin, consistent with findings that, where factor markets function reasonably well, such intervention significantly reduces technical efficiency (ZHANG ET AL., 2011).

Regarding transferability, measures to facilitate market-based land transfers, e.g. by increasing coverage with land certificates and outlawing reallocation have a potential to make a very positive contribution to the economy (CARTER AND YAO,

2002). Indeed, China witnessed rapid emergence of land rental markets which had hardly existed as late as by the mid-1990s (DEININGER AND JIN, 2005). In a situation where land loss by cultivators is unlikely and use of rural land as collateral not allowed, certificates or transferability could affect outcomes through two channels (DEININGER ET AL., 2012). First, by making contract enforcement easier, thus facilitating land transactions with individuals who are not close kin so that use of informal mechanisms for contract enforcement is not an option. Second is to reduce the fear of land loss even if land is transferred for longer periods, thus allowing use of long-term contracts that can make a more substantive contribution to structural transformation, e.g. by allowing tenants to make long-term plans and investment. Both of these can allow land users who might temporarily or permanently move out of the sector to earn higher and less risky returns from their land, thereby facilitating operation of factor markets and, if some of the proceeds are invested locally, creating the basis for a more vibrant rural economy (DEININGER ET AL., 2012).

3.5 Conceptual Framework of the Research

The objective of this study is to identify the determinant factors of household decisions regarding off-farm employment and land rental markets, especially the impact from land tenure arrangements, and evaluate the decision's influence on agriculture production. Based on the theories discussed in the previous sections, the conceptual framework is derived to present the linkage between research objectives and the empirical analysis procedures (Figure 3.5).

The study begins with the determinants of off-farm employment, particularly the impact from land tenure arrangements. This part of research seeks help from the New Economics of Labor Migration (NELM) to meet the objectives. In China, family ties are very strong and most decisions by household members are made jointly after consulting with household members. Off-farm labor allocation is an important household livelihood strategy and therefore the household should be the basic unit of analysis and not the individual. The NELM considers the household as the basic unit of analysis and migration is considered to be a household decision. Therefore, in this study the household characteristics are considered in analyzing the household off-farm employment decisions. Furthermore, unlike other theories of migration NELM does not imply that migration decisions are only the result of labor market conditions, that is wage or income opportunity differences, either actual or perceived, or market failures such as the insurance market, credit market etc., but also contribute to the household migration decision (STARK, 1991). Rural areas in China are constrained by a variety of market failures, such as land rental markets, credit markets and also the lack of social

security. Therefore, the NELM that considers these factors would be an appropriate theory for explaining the migration decision as well as off-farm employment decision of households.

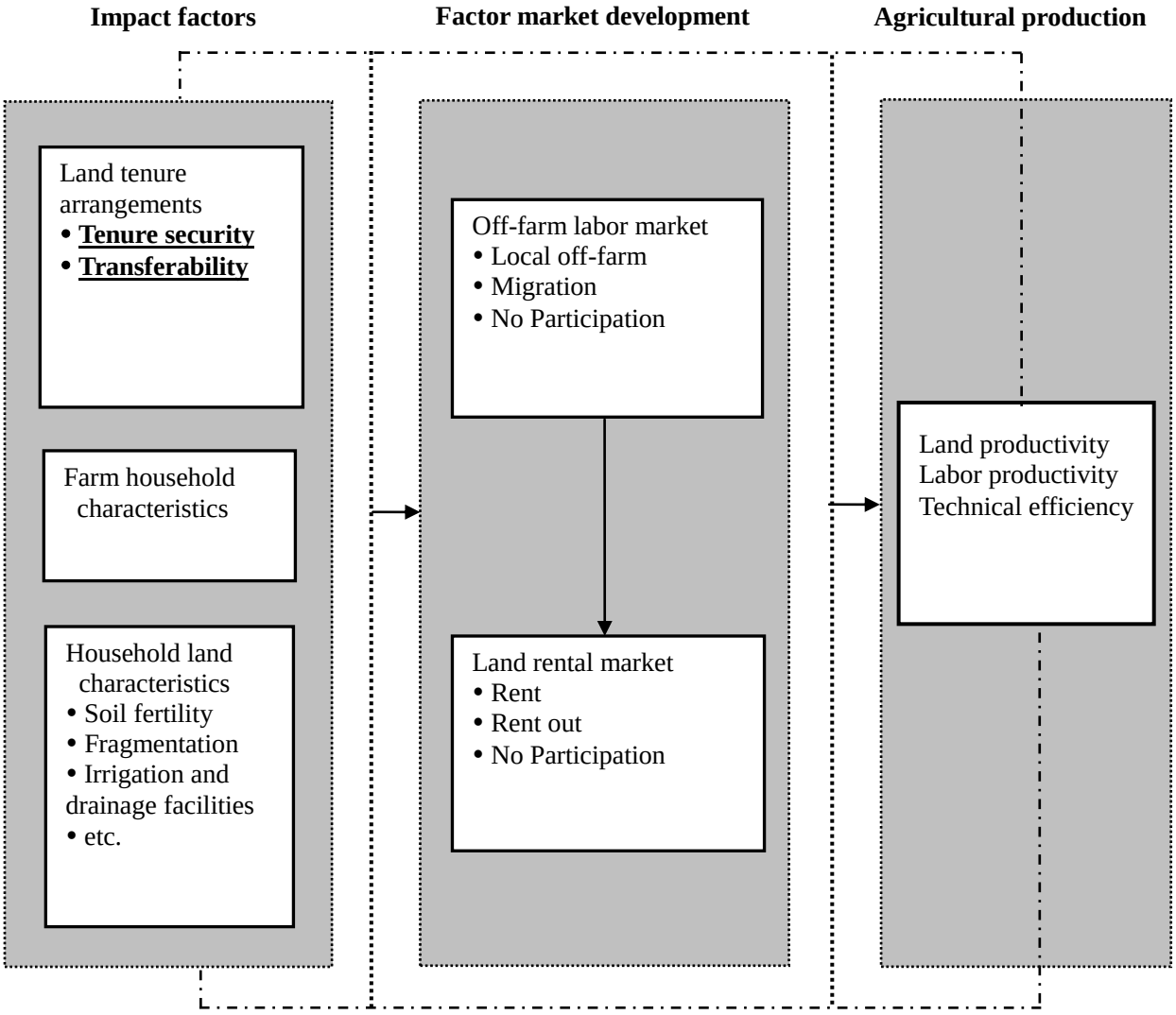


Figure 3.5: Conceptual framework of the study
Source: Own presentation

Liberalization of labor markets in China began as early as the start of economic reform. In contrast to the other factor markets, the land rental markets, have just emerged and are mainly constrained by communal property rights. Hence, the next step of this research is to analyze the households land rental market participation decision, in particularly, how land tenure arrangements and labor market participation impact the land rental market participation decision. This part of the study is theoretically based on the theory of the property rights school. Even though political considerations constrain the implementation of a system of rigorously enforced property rights, a compromise can be made such that a nationwide land registration program gives the farmers land-use rights with more official certificates, and extends the contract period. Therefore, with these

quasi-private property rights, the property rights school theory would be more suitable for this part of analysis.

When the analyses of the main factors markets are settled, the analysis of how the land tenure arrangements and participation in these markets affects household agricultural productivity will be carried out. This part of the research is based on the blending of all of the structural change, property rights and migration theories, and a detailed analysis is given in chapter 7.

4 DESCRIPTION OF FIELD STUDY

This chapter is divided into three distinct sections: the study area, research design and descriptive analysis results. The chapter begins with a detailed description of the study area and rationale for the choice of the study area, along with its location, topography, demographic features, land-use profile and a comparison between the three study regions. The second section provides detail on research design, sample size, sampling procedure, data collection and data processing. The third section presents descriptive results from the field study, including major household characteristics, resource endowments, land tenure-related variables, household market participation and crop production.

4.1 Description of the Study Area

Before proceeding to the detailed data collection issues and descriptive analysis, an effort is made to provide some background information such as geographic and socio-economic characteristics of the study area.

4.1.1 Selection of Study Area

China occupies much territory, but only about 15 percent of China's total land area can be cultivated. From the map of China's agricultural regions (figure 4.1), China's arable land is primarily in the eastern region. Henan province is located in the middle of this region. It ranks first in China in agriculture and grain production and second in arable land available, only after Heilongjiang province. Henan province plays an important role in China's economic development and social progress. Its grain production's fluctuation inevitably influences national grain security and even causes economic and social fluctuation (LI ET AL., 2012). Moreover, Henan has historically been one of the most highly-populated centers in China. It now is the most populated province in the nation that has a population of 104.89 million, living in 167 thousand square kilometers. Although, its population density rank second after Chongqing, it still stands, at 628 persons per square kilometer, almost four times the average national density (144 inhabitants/km^2) (NBS, 2012). In addition, compared to other regions, it has the smallest per capita land ratio, with 0.07 hectares per rural person (more than 14 persons per hectare).

Henan is also the number one source of labor migration. Due to its high labor-land ratio, and the improvement of agricultural mechanization, there are millions of surplus laborers in the agricultural sector. Since 1995, more than 3 million rural laborers have migrated out of Henan each year (ZHANG ET AL., 2008). During 2000 to 2008, the off-farm participation rate of agricultural labor in Henan

Province increased from 24.36 percent to 41.40 percent, which is higher than the national average (26.34 percent to 31.15 percent) (ZHU AND LIU, 2012).

As mentioned above, Henan is one of China's major grain-producing areas. As grain production is easily mechanized and suitable for large-scale operations, economies of scale achieved by increasing farm size through land rental markets will have a profound impact on regional economic development as well as national food security. In fact, land rental markets have been emerging since the late 1980s, however, after the mid-1990s, land rental activities started to expand. By the year 2010, transferred land area reached 782,000 hectares in Henan province, accounting for 12 percent of total cultivated land, and almost 7 times the land transfer area in 2001 (115,333 hectares), with an average increase of 74,000 hectares (MIAO, 2011).

The main purpose of this study is to explore the linkage between land tenure arrangements, factor markets (off-farm employment and land rental markets) development, and agricultural productivity. Even though Chinese authorities have implemented uniform land laws and policies, different village collectives have their own land institutions, such as different rules in land distribution, adjustment, and transfer, different timing of implementing land laws and policies, different durations of land contracts, etc. (FENG AND HEERINK, 2008). All of these variations allow us to use a model to investigate the impact of land tenure arrangements on off-farm employment, land rental markets and agricultural productivity. Henan's important position in China's agriculture and the development of both off-farm labor markets and land rental markets, make it the rational province to carry out this research.

4.1.2 General Information about Henan Province

Henan Province is located in the middle and lower reaches of the Yellow River of mid-eastern China (LI, ET AL., 2009). It is situated between110 °21'-116 °39' east longitude and 31 °23'-36 °23' north latitude, with higher altitude in the west and lower altitude in the east (LI, 2009). It is surrounded by four mountain ranges, the Taihang, Funiu, Tongbai and Dabie, which stand to its north, west and south. In its middle and eastern parts there is a vast fluvial plain created by the Yellow, Huaihe and Haihe rivers (ZHANG, ET AL., 2008). It borders Shaanxi, Shanxi, Hebei, Shandong, Anhui, and Hubei and has an area of 167,000 square kilometers, accounting for 1.74 percent of the national total (ZHANG, ET AL., 2008; LI, 2009). Its mountainous area comprises about 44,000 square kilometers, accounting for 26.6 percent of the provincial total. Hills cover around 30,000 square kilometers, taking up 17.7 percent of the total. Plains cover around 93,000 square kilometers,

55.7 percent of the provincial total (ZHANG, ET AL., 2008).

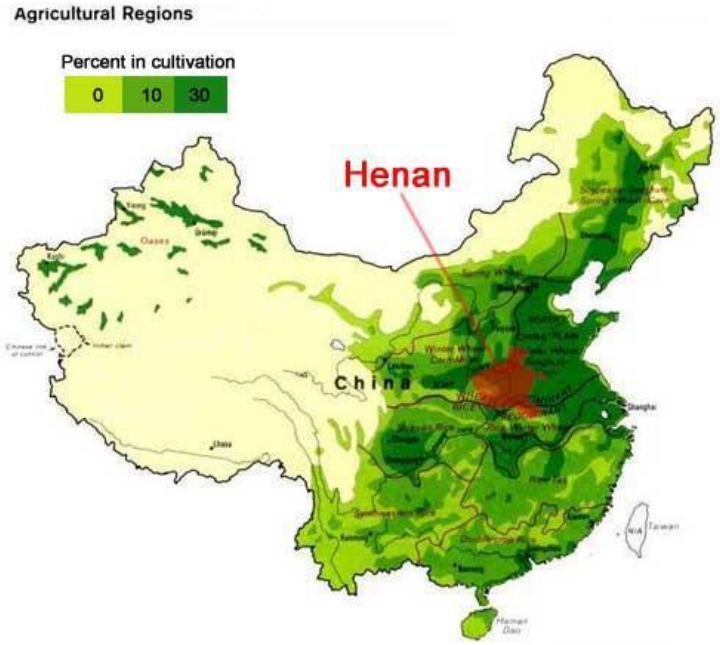


Figure 4.1: Map of China indicating percentage of cultivation

Figure 4.2: Map of Henan province
Source: http://www.maps-of-china.com

Henan Province is mostly warm temperate with a subtropical zone in the south belonging to the continental monsoon climate, Henan is a region of transition between subtropical and warm temperate zones (LI, 2009). It also has the

characteristics of transition from plain to hill and mountain topography from east to west with hot, rainy summers; dry, inclement winters and windy springs (ZHANG, ET AL., 2008; LI, 2009). The range of annual average temperature from north to south in Henan province is 13℃-15℃, annual average precipitation of 600-900 millimeters, annual average sunshine of 1848-2489 hours and an annual frost-free period of 189-240 days, which makes it suitable for the growth of many crops (ZHANG, ET AL., 2008; LI, 2009).

Henan is one of the cradles of China's agriculture. The development of agriculture in this province plays an important role in China. As one of the major agricultural product bases in China, the province teems with wheat, maize, rice, cotton, sesame, peanut, flue-cured tobacco and many other local products (ZHANG, ET AL., 2008). As one of the most important grain producing provinces in China, Henan has a variety of crops and complicated planting modes. Double-cropping of winter wheat and summer maize is the major planting mode in the province. The area and total output of the two crops and also the commodity grain provided each year rank among the top in China.

Henan is a semi-industrialized economy with an underdeveloped service sector. In 2011, Henan's nominal GDP was 3.20 trillion RMB (US$427 billion), making it the fifth largest economy in China, although it ranks nineteenth in terms of GDP per capita (NBS, 2012). The contributions of the agriculture, industry and service sectors are 5.2 percent, 64.8 percent and 30 percent respectively (HENAN STATISTIC YEARBOOK, 2012).

Directly under the jurisdiction of the provincial government are 18 cities and prefectures that govern 158 counties[3] and districts, and 1,892 towns (ZHANG, ET AL., 2008; LI, 2009). By the end of 2011, the province had 62.34 million rural residents, accounting for 59 percent of the total population (HENAN STATISTIC YEARBOOK, 2012).

4.1.3 Description of the Actual Study Area

4.1.3.1 Location and Physical Environment

This study focuses on the north of Henan Province. The climate in this area is classified as a semi-humid area in terms of agro-ecology, which also represents the semi-humid areas in western Henan Province, the Fenwei Plain and Low Coastal Plan in Northern China. The terrain is mostly low and hilly, where the soil is cinnamon and yellow-colored, and soil fertility is low (organic matter content is

[3] According to the administrative divisions of China, there are five practical levels of local government: the province, prefecture, county, township, and village (http://www.gov.cn).

1.43 percent) (WANG, ET AL., 2008). In terms of climatic conditions, light and heat resources are adequate, rainfall is unevenly distributed, and seasonal drought is distinctive. The main crops in this area include winter wheat, maize, sweet potato and miscellaneous grain crops. There is a large disparity in inter-annual grain output. The cropping systems include one harvest per year, three harvests in two years and double harvest. It is an important dry-farming area in China. The field survey was conducted in the three counties Mengzhou, Wenxian and Huaxian

4.1.3.2 Demographic Characteristics

The three counties under study differ in terms of demographic characteristics. According to the 2010 Sixth National population census, Huaxian had the greatest population, Mengzhou had the least, and Wenxian stood in-between. In contrast, Mengzhou had the highest proportion of population living in urban areas, Huaxian had the lowest percentage of urban population, where around 80 percent of the population lives in rural areas, and again Wenxian was in the middle. However, urbanization rates for the three counties are less than the provincial average of 40.6 percent, indicating that they are all agricultural counties. The population growth rates of the three counties are more or less similar to the province average of 0.5 percent, with the exception of Mengzhou, which is only at 0.42 percent. Wenxian is the most populated county among the three with a population density of 942 persons per square kilometer. Additionally, all of the three county population densities are higher than the provincial average. Details are presented in Table 4.1.

Table 4.1: Some demographic indicators of the study counties

Indicator	Mengzhou	Wenxian	Huaxian	Province
Population (million person)	0.37	0.43	1.339	104.89
Urban population (%)	37.93	35.96	20	40.6
Rural population (%)	62.07	64.07	80	59.4
Population growth rate (%)	0.416	0.517	0.499	0.50
Population density (persons per km^2.)	812	942	734	628
Households number (thousand hhs)	103	133	369	31020

Source: Henan Statistic Yearbook 2012.

4.1.3.3 Land Use and Crop Production

The three counties have different land endowments. Huaxian covers a large geographical area, cultivated land and sown areas are both almost more than twice that of the other two counties added together. Compared to Mengzhou and Huaxian, Wenxian has the highest percentage of irrigated land, more than 88

percent of its cultivated land having access to irrigation. This is high even compared to the other parts of Henan province.

Table 4.2: Land utilization in the study counties (1,000 hectares)

	Mengzhou	Wenxian	Huaxian	Province
Land	54.1	46.2	181.4	16700
Cultivated land	27.3	29.7	130	7926.4
Sown areas	53.9	53.5	258.8	14258.6
Irrigated land (% of cultivated land)	63.7	88.6	75	65

Source: Henan Statistic Yearbook 2012.

Details on land utilization are given in Figure 4.3. As mentioned earlier, Henan province is one of the nation's major grain producing provinces, with about 37 percent of the sown area cultivated with wheat, about 21 percent of the sown areas cultivated with maize. The percentages of sown area for wheat in the three counties are slightly higher than the province average, at 40 percent in Mengzhou, 39 percent in Wenxian, and 44 percent in Huaxian. Similar are the ratios of maize-sown areas, indicating that these three counties are the main grain-producing regions in the province.

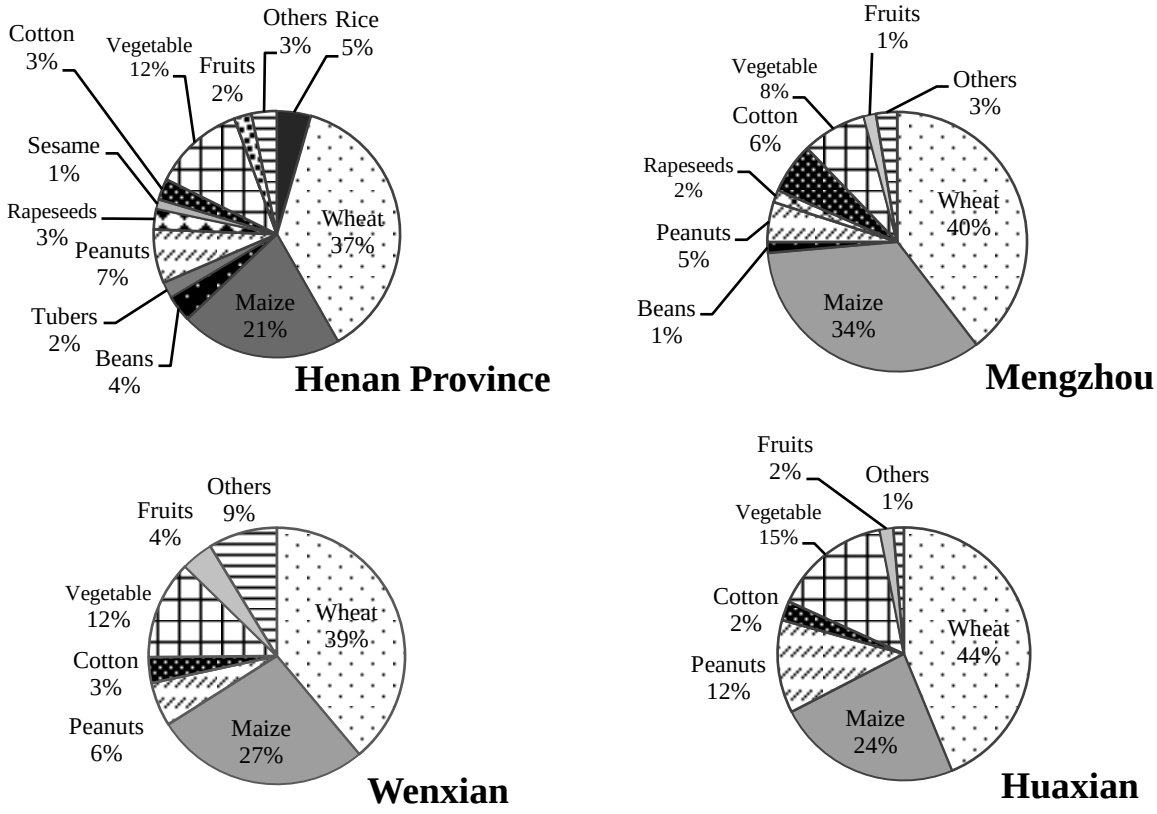


Figure 4.3: Percentage of sown areas by crop (2011).
Source: Henan Statistic Yearbook 2012.

Henan province is also a very important place for vegetable production. Area

sown with vegetables is 12 percent of total sown area in the province, the figure is exactly the same in Wenxian, while in Huaxian it is slightly higher, at 15 percent. Huaxian has the smallest sown area for vegetables, only 8 percent. The other agricultural crops include fruits, beans, rapeseed, cotton, peanuts, etc.

As can be seen in Table 4.3, the productivity of major crops in the three counties is all higher than the province average. Particularly, per hectare output for both wheat and maize in Wenxian is the highest among the three. Considering that land in Wenxian is relatively scarce; farmers probably use more variable inputs such as labor and chemical fertilizer to increase productivity. Further analysis regarding this will be carried out in chapter 7.

For other grain crops, Mengzhou has the highest per-hectare output of beans; Huaxian has the highest yield of tubers. Oil crops are another important crop in Henan province. Per-hectare output of peanuts in Wenxian is the highest among the three counties, while the highest yield of rapeseed is in Mengzhou, which is also the forerunner in per-hectare output of cotton. For vegetables and fruits production, Wenxian is again first, at around 1.5 times the provincial average yield.

Table 4.3: Yields of major farm crops by county in 2011(ton/ha)

Crops	Mengzhou	Wenxian	Huaxian	Province
Wheat	7.65	8.08	7.34	5.87
Maize	7.37	7.85	7.86	5.61
Beans	3.51	1.79	3.47	1.88
Tubers	8.25	7.53	9.25	4.66
Peanuts	4.60	4.80	4.50	4.25
Rapeseeds	3.01	2.80	2.13	2.02
Cotton	1.03	0.82	0.92	0.96
Vegetables	56.92	61.67	47.33	39.01

Source: Henan Statistic Yearbook 2012

4.2 Sampling Design

The research was initiated with an extensive review of the existing literature, to identify and specify the problem. Once the problem was identified, general and specific objectives were developed. Next, the data required to meet the objectives were identified and collected from various sources using various tools. The collected data was then analyzed and reported.

4.2.1 Sampling Procedures

The objective of sampling is to ensure a representative picture of the agricultural

households in the study area. In addition, the sample frame allows reasonable aggregation of the study analysis in order to control the driving force (regional patterns) and to isolate the true effects of land tenure arrangements. A multistage sampling procedure was used as presented in Figure 4.3.

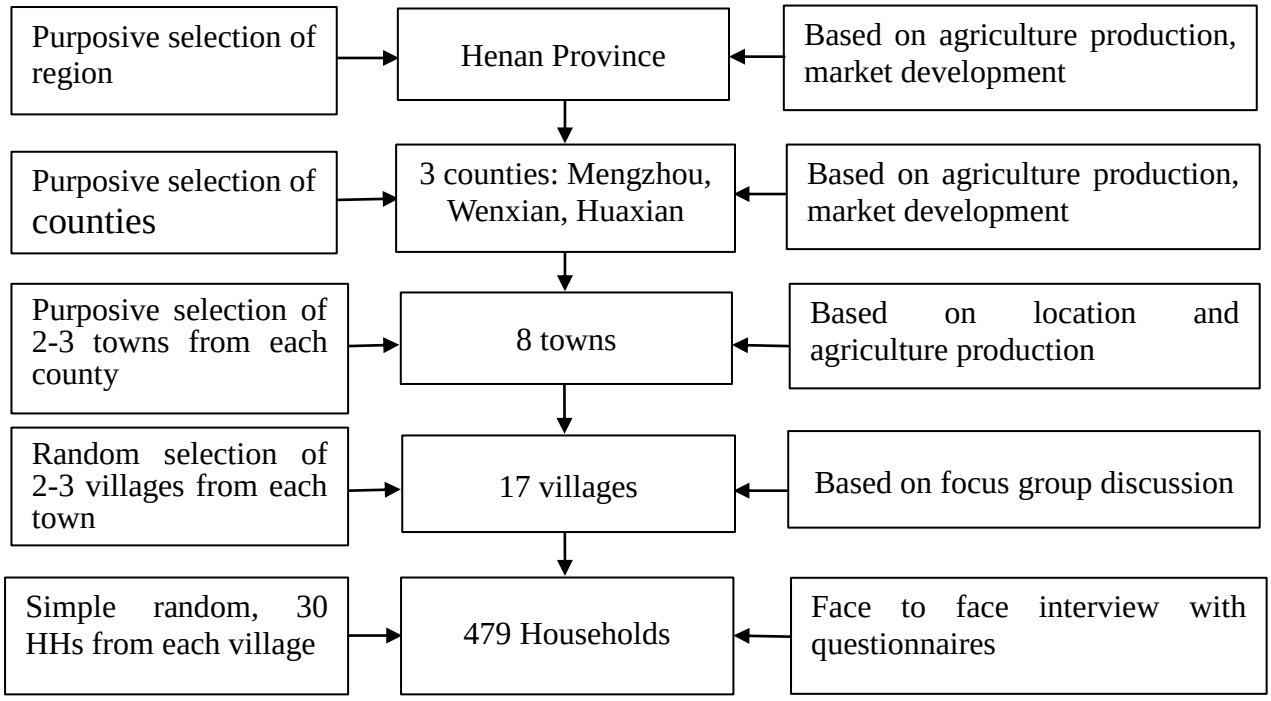


Figure 4.4: Multistage sampling procedure
Source: Own compilation

Initially Henan province was selected based on its agriculturally important position in China. Then later, three counties in north Henan were selected based on their agricultural production and economic development. In the next stage, three townships in Mengzhou and Huaxian and two townships in Wenxian were selected based upon economic development; and then two to three administrative villages in each township were chosen based on the outcome of group discussion. In each village 30 households were randomly chosen for interviews. In total, the sample size included eight townships, 17 villages, and 479 households.

Table 4.4: Sample distribution

County	Town	Village	Households
Mengzhou	3	6	178
Wenxian	2	5	155
Huaxian	3	6	146
Total	8	17	479

Source: Author's survey

4.2.2 Data Collection

4.2.2.1 Primary Data

To meet the objectives of the research both primary and secondary data were used. The primary data set were generally collected at two levels: village and household. The village level data were collected using group discussions; in which about 7-10 individuals consisting of township leaders, representative farmers, and related experts from local college (Henan Polytechnic University) were involved. Village level variables included institutions in the village, off-farm employment and land rental activity at the village level, market access, population density, and village resource endowment. Household level data were collect by structured questionnaire.

A standard questionnaire was administered, and most of the respondents were household heads, since the survey was conducted mainly in September to October, most of the household labor who engaged in off-farm activity had come back for harvest. In case the household heads were absent, their spouse replaced them. The interviews were conducted directly by the survey team, without interference from local officials, and the use of face-to-face methods ensured a high level of completeness and accuracy of the data. Household level data included variables like land tenure, agricultural production, household labor allocation including both local off-farm work and migration, and the demographic and economic characteristics of the household.

For in-depth information at the county level and other aspects of the research, small workshops, focus-group discussion and key information interviews were carried out. Additionally, consulting with government officers like the county Agriculture Bureau and Land Resource Bureau were also done.

4.2.2.2 Secondary Data

Secondary data were collected by reviewing the existing literature and from published and unpublished reports and documents from various organizations and government offices including the Statistics Bureau, Agriculture Department, Land Resource Department, and Labor Department of Henan Province and their subdivisions at both prefecture and county levels. This information consisted of statistics, reports and documents on agricultural production, labor out-migration, land transactions as well as related policies.

4.3 General Analytical Approach

The main purpose of this study is to analyze the relationships among land tenure

arrangements, off-farm employment, land rental market development, agricultural productivity and their determinants. The dependent variables analyzed in this study include off-farm labor market participation and its intensity, land rental market participation and transaction amount, land and labor productivity.

The selection of econometric tools was based on literature review and consideration of the theoretical framework. The research used various econometric tools covering both single regression as well as two-stage regression. These models basically take into account the nature of the dependent variables, dependence of error terms across equations (simultaneity problem), correlation of error terms to one or more independent variables in the models (endogeneity problem), and other econometric considerations (KETEMA, 2011).

Probit model, poisson model, and tobit model were used for analyzing the determinants of off-farm employment participation, off-farm employment labor allocation and their work duration. A double-hurdle model was used for identifying factors affecting land rental market participation and its transaction amount. Simple Ordinary Least Square (OLS) regression was used for investigating the impact of land tenure, off-farm employment and land rental participation on agriculture land and labor productivity. Finally, one-step Stochastic Frontier Production model was employed for examining the determinants of technical efficiency. Detailed specifications of these econometric models and their applications are explained in subsequent chapters of this study.

4.4 Field Study Results

This section explores the data with the aim of generating descriptive statistics. It begins with a description of selected socioeconomic characteristics of the survey households. The second section covers household-resource endowment. The third section presents land tenure related variables and their statistical features. The fourth section provides a descriptive analysis of household's market participation. The final section provides a general picture of agriculture production of surveyed households. The information presented in this section represents the empirical base for the econometric models in the next three chapters.

4.4.1 Household Demographic Characteristics

Different household-specific demographic characteristics are presented in this sub-section in order to get some insights into the main features of the sample households. As table 4.5 shows, the mean age of the household head in the total sample is 50.22 years. Mean age differences among Mengzhou, Wenxian and Huaxian are statistically significant examined in an ANOVA test. The average

age of household head ranges from 48.48 years in Wenxian to 52.98 years in Mengzhou, while the average age of household head in Huaxian was found to be 48.7 years.

Table 4.5: Demographic characteristics of households by county

Variables	County	Mean	S.D	F	Sig.
Age of HH head (yrs)	Mengzhou	52.98	10.36	9.99	0.000
	Wenxian	48.48	10.05		
	Huaxian	48.70	10.81		
	Total	50.22	10.60		
Education of HH head (yrs)	Mengzhou	7.36	2.09	1.42	0.244
	Wenxian	7.76	2.49		
	Huaxian	7.38	2.64		
	Total	7.49	2.40		
Household size (number)	Mengzhou	4.63	1.33	2.63	0.073
	Wenxian	4.91	1.23		
	Huaxian	4.59	1.43		
	Total	4.71	1.34		
Dependency ratio[1]	Mengzhou	0.21	0.19	0.45	0.638
	Wenxian	0.21	0.18		
	Huaxian	0.23	0.20		
	Total	0.21	0.19		

[1]The dependency ratio is defined as the number of household members below 16 and above 65 divided by household size.
Source: Field survey (2009)

The average education level of household heads ranges from around 7.4 years in Huaxian and Mengzhou to 7.7 years in Wenxian, thus the interregional difference is not substantial. The table further reveals that there are also significant variations among regions in terms of household size. A slightly higher average household size was observed in Wenxian followed by Mengzhou and Huaxian. The average dependency ratio of the three survey regions is almost the same; ANOVA test further confirmed that there is no significant difference.

4.4.2 Household Resource Endowment

4.4.2.1 Resource Endowment

Resource endowments of sample household are examined in this section. From descriptive analyses, it is evident that the differences between households in the three counties are clearly observable. Land is the most basic of all economic resources and hence crucial for the livelihoods of rural households in the study area and in China in general. Size of land holdings and fragmentation are both important determinants in reaping economic benefit out of land. It is widely recognized that fragmentation adversely affect agriculture productivity, since fragmented land needs more labor input (TAN ET AL., 2008), it also constrains mechnical implimentation and infrustruction construction such as irrigation and drainage facilities.

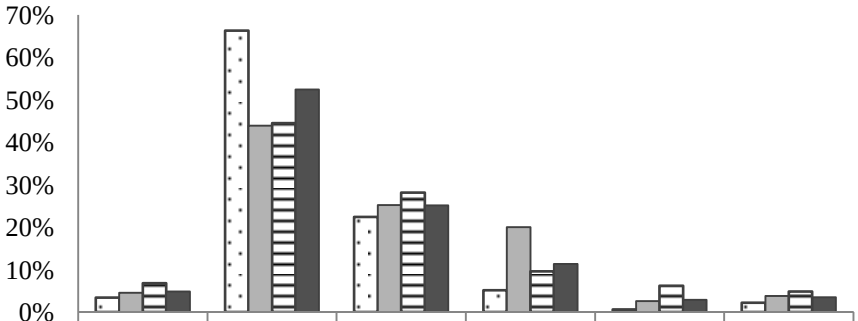
Table 4.6: Household resource endowment by county

Variables	County	Mean	S.D	F	Sig.
Farm size (mu)	Mengzhou	3.00	1.35	130.75	0.000
	Wenxian	2.62	0.98		
	Huaxian	5.93	3.03		
	Total	3.77	2.42		
Av. plot size (mu)	Mengzhou	2.32	1.28	59.03	0.000
	Wenxian	1.64	0.96		
	Huaxian	3.40	1.88		
	Total	2.43	1.57		
Labor (number)	Mengzhou	3.64	1.03	3.84	0.022
	Wenxian	3.82	1.02		
	Huaxian	3.48	1.15		
	Total	3.65	1.07		
Agricultural assets (number)	Mengzhou	0.77	1.86	5.69	0.004
	Wenxian	0.81	1.90		
	Huaxian	1.44	2.09		
	Total	0.99	1.97		

Source: Field survey (2009)

Household farm size in the study area is very small, moreover the land is highly fragmented. The average size of a land holding in the three counties is about 3.77 mu (0.25 hectare), where Huaxian has the largest average farm size of 5.39 mu (0.36 hectare) (Table 4.6). The average land holding in the study areas is generally less than the national average of about 0.5 hectares per household, indicating a very intense land scarcity problem in the survey region. In terms of average plot size, the average for all the three counties is about 2.43 mu (0.16 hectares) with a relative larger value of about 3.40 mu (0.22 hectares) for Huaxian. The Smallest average plot is found in Wenxian at only 1.65 mu (0.11 hectares) per plot.

In terms of plots operated by farmers in the three counties, a large proportion of farmers have two parcels (52.4 percent) followed by three parcels (25.1 percent) and four parcels (11.3 percent) as indicated in Figure 4.5. The result from Chi-square test suggests that the distribution of plot number varies substantially across regions. The percentage of households who have two parcels in Mengzhou is higher than in the other two counties. While the proportion of households in Wenxian who have more than four parcels is the highest among the three counties.



	one	two	three	four	five	six and more
Mengzhou	3.4%	66.3%	22.4%	5.1%	0.6%	2.2%
Wenxian	4.5%	43.9%	25.2%	20.0%	2.6%	3.8%
Huaxian	6.8%	44.5%	28.1%	9.6%	6.2%	4.8%
Total	4.8%	52.4%	25.1%	11.3%	2.9%	3.5%

Pearson Chi-square =48.701, df=14 and Asymp. Sig. (2-sided) 0.000
Figure 4.5: Distribution of households by the number of parcels
Source: Field survey (2009)

Labor is another important resource in agricultural production. Like in other developing countries, agriculture in China is highly labor intensive. The labor demand peaks during planting and harvesting seasons. The average labor endowment in the total sample is 3.65 laborers per household. From ANOVA test,

there is a statistically significant difference in the average labor resources among the three survey counties. As regards agricultural assets, which refer to the number of valuable production tools such as (draft) cattle, seeders, tractors, combines etc., the average number of such tools per household in the survey area is one. For households in Huaxian, the average number of assets is more than one, while for households in Wenxian and Mengzhou the average is less than one agriculture production tool. Again, the interregional differences in the three surveyed counties is substantial.

4.4.2.2 Household Perception of Irrigation Facilities and Soil Quality

In the survey, households were also asked about their perception of the irrigation and drainage facilities serving their contracted land, as well as the soil quality of the land they cultivated. For ranking purposes, a value range from one to four was used to demonstrate poor to very good irrigation and drainage systems and low to very high soil quality.

Table 4.7: Household perception of irrigation and drainage facilities

County	Rating of irrigation and drainage facilities				Total
	Poor	Medium	Good	Very good	
Mengzhou	50	54	58	16	178
	28.1%	30.3%	32.6%	9.0%	100%
Wenxian	44	48	48	15	155
	28.4%	31.0%	31.0%	9.7%	100%
Huaxian	35	64	41	6	146
	24.0%	43.8%	28.1%	4.1%	100%
Total	129	166	147	37	479
	26.9%	34.7%	30.7%	7.7%	100%

Pearson Chi-square=9.941, df=6 and Asymp. Sig. (2-sided) 0.127
Source: Field survey (2009)

Table 4.7 shows households' rating of the irrigation and drainage facilities serving their land. About one third of total households thought their land's irrigation infrastructure was medium, less than one third of households rated it good, about 27 percent of households consider their irrigation facilities as poor, only eight percent of households gave a high rating to their irrigation and drainage facilities. However, there is no statistically significant difference in irrigation rating across regions. Specifically, the distribution of ratings is more or less similar in all counties, a large number of households give a medium rating to their irrigation facilities. As mentioned in section 4.1.3, Wenxian has the highest percentage of irrigated land among the three counties, in this survey, around ten percent

households in Wenxian think highly of their irrigation and drainage facilities, while still 28.4 percent of households considered these facilities poor.

As regarding soil quality, less than half of the total households thought their soil was in medium condition, while another 39 percent household gave a good rating to their cultivated land, only 6.5 percent of households considered their soil quality very good (Table 4.8). Again, there is no significant difference in soil quality ratings across counties. The Majority of households consider the quality of their cultivated land's soil as medium to high. Comparing households across counties, ten percent of households in Huaxian rated their soil quality as very high, followed by Mengzhou, while only 4.2 percent households in Wenxian gave a very high rating to their soil quality.

Table 4.8: Household perception of soil quality

County	Rating of soil quality				Total
	Low	Medium	High	Very high	
Mengzhou (N=149)	13	62	65	9	149
	8.7%	41.6%	43.6%	6.0%	100%
Wenxian (N=119)	17	58	39	5	119
	14.3%	48.7%	32.8%	4.2%	100%
Huaxian (N=114)	7	53	43	11	114
	6.1%	46.5%	37.7%	9.6%	100%
Total (N=382)	37	173	147	25	382
	9.7%	45.3%	38.5%	6.5%	100%

Pearson Chi-square=9.799, df=6 and Asymp. Sig. (2-sided) 0.133
Source: Field survey (2009)

4.4.3 Land Tenure Arrangements Related Variables

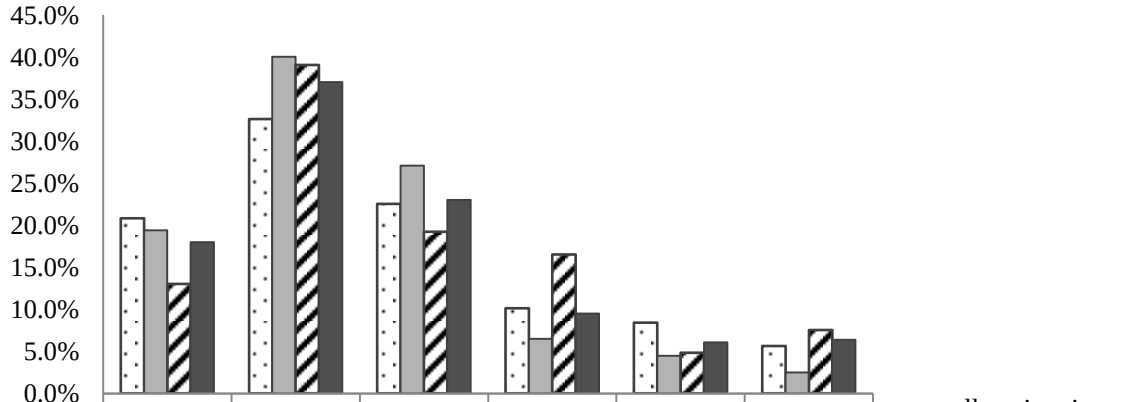
Based on the notion of tenure security and transferability as the main ways through which land tenure affects behavior, this study uses four variables to measure land tenure arrangements.

4.4.3.1 Land Tenure Security

Two variables were chosen to represent tenure security, the number of reallocations that had taken place in a village since the HRS was established and a household's expectation of land reallocation in the next few years. Under China's land tenure system, tenure security is largely determined by the frequency and magnitude of village-wide reallocations (ROZELLE ET AL., 2002). Therefore, the number of past reallocations was chosen as a proxy of tenure secure. Furthermore, since there is a risk that households in a village that had experienced a larger

number of reallocations in the past would likely expect frequent reallocation in the future, the first variable alone is not enough to capture the probability of reallocation. The second variable is assigned a value of one if the household thought there would be reallocation in the future, and otherwise a value of zero. This variable complements the first by accounting for household expectations of future reallocations.

Figure 4.6 presents the distribution of household by past reallocations. All of the households experienced at least one reallocation. To interpret this fact, recall that many villages experienced a reallocation around 1998 in the context of renewal of land use contracts that had expired after the first 15-year period following the HRS (DEININGER ET AL., 2012). A large percentage of households experienced at least two land reallocations, second-most common was three reallocations. According to Chi-square test, there is a statistically significant difference across counties concerning land reallocation frequency. The proportion of households that experienced more than two reallocations is highest in Huaxian, partly due to the birth rate there being relative higher, resulting in a more active demographic change.



	one	two	three	four	five	six and more
Mengzhou	20.8%	32.6%	22.5%	10.1%	8.4%	5.6%
Wenxian	19.4%	40.0%	27.1%	6.5%	4.5%	2.5%
Huaxian	13.0%	39.0%	19.2%	16.5%	4.8%	7.5%
Total	18.0%	37.0%	23.0%	9.5%	6.1%	6.4%

Pearson Chi-square=30.343, df=16 and Asymp. Sig. (2-sided) 0.016
Figure 4.6: Distribution of households by the number of land reallocations
Source: Field survey (2009)

Expectancy theory proposes that the motivation of behavior selection is determined by the expectation of the outcome (OLIVER, 1974). Therefore, famer expectations of future land reallocation are assumed to have a certain impact on household land and labor allocation through their off-farm employment and land

rental market participation behavior. As indicated in Table 4.9, households in Huaxian feel relatively more secure about their land use rights as compared to the other two regions. The highest percentage of households who expected further reallocation soon is in Mengzhou, followed by Wenxian.

Table 4.9: Household expectation of future land reallocation

County	Expectation of land reallocation		Total
	Yes	No	
Mengzhou	99	79	178
	55.6%	44.4%	100%
Wenxian	77	78	155
	49.7%	50.3%	100%
Huaxian	62	84	146
	42.5%	57.5%	100%
Total	238	241	479
	49.7%	50.3%	100%

Pearson Chi-square=5.550, df=14 and Asymp. Sig. (2-sided) 0.062
Source: Field survey (2009)

4.4.3.2 Land Transferability

The share of households with certificates in a village and land transfer rights possessed by a household are used to indicate household land transferability. According to land laws and regulations, a village collective should sign a written land contract with an individual household, and the township government should grant them a land-use certificate. However, in reality, different villages have different rules in implementing land laws and policies. According to DEININGER ET AL. (2012), formal documentation of rights, e.g. land certificates, makes it easier to unambiguously identify legitimate owners and thereby reduce the transaction cost of market-based land transfers. Households that possess land certificates find it easier to transfer their farmland. In the survey, households were also asked whether they had the right to transfer land. There were four choices, from one to four, respectively: land transfer is forbidden; land can be transferred within the village; land can be transferred outside the village with the permission from the village committee; land can be transferred freely to anyone.

Table 4.10 illustrates that only around one third of households confirmed that they had a land use certificate. An AVOVA test shows that although issuance of certificates has progressed more uniformly, there is still variation in land certificate issuance, in contrast to variable levels of compliance with policies to stop land reallocations.

Table 4.10: Village level shares of land certificate (%)

County	Mean	S.D	F	Sig.
Mengzhou	40.11	0.33	11.99	0.00
Wenxian	34.77	0.85		
Huaxian	38.59	1.14		
Total	37.92	0.47		

Source: Field survey (2009)

Table 4.11 shows household land transfer rights in the survey region. For around six percent of households in the total sample, land-use rights transfer are forbidden. Up to 27 percent of households can only transfer their land within the village. Another 39 percent of households have the right to rent out their land to anyone if they get permission from their village committee. Only 28 percent of households have the right to rent out their land to anybody they want. These results indicate that even with the guarantee of the RLCL for the free transfer of land use rights, there is still village or local government intervention on household land rental behavior.

Table 4.11: Household land transfer rights

County	whether households have the right to transfer land				Total
	forbidden	within village	with permission	freely	
Mengzhou	6	25	98	49	178
	3.4%	14.0%	55.1%	27.5%	100%
Wenxian	5	64	48	38	155
	3.2%	41.3%	31.0%	24.5%	100%
Huaxian	16	39	42	49	146
	11.0%	26.7%	28.8%	33.6%	100%
Total	27	128	188	136	479
	5.6%	26.7%	39.2%	28.4%	100%

Pearson Chi-square=53.940, df=6 and Asymp. Sig. (2-sided) 0.000
Source: Field survey (2009)

Moreover, from the Chi-square test, it can be learned that the variation of intervention across counties is significant at the one percent level. Households in Mengzhou have freer land transfer rights, since the proportion of households who are forbidden to rent out their land is only six percent, the percentage of households who have free land transfer rights is also relatively high and a large number of households fall into the category of being able to rent out their land on the condition of getting permission from their village committee. A large

percentage of households in Wenxian only get the right to transfer their land to farmers in the same village. The situation is divergent in Huaxian. The percentages of households who are forbidden to rent out land and who can freely rent out land are both the highest of the three counties. The divergence of these land tenure-related variables allows the opportunity to analyze the impact on household market participation and production behavior.

4.4.4 Household Market Participation

This section provides a descriptive profile of market participation in the survey areas. Household participation in markets covers off-farm labor market participation, land rental market participation, and agricultural products market participation and their statistical features.

4.4.4.1 Off-farm Employment Participation

Local off-farm employment and migration are the two basic off-farm employment categories. Their impact on household incomes and the village economy may differ substantially, because migrants live apart from other household members and spend a large share of their earnings outside the village. Local off-farm employment includes farm hiring employment, non-agricultural wage employment, and self-employment (SHI, 2007). Participation in off-farm employment in the three surveyed villages in 2008 is presented in Table 4.12.

Table 4.12: Off-farm labor market participation by county in 2008

County	Off-farm employment participation				No participation
	migration	local	both[1]	off-farm[2]	
Mengzhou	99	152	85	166	12[3]
	55.6%	85.4%	47.8%	93.3%	6.7%[4]
Wenxian	102	132	85	149	6
	65.8%	85.2%	54.8%	96.1%	3.9
Huaxian	88	109	67	131	15
	60.3%	74.7%	45.9%	89.7%	10.3%
Pearson Chi-square	3.594	7.786	2.746	4.815	
df	2	2	2	2	
Asymp. Sig.	0.166	0.020	0.253	0.090	
Total	289	393	237	446	33
	60.3%	82.1%	49.5%	93.1%	6.9%

Notes: [1] households participate in both migration and local off-farm activities; [2] households take part in either migration or local off-farm activities; [3] number of households participate in each activities; [4] percentage of households participate in each activities to the total households.
Source: Field survey (2009)

Up to 93 percent of surveyed households participated in off-farm employment in 2008. Of all the sample households in the three counties, 82 percent participated in local off-farm employment and 60 percent in migration, half of them engaged in both local off-farm work and migration. The Chi-square test shows that there is no substantial variation in migration across counties, while the difference of participation in local off-farm employment across regions is statistically significant. As much as 85 percent of farm households participated in local off-farm work in both Mengzhou and Wenxian, where per capita farmland resources are scarce while market access is good. The overall participation in off-farm employment is also much higher in these two counties (93 percent and 96 percent respectively) than in Huaxian (89 percent).

4.4.4.2 Land Rental Market Participation

A summary of household land rental participation is provided in Table 4.13. In 2009, among the 479 households included in our dataset, 152 households (or 32 percent of the sample households) rent land, while 90 households (or 19 percent) rented-out land, indicating that the land rental market is active in the study area. By looking at renting of land, Mengzhou has the highest land renting rate of 38 percent, followed by Huaxian, where 34 percent of sample households rent land, while Wenxian has the lowest land renting rate, 22 percent. Concerning renting-out land, about 21 percent of households in Wenxian rented-out land, followed by Huaxian with 21 percent and Mengzhou with 15 percent.

Table 4.13: Land rental market participation by county in 2009

county	Land rental participation		No participation	Total
	Rent-in	Rent-out		
Mengzhou	61	27	90	178
	34.3%	15.2%	50.5%	100%
Wenxian	35	33	87	156
	22.6%	21.3%	56.1%	100%
Huaxian	56	30	60	146
	38.4%	20.5%	41.1%	100%
Total	152	90	237	479
	31.7%	18.8%	49.5%	100%

Pearson Chi-square=11.716, df=4 and Asymp. Sig. (2-sided) 0.020
Source: Field survey (2009)

Compared to the high land renting rate, the land renting-out rate is low, possibly indicating that rural households that had migrated out of the village were not covered in the sample. These households still hold land-use rights in the villages from which they migrated, but have generally rented their land out to other

households (TU, HEERINK AND LI, 2006). The reason why more households in Huaxian rent land is that the average farm size is larger in this county, agricultural incomes are a large part of total income, thus households have more motivation to rent farm land to increase their farm size. In contrast, the status of economic development in Mengzhou and Wenxian is better, households more easily find off-farm employment and therefore have more reason to rent-out their land.

Table 4.14 describes the percentage of households' intentions to participate in land rental markets. The potential land rent demand is larger than rent-out supply; 43 percent of households in the sample want to rent land, while only 26 percent of households have the intention to rent-out land, the other 30 percent of households do not want to participate. Among the study areas, there is no significant difference in the proportion of household's land rental intention. Generally, there are more households who want to rent land than households who want to rent-out land, indicating a certain gap between the potential demand and potential supply.

Table 4.14: Household perceptions of land rental markets participation

	Mengzhou	Wenxian	Huaxian	Total
Share of HH wanting to rent land (%)	40.6	44.1	50.3	43.3
Share of HH wanting to rent-out land (%)	27.2	27.7	21.4	26.4
Share of HH not wanting to rent land (%)	32.1	28.2	28.4	30.3
Total	100	100	100	100

Pearson Chi-square=1.970, df=4 and Asymp. Sig. (2-sided) 0.741
Source: Field survey (2009)

Even for households very willing to rent land, the reality is that there are many obstacles constraining the realization of their land rental intentions. Table 4.15 lists several main obstacles confronted by households in the study area. The two main reasons are "to their knowledge, no households want to rent-out land" and "they do not know who wants to rent-out land", 58.9 percent of households chose the former and 28.8 percent households chose the latter. Households in Huaxian consider these the two main reasons at 71.2 percent and 46.2 percent respectively. This further confirms the previous conclusion that land rental demand is far greater than land rental supply.

Moreover, the remaining 25.2 and 12.3 percent of respondents consider the control at the village level and high rental prices things that make it difficult to transfer land. Although land transfer is permitted by RLCL, the reality is that despite local governments undertaking extensive dissemination of information about the law, only a few village leaders were aware that land transfers were permitted (DEININGER ET AL., 2007). Land transfer is subject to notification of village leaders. In some village, the leaders still strongly control land rental

between households. In Mengzhou, 31.3 percent of farmers think village-level constraints are one of the obstacles.

The other seven percent of farmers regard "too much trouble negotiating with other households" as a constraint. Lack of information regarding who wants to rent-out land and the difficulty in negotiation both increase the transaction costs of land transfer. That is why 1.9 percent of households prefer to wait for adjustment by the village committee. Finally, 3.3 percent of the sample households consider the renting time too short to make any profit. This finding is consistent with DEININGER AND JIN (2007), they find that contracts remain informal and unwritten, and are frequently made with relatives seasonally or annually.

Table 4.15: Percentages in household perceptions of obstacles to rent land

	Mengzhou	Wenxian	Huaxian	Total
No HH want to rent-out land	52.0	63	71.2	58.9
Do not know who wants to rent-out land	25.3	25	46.2	28.8
Village constraints	31.3	25	7.7	25.2
High rental prices	16.0	12	1.9	12.3
Too much trouble negotiating with other HH	9.3	6	1.9	7.0
Renting time is too short to make any profit	4.7	2	1.9	3.3
Waiting for adjustment by the village	7.0	9.3	6	1.9

Source: Field survey (2009)

4.4.4.3 Agricultural Product Market Participation

As FRANK ELLIS (1993) stated, famers are not wholly and inextricably linked to the market economy. Their main factors of production, land and family labor, are not purchased in the market, and often only a proportion of their output is sold in the market. In order to measure farmer participation in agricultural product markets, this study uses the ratio of sold output to total output as a proxy. Table 4.16 illustrates household agricultural product market participation. On average, households sell up to 70 percent of total products. While this variable is significantly different at the one percent level across regions. Households in Huaxian are more active in product markets, since an average of 86 percent of household products are sold, followed by Mengzhou, while households in Wenxian are the least active participants. The possible reason that the share of sold output to total output is very low in Wenxian is that households in Wenxian possess the smallest per household farm size among the three counties, most of their output is consumed by family members so there is not so much to sell for

cash income.

Table 4.16: Shares of sold agricultural products to total products (%)

County	Mean	S.D	F	Sig.
Mengzhou (N=149)	0.697	0.016	64.690	0.000
Wenxian (N=119)	0.554	0.022		
Huaxian (N=114)	0.856	0.014		
Total (N=382)	0.700	0.012		

Source: Field survey (2009)

4.4.5 Crop Production

The dominant cropping pattern in the study area is double cropping of winter wheat and summer maize. Every year in June, right after the harvesting of wheat, farmers start to plant summer maize, and from June to September is the growing season for maize, then after the harvesting of maize, it is time to plant wheat. Frequent spring drought during the wheat growing season requires additional irrigation to achieve a high yield. While the summer maize growing season is during the rainy season in the study area, the farmers usually irrigate the land before sowing to maintain soil moisture.

Omitting 90 households who rented out their land, as well as households whose farms were too small, 382 households were left for production analysis. Table 4.17 presents the average yield of wheat and maize achieved by households. On average, the yield levels of wheat and maize production is about 478 kg per mu (7.15 tons per hectare) and 487 kg per mu (7.3 tons per hectare) for all households. Specifically, for wheat production, the highest average yield level is achieved by households in Mengzhou, followed by households in Huaxian, while households in Wenxian have the lowest average wheat yield. By contrast, households in Huaxian are first in maize production, while households in Mengzhou rank next and households in Wenxian obtain the lowest average yield also with maize. The results from ANOVA test show that the difference is significant at the one percent level.

As regards inputs of agricultural production in the survey region, labor demand usually peaks during planting and harvesting seasons, such as mid-May to the end of June and mid-September to the end of October. The seasonality of the agricultural sector makes labor demand seasonal as well. However, rural China typically faces the problem of underemployment. As mentioned in the previous section, large amounts of surplus labor work in the non-agricultural sector, having either migrated to the country’s coastal region or provincial capital city, or

pursuing local off-farm work. For those engaged in local off-farm employment, part-time farming is common; they often go back to the family farm during the peak season.

Table 4.17: Yields of wheat and maize by county in 2009 (kg/mu)

County	Wheat		F	Sig.	Maize		F	Sig
	Mean	S.D			Mean	S.D		
Mengzhou (N=149)	499.39	46.73	28.44	0.00	492.59	56.64	17.46	0.00
Wenxian (N=119)	454.06	54.76			462.38	61.48		
Huaxian (N=114)	473.79	46.53			506.79	59.22		
Total (N=382)	477.63	52.75			487.42	61.44		

Source: Field survey (2009)

The average amounts of various farm inputs are reported in Table 4.18. According to ANOVA test, there is a significant difference in input use between the three counties. In Wenxian, households used the most labor days among the three counties, 10.5 days per mu, followed by Mengzhou at 8.6 days per mu, while households in Huaxian have the lowest labor input per unit of cultivated land which is only 6.6 days.

The average seed cost of all three counties is 29.6 Yuan per mu. For households in Mengzhou and Wenxian, average seed input was 29.6 and 28.8 Yuan respectively, while households in Huaxian used slightly more seed per mu, this is partially due to the fact that households in Huaxian use different seed varieties with a relative higher price.

The average unit of herbicides and pesticides input use varies from county to county. As can be seen in Table 4.18, households in Mengzhou used the most herbicides and pesticides per unit of land, followed by Wenxian and Huaxian. In terms of average chemical fertilizer use per unit of land, it is again low for households in Huaxian, only 128.73 Yuan, while households in Mengzhou use the greatest value of fertilizer among the three (around 164 Yuan per mu).

For wheat and maize, sowing, plowing and tilling with machines are quite common in the study area. Mechanization in wheat harvesting is also popular, whereas harvesting of maize is still highly dependent on manual labor. Table 4.18 also shows that the average cost of machinery use ranges from 24.15 Yuan per mu in Huaxian to 39.64 Yuan per mu in Mengzhou. Wenxian stands in between at 29.31 Yuan per mu. The higher input levels of pesticides, fertilizers and machinery is the reason that households in Mengzhou obtain the higher yields in both wheat and maize production.

Table 4.18: Input use per unit of cultivated land by sample households

Variables	County	Mean	S.D	F	Sig.
Labor (day/mu)	Mengzhou	8.61	3.28	27.38	0.000
	Wenxian	10.50	5.60		
	Huaxian	6.60	2.69		
	Total	8.60	4.28		
Seed (Yuan/mu)	Mengzhou	29.55	13.83	0.67	0.515
	Wenxian	28.81	10.17		
	Huaxian	30.60	10.70		
	Total	29.63	11.86		
Pesticides (Yuan/mu)	Mengzhou	34.45	19.26	5.64	0.004
	Wenxian	28.53	15.41		
	Huaxian	28.18	16.49		
	Total	30.73	17.53		
Fertilizer (Yuan/mu)	Mengzhou	154.70	48.19	4.04	0.018
	Wenxian	146.38	51.94		
	Huaxian	137.99	40.85		
	Total	147.12	47.75		
Machinery (Yuan/mu)	Mengzhou	40.69	15.06	37.45	0.000
	Wenxian	29.31	10.29		
	Huaxian	29.01	11.56		
	Total	33.66	13.86		
Irrigation (Yuan/mu)	Mengzhou	33.27	18.15	6.39	0.002
	Wenxian	40.87	19.04		
	Huaxian	35.10	15.60		
	Total	36.18	17.97		

Source: Field survey (2009)

As mentioned above, irrigation is important for both wheat and maize production. Table 4.18 shows that households in Wenxian paid the most for irrigation, at 40.87 Yuan per mu, while households in Huaxian paid the least (33.67 Yuan per mu), whereas households in Mengzhou on the average spent 34.20 Yuan per mu of land.

4.5 Summary

This study was conducted in Henan province across three counties, namely Mengzhou, Huaxian and Wenxian. These regions differ not only in location and topography, but also in demographic features, land use profiles and crop production. Using multistage sampling techniques, data were collected from 479 randomly selected farm households in 2009. A structured questionnaire was administered to household heads or their spouses. Key informant interviews and observation were also used to gather primary data. Secondary sources completed the procurement of pertinent information.

The descriptive analysis gives an overview of the characteristics of the sampled households, their resource endowments, markets participation behavior and crop production. The analysis and discussion presented in the previous sections suggest that there are active off-farm labor markets and land rental markets in the study area; however, households still face obstacles to transferring their land.

A closer look into the descriptive statistics shows that the average size of sample households is 4.7, with a dependency ratio of 0.21. More than 90 percent of sample households operate a relatively small area of land, less than 0.5 hectares. As far as crop production is concerned, the study area exhibited yields above national averages in wheat and maize production. The descriptive statistics of input analysis shows these high yields a result of intensive use of fertilizers, pesticides and mechanical power. There is a significant difference in land tenure-related variables among counties. This variation of former reallocations, expectations of future reallocation, share of certificates at the village level, as well as household land transfer rights across regions allow us to use econometric tools to measure their impact on household market participation and production in the next three chapters.

5 LAND TENURE AND OFF-FARM LABOR MARKETS DEVELOPMENT

Given the scarce land resources and surplus labor of rural households in China, working off-farm is an important livelihood strategy of rural households. As explained in previous chapters, more and more farm households are becoming involved in off-farm employment. However, migration of rural labor is still constrained to some extent by institutional and other related factors, while local non-farm employment opportunities differ greatly between regions (SHI, 2007). China has the world's largest rural population and the most unique land tenure system. Experts believe that the only way to solve Chinese rural problems is to transfer most of the 657 million rural residents (almost 49 percent of total population) to urban areas (LI AND YAO, 2001). With the easing of the household registration (Hukou) system and reduction of the disparities between rural and urban areas, the importance of the influence by the current land tenure system on migration has emerged (MULLAN ET AL., 2011).

5.1 Introduction

The development of off-farm employment plays an important role in improving agricultural productivity and rural household incomes (OECD, 2005; REARDON ET AL., 2001; ROZELLE ET AL., 1999a; TAYLOR ET AL., 2003; WOUTERSE, 2006). The emergence of a labor market in China is the result of economic reforms (FENG AND HEERINK, 2008). In the past, off-farm employment was constrained by the household registration system (Hukou). Since the mid-1980s, however, it has become a significant phenomenon in rural China. Of China's more than 500 million-strong rural labor force, 265 million people were estimated to have off-farm employment in the mid-2000s (ZHANG ET AL., 2008). Local off-farm employment and migration are the two basic off-farm employment categories. In other developing countries, permanent rural-urban migration is very common during economic development (TODARO, 1969; COLE AND SANDERS, 1986). However, Chinese farmers normally engage in temporary jobs in cities, and move back and forth between home villages and destination areas. Besides, a vast number of rural labors have found local employment in nonagricultural activities.

The unique labor and land system in China is the main reason for this distinct pattern of rural labor mobility. The Hukou System, which was originally established to prohibit rural labor migration, has been gradually relaxed, but still restricts migrant labor access to public healthcare, pension systems, legal aid, social services, etc. (ZHAN, 2005). Therefore, the land of the migrants at their original home often acts as a safety net when they lose their job or get old. On the

other hand, land tenure arrangements characterized by small farm size and frequent reallocation due to the egalitarian distribution principle, make it risky to migrate for a long time because migrants may lose their land in the next session of land reallocation. While pursuing local off-farm jobs, farmers can still stay in the village and partially engage in farm activities, they can enjoy the increase of their income while avoiding the risk of losing their land. Thus, studying the effects of land arrangements on rural labor mobility can provide theoretical and practical support for building relevant systems and policies to promote the efficient use of both land and labor resources which are vital to China's further economic development.

This chapter focuses on the effects of the rural land tenure system on off-farm labor market development. Section 2 begins by reviewing literature on the impacts of land tenure arrangements on off-farm employment. The subsequent section presents the analytical framework and describes the variables while section 4 presents the econometric results. Finally, section 5 summarizes this chapter with policy messages arising from the discussion of the results.

5.2 The Role of Land and Off-Farm Labor Markets

5.2.1 Farm Size and Off-farm Labor Markets

VENWEY (2005) develops four perspectives on the way land might influence the decisions of rural household members regarding migration. Three of them are suitable in the context of China. Land represents a source of wealth that can provide the initial financial support for migration (VENWEY, 2005; LI AND YAO, 2001). Alternatively, land can be considered as a source of employment. The more land owned by a given household, the more members can be employed in the home community (VENWEY, 2005). As another alternative, land can be considered as an investment opportunity (VENWEY, 2003; 2005).

Land can be considered simply as another form of wealth, enabling household members to pay for expensive or risky migrations. In the current context of China, migration is characterized by a fair number of risks. The first one is the risk of not finding a job, or of losing the job after finding it. Following the 2008 downturn in the global economy, more than 49 million rural migrants, 17.6 percent of those employed in the off-farm employment sector in September 2008, were laid off from factories and returned to their home villages between October 2008 and April 2009 (HUANG ET AL., 2011). The second type of risk is the existence of a high incidence of wage arrears and non-payment of migrants (LI ANDYAO, 2001). Added to these risks are the substantial fixed costs involved in migration, such as the costs of transportation, accommodation, and job search. As long as households

do not have the right to sell land in China, the extent to which land can be used to finance migration or used as collateral for obtaining credit is limited. However, the accumulation of several years' income generated on the land is sufficient to finance the fixed costs of temporary migration (LI ANDYAO, 2001). Because the wages earned by migrants are much higher than agricultural earnings, the investment is worthwhile. As described above, wealthier households are able to bear the costs of migration and more likely to have migrants, leading to a positive effect of amount of land on migration.

Land is also a place to work, providing employment opportunity. The amount of land possessed by a household determines the demand for labor inputs. China's population recently reached 1.3 billion, with about 49 percent of them still living in rural areas. The average size of landholdings is only around 0.5 hectares per family (NBS, 2011), and normally cannot fully employ a family's labor force (FENG AND HEERINK, 2008). Controlling for other employment opportunities, as farm size increases, its ability to absorb more labor increases (VANWEY, 2005). This subsequently decreases migration and other off-farm activities. Considering land in this way, we expect a generally negative relationship between farm size and off-farm employment.

Land represents the household-level opportunity for productive investment. Increasing the productivity of land in many areas depends on the households' investment ability, e.g. purchasing of fertilizer, herbicides, and high-yielding seeds etc. These require a large amount of capital that is often inaccessible in rural areas of developing countries. The cash income from off-farm employment can be a crucial enabler of production investment (SHI, 2007). Following this line of argument, the size of the landholding will have a positive effect on off-farm employment. It is important to point out here that these sorts of productive investments exhibit economies of scale (VENWEY, 2005). Larger returns to investment are realized on larger pieces of land. This curvilinear effect shows the highest probabilities of off-farm employment for members of households with small or large farm size and the lowest probabilities of migration for members of households with medium farm size (VENWEY, 2003; 2005).

Previous work on the relationship between farm size and off-farm employment shows mixed results. Studies in many contexts show a negative effect of farm size on migration. TAYLOR AND YUNEZ-NAUDE (2000) found landholding had a negative relationship with internal migration within Mexico, while had no significant effect on Mexico-to-U.S migration. A one-hectare increase in landholding is associated with a 1.5 percent decrease in the likelihood of internal Mexico migration. By investigating the determinants of rural to urban migration in

Bangladesh, KUHN (2005) concluded that the likelihood of both family and individual migration drops with larger land holdings. VENWEY (2003) had similar findings in Nang Rong, Thailand. However, other studies have found a positive relationship between farm size and migration. OLOWAAND AWOYEMI's (2012) findings showed that land size is positively and significantly associated with internal migration in Nigeria, with a one hectare increase of land size increasing the probability of internal migration by 0.32 percent.

Furthermore, several studies found that farm size had a curvilinear effect on migration. BHANDARI (2004) found that Nepalese households with medium-sized farms were more likely to have their members migrate. WINTERS ET AL. (2001) discovered that households with more than 15 hectares of land sent fewer migrants, while those with over 30 hectares of cropland tend not to provide migrants. In addition, a number of other studies (e.g., STARK AND TAYLOR, 1991; HABERFELD ET AL., 1999) have found insignificant effects of farm size on migration.

For existing studies which focus on China, ROZELLE ET AL. (1999) found that households with more land are likely to be more capital-constrained in crop production, thus more likely to seek income from migration to North China. In contrast, ZHAO (1999b) found that workers from land-scarce households tended to have higher probabilities of migration. However, LI AND YAO (2001) observed an inverse U-curve relationship between landholdings and migration and concluded that households with medium farm size are more likely to migrate. LI AND ZAHNISER (2002) found statistically that land had no significant impact on an individual's migration decision. SHI ET AL. (2007) suggested that types of landholdings also had an impact on labor migration decision-making, with irrigated cropland having a negative effect, while dry-land and forest having no significant effect.

5.2.2 Land Tenure Security and Off-farm Labor Markets

An abundance of theoretical research suggests that insecure property rights may have important impacts on productivity, factor allocation and economic development in China as they have elsewhere in the developed and developing world (BESLEY, 1995; BENJAMIN AND BRANDT, 2002; FENG AND HEERINK, 2008; JACOBY ET AL., 2002; LI, ROZELLE AND BRANDT, 1998; LIU ET AL., 1998). Under China's land management system, land tenure is not fully secure since land use rights may be lost (or gained) in village-wide reallocations. In other words, tenure security is largely determined by the frequency and magnitude of village-wide reallocations (ROZELLE ET AL., 2002). Renting out of land by somebody exiting agriculture could be perceived as a signal that the land is no longer required and

could be transferred by administrative reallocation (BRANDT ET AL. 2004, YANG 1997). Reallocation may thus discourage exit from the sector at the margin. However, this negative effect is counter balanced by a positive effect if the farm size and off-farm employment exhibits an inverse U relationship, which guarantees that a person with an average landholding is more likely to pursue off-farm activities. Land allocation draws households closer to the mean landholding in the village. Therefore, the increase in tenure security associated with the decrease of reallocation may have a positive or negative net effect on migration.

Regarding transferability, measures to facilitate market-based land transfers, e.g. by increasing coverage with land certificates and outlawing reallocation, have potential to make a very positive contribution to the economy (CARTER AND YAO 2002). If land cannot be rented out, households have to forfeit the revenue from land due to the loss of labor through migration. This represents the opportunity cost of migration. However, If households are able to lease out land at competitive prices, they would receive the future stream of rentals, and their decision to leave farming would be primarily based on labor earnings alone (YANG, 1999).

The influence of tenure security on labor market, off-farm activities and migration has been found in more recent empirical research. DO AND IYER (2008) find that a land titling program in Vietnam led to increases in the proportion of cultivated land devoted to perennial crops and facilitated shifting of land to non-farm activities. VALSECCHI (2010) finds that access to a formal land title increases Mexican emigration to the US, and DE BRAUW AND MUELLER (2011) show a positive correlation between land transferability rights and internal migration in Ethiopia. DE LA RUPPLE ET AL. (2009) explored the causes of temporary migration, and found that land rights insecurity is a manifest constraint on the labor allocation of rural households. FENG AND HEERINK (2008) found a negative relationship between household land renting and migration decisions. MULLAN ET AL. (2011) examined the relationship between tenure insecurity and households' participation in labor markets in China. Their results indicated that rural land tenure arrangements act as a further constraint on migration. Past land reallocations discourage households from exiting agriculture (DEININGER ET AL., 2012). A higher probability of village-wide land reallocation will reduce farmers' migration probability by 2.1 percent (GILES AND MU, 2012).

5.2.3 Land Quality and Off-farm Labor Markets

Land is a resource endowment, its quality has an impact on household agricultural production and investment decisions, thereby affecting the household labor allocation. Since land classification and gradation are different between regions.

This study does not consider indicators such as soil quality, land degradation and agro-biodiversity, but only examines land-use conditions from two aspects, the first one is the rating of the irrigation and drainage facilities, and the second one is land fragmentation.

Well-developed irrigation and drainage infrastructure can increase agricultural output with relatively less labor input. Thus, households are able to allocate more time to off-farm work. Therefore, irrigation and drainage facilities are expected to increase household off-farm activity. Additionally, various researchers have pointed out that land fragmentation is the cause of productivity losses (NGUYENET AL., 1996; WAN AND CHENG, 2001; CHEN ET AL., 2009). TANET AL. (2008) found that fragmented farm structure correlates well with higher labor costs, that is, farmers with more fragmented land use more labor in order to compensate for the negative effects of fragmentation. While JIA AND PETRICK (2011) found that land fragmentation indeed leads to lower agricultural labor productivity, land fragmentation makes labor less productive, so a rational response is to use less of it on-farm and rather switch to off-farm income generation activities. Therefore, the above analysis suggests that the prosperity resulting from land quality may have two countervailing effects on off-farm employment.

5.3 Analytical Framework

5.3.1 Model Specification

This chapter focuses on the analysis of impacts of current land tenure arrangements on household off-farm employment behavior. To identify the impact and other determinants, a reduced form equation was used as follows:

$$\mathrm{M} = \beta_0 + \beta_1 Z + \beta_2 \bar{A} + \beta_3 \mathrm{Z}^{\mathrm{p}} + \beta_4 Z^{h} + \varepsilon \qquad (5.1)$$

Where M represents either (i) an indicator variable that is equal to one if the household derives all its income from non-farm activities and zero otherwise; (ii) the number of individuals in the household who derive their main income from off-farm activities; or (iii) the number of labor days supplied to off-farm labor markets. Whereas, Z is a vector of institutional variables including the number of experienced land reallocations, household expectation of land reallocation, the share of households in the village who received land certificates and the freedom of land transfer rights. $\bar{A}$ is household land endowment (in mu, 1 mu = 1/15 hectare). Z^{q} is a vector of land quality factors. Z^{h} is a vector of household characteristics including household demographics, assets, etc.

A drawback of the linear model for discrete responses is that partial effects are

constant throughout the range of dependent variables and that negative fitted values show inconsistent conditional variance. For the decision to move off-farm, the dependent variables expressed are as a dichotomous variable, which means a probit model can be used. For the number of individuals moving off-farm, the dependent variables are non-negative integer values with a large proportion at zero; accordingly, the poisson model is suitable. For the off-farm work duration expressed as a continuous variable with an optimum value of zero, the censored regression model (tobit) which captures both the limit (zero) and non-limit (continuous) observations is chosen.

5.3.2 Variables

The variables used in the empirical equations are reported as following. As mentioned in the previous chapter, there are four variables to indicate land tenure arrangements. Among them, two variables representing tenure security are the number of reallocations that have taken place in a village since the HRS was established and a household's expectation of land reallocation in the next few years. Since households that experienced a larger number of reallocations in the past would feel less secure of their land-use rights, reallocations are expected to be negatively related to off-farm employment. Similarly, if households predict an eminent reallocation, their decision to participate in off-farm activities, particularly by migrating, would be less likely. Hence, an expectation of land reallocation discourages household off-farm employment. Two variables representing land transferability are the share of households in a village with certificates and land transfer rights possessed by a household. Possession of land certificate may reduce land transaction costs. Consequently, households in a village with greater coverage with certificates are more likely to increase their off-farm employment participation behavior. Additionally, a high value for the land transfer rights indicator is expected to have a positive impact on off-farm employment.

Other variables related to land are a household's farm size, the rating of irrigation and drainage facilities and average plot size. Farm size is measured by per capita landholding (expressed in mu) of the household that a person belonged to. In order to capture any curvilinear effect of farm size on migration, per labor landholding squared will be added to the regressions. As mentioned earlier, well-developed irrigation and drainage infrastructure reduce the labor required for agricultural production, thus providing farmers with time to participate in off-farm activities. Therefore, this variable is expected to have a positive effect on off-farm employment. In addition, average plot size is used to measure land fragmentation. Fragmentation is correlated with higher labor costs, households with more fragmented land use more labor (TAN ET AL., 2008) and therefore have less

inclination to engage in off-farm work.

The other independent variables used in the models are those that would be expected to affect household off-farm employment decisions. These are selected on the basis of previous literature on migration in China (e.g., YAO, 2001; GILES AND MU, 2007; MULLANET AL., 2011). These are household size, average age of adults, average years of schooling of household adults, number of dependents and household fixed assets. According to NELM, migration can be viewed as part of a family adaptive strategy. Hence, the assumption here is that off-farm labor market decisions, especially migration decisions are made jointly by all household members. Therefore, the average adult age and education level were used to specify the equation. While average schooling years captures a household's human capital potential, average age captures the experience a household has accumulated. It is expected that a household with more members will be more likely to pursue off-farm employment, whereas a household with more dependents will be less likely to work outside of the agricultural sector. Household fixed assets refer to household possession of valuable production tools, from conventional assets such as cattle to expensive modern machinery, the choice is from one to six, the larger the value, the more expensive the assets a household has. The rationale is that households with more agricultural assets tend to be less likely to migrate, but more likely to participate in local off-farm work. Because those households invest more in the agriculture sector, they are, as professional farmers, more reliant on farming, besides they can get extra income from renting out machines, therefore migration is not attractive enough for them.

Finally, except the county dummies, following STARK, TAYLOR (1989; 1991) and QUINN (2006), this study also incorporate relative income deprivation into the empirical models. Relative deprivation is defined as a household viewing their situation as less than a reference point such as a community standard or as less than the outcome of a particular group (QUINN, 2006). Households relatively deprived in a village are more likely to migrate. Income deprivation is calculated as a ratio of the household's income as compared to the village average income as given in the formula.

$$\text{Relative Income Deprivation}=1-\frac{\text{household income}}{\text{village average income}} \qquad (5.2)$$

5.4 Empirical Results

As shown in table 5.1, coefficients of column 2 to 4 are average partial effects for the probability of moving off-farm (including off-farm employment, migration and local off-farm employment), coefficients of column 5 to 7 are the number of

individuals participating in different types of non-agricultural activities, and coefficients of column 8 to 10 are the number of days spent in the various off-farm labor markets.

The regression results indicate that number of experienced reallocation significantly reduces labor moving out of the agricultural sector, whether for local employment or migration. Households who have experienced more reallocations are less likely to exit agriculture than those who have experienced less. The results show that the impact is especially distinction migration, where each additional land reallocation in the past results in a 12 percent decrease in the propensity to migrate, a 9 percent decrease in the number of migrants supplied to migration destinations, and a 22-day decrease of household labor supply to such markets. This suggests that legal restrictions on reallocation may be less than perfectly enforced (DEININGER ET AL., 2012). Part-time labor supply to non-agricultural labor markets is estimated to be less affected by reallocation, except the participation in local off-farm labor markets, other coefficients are negative but insignificantly different to zero. Reallocations thus seem more important in affecting household decisions on migration rather than engagement in local off-farm activities. Also, expectations of land reallocation in the near future appear to affect household decisions to stay in agricultural production rather than the specific choices of whether to engage in migration or local off-farm activities. Farmers who expected land reallocation in the coming years, compared to farmers who did not have such expectations, are 78 percent less likely to participate in off-farm employment, and the household labor supply to non-agricultural markets would reduce by 48 days.

The share of certificates at village level, as a proxy for the transaction cost of land transfers, appears to affect both exiting decisions and the supply of labor days. Availability of certificates significantly contributes to participation in off-farm labor markets. The magnitude of estimated coefficients is large, compared to a village with no land certificates, issuance of land-use certificates to every household in the village is predicted to result in a 61 percent increase in the likelihood of moving off the farm, an 8 percent increase in the number of individuals supplying labor to non-agricultural labor markets or an increase of household supply of labor to such markets of 59 days. Specifically, it would increase the likelihood of migration by 15 percent and the migrants' working days by 45. It would also increase the propensity for local off-farm work by 30 percent and local workdays by 27 days. The size of this effect is particularly remarkable given that data collection was conducted right after a financial crisis. Land transfer rights have a significantly positive influence on off-farm employment and its duration. Households with more land transfer rights are 46 percent more likely to exit agriculture, and work 29 more days in the off-farm sector compared to

households with less land transfer rights.

Farm size has a significant negative impact on off-farm employment. Regarding movement of labor out of the agricultural sector, whether for local employment or migration, households who have more land are less likely to participate in off-farm activities. The estimated marginal effect indicates that per capita land holding increasing by one mu decreases the propensity of moving out of the agricultural sector by 84 percent, and decreases the number of laborers supplied to external markets by 16 percent, and reduces the supply of man-days by 90 days. To be specific, the increase of each additional mu of per capita farm size leads to a 27 percent decline in migration inclination, a 14 percent decrease in migrants, or 68 migration days. It also reduces the probability of working locally by 33 percent, the provision of laborers to such markets by 18 percent, and the duration of such supply by 57 days.

The irrigation and drainage facilities rating has a significant positive impact on labor moving off-farm, which indicates that improving irrigation and drainage facilities in rural areas will release more labor from the agricultural sector. This result is mainly driven by the impact of these facilities on encouraging migration. Construction of this infrastructure is predicted to increase the propensity of labor moving off-farm by 29 percent, and the off-farm workdays by 36 days. Specifically, it would increase the likelihood of migration by 29 percent, the number of migrants by 11 percent and the workdays by 60. However, another variable representing land quality, land fragmentation measured by average plot size, positively affect the household decision on migration but negatively affects their decision to seek local off-farm work. One possible explanation is that fragmentation makes on-farm work less attractive by increasing the cost and reducing the profit, so that farmers prefer to migrate to engage in wage-earning work. While for farmers who pursue local off-farm employment are normally part-time farmers, fragmented land incurs more labor cost in agricultural production and thus the supply of labor to the local off-farm labor market will decrease.

Table 5.1: Regressions results of household members moving off the farm and the labor supplied to off-farm activities

	Participate in			No. of individuals employed in			Days worked in		
	off-farm	migration	local	off-farm	migration	local	off-farm	migration	local
Land tenure variables									
Land reallocations[4]	-0.145*	-0.116**	-0.139***	-0.054*	-0.090**	-0.037	-14.92**	-22.08**	-7.308
(number)	(-1.71)	(-2.25)	(-2.68)	(-2.27)	(-2.37)	(-1.21)	(-2.11)	(-2.22)	(-1.13)
Expectation of land	-0.775**	0.003	-0.057	-0.050	-0.058	-0.026	-48.42**	-30.38	-15.99
Realloca.[5] (dummy)	(-2.39)	(0.02)	(-0.37)	(-0.79)	(-0.62)	(-0.30)	(-2.39)	(-1.11)	(-0.86)
Share of land	0.608***	0.154*	0.295***	0.077**	0.078	0.077	58.83***	44.72***	27.27**
certificates[6] (%)	(2.78)	(1.70)	(2.95)	(2.04)	(1.40)	(1.50)	(4.81)	(2.76)	(2.41)
Land transfer	0.464**	0.044	-0.129	-0.007	-0.011	-0.010	-29.16*	-8.060	-19.15
rights[7](number)	(2.23)	(0.42)	(-1.12)	(-0.17)	(-0.16)	(-0.16)	(-2.05)	(-0.43)	(-1.47)
Land variables									
Farm size (mu)	-0.841***	-0.265**	-0.328***	-0.155**	-0.140*	-0.180**	-90.27***	-67.55***	-57.27***
	(-4.09)	(-2.20)	(-2.77)	(-2.61)	(-1.73)	(-2.10)	(-5.30)	(-2.89)	(-3.48)
Irrigation rating	0.288*	0.287***	-0.104	0.038	0.108**	-0.035	35.73***	56.92***	-9.649
	(1.73)	(3.44)	(-1.24)	(1.13)	(2.19)	(-0.77)	(3.28)	(3.92)	(-0.96)
Plot number	0.095	0.137**	-0.100**	0.006	0.048	-0.029	-0.165	21.41**	-14.38**
	(1.02)	(2.62)	(-1.99)	(0.26)	(1.50)	(-0.96)	(-0.02)	(2.33)	(-2.22)
Household variables									
HH size (persons)	0.167	0.614***	0.011	0.237***	0.435***	0.103**	127.6***	158.5***	31.59***
	(1.28)	(7.39)	(0.14)	(7.30)	(8.47)	(2.43)	(12.45)	(10.62)	(3.35)
Dependant Ratio	-0.221	-1.080***	0.139	-0.316***	-0.755***	-0.034	-159.5***	-266.3***	0.517
(%)	(-1.21)	(-8.93)	(1.26)	(-6.59)	(-9.29)	(-0.57)	(-11.19)	(-12.15)	(0.04)

[4] Past land reallocations that a household has experienced.
[5] 1 if household expect land reallocation in the near future, 0 otherwise.
[6] Share of households with certificates in a village.
[7] The freedom of household land transfer rights, from 1 to 4, the higher the value the greater the right.

Average adult age (yrs)	-0.018	0.001	-0.048***	-0.008	0.010	-0.018**	-3.197*	2.431	-6.788***
	(-1.01)	(0.10)	(-3.99)	(-1.35)	(1.10)	(-2.50)	(-1.91)	(1.01)	(-4.48)
Average Adult education (yrs)	0.230**	0.149***	0.022	0.040**	0.067*	0.010	31.95***	38.37***	3.614
	(2.47)	(3.16)	(0.51)	(2.13)	(2.48)	(0.41)	(5.33)	(4.73)	(0.66)
Agricultural assets	-0.119*	-0.081**	0.038	0.003	-0.045*	0.038*	4.832	-19.61***	19.74***
	(-1.85)	(-2.27)	(0.93)	(0.18)	(-1.74)	(1.92)	(0.95)	(-2.83)	(4.25)
Income deprivation (%)	-0.199	-0.284**	-0.049	-0.075*	-0.127**	-0.040	-83.17***	-64.43***	-42.25***
	(-1.07)	(-2.16)	(-0.44)	(-1.72)	(-2.07)	(-0.64)	(-5.53)	(-3.21)	(-3.03)
Mengxian dummy	-0.989**	-0.427**	0.274	-0.023	-0.041	0.023	-24.57	-63.62*	31.76
	(-2.27)	(-2.24)	(1.37)	(-0.30)	(-0.35)	(0.23)	(-0.99)	(-1.91)	(1.38)
Wenxian dummy	0.583	0.039	0.032	-0.048	0.001	-0.076	-75.83*	-22.92	-62.40*
	(1.14)	(0.13)	(0.11)	(-0.36)	(0.00)	(-0.42)	(-1.92)	(-0.41)	(-1.70)
Constant	-1.257	-3.288***	2.938**	-0.050	-2.500***	0.514	-37.20	-799.4***	428.9***
	(-0.83)	(-3.63)	(3.26)	(-0.13)	(-4.13)	(1.02)	(-0.31)	(-4.75)	(3.91)
No. of observations	479	479	479	479	479	479	479	479	479
Chi-square	122.09	233.44	82.98	170.56	228.46	48.62	413.64	331.30	142.69
Log likelihood	-59.073	-204.568	-183.974	-701.035	-510.867	-587.08	-3048.3	-2140.8	-2714.9
Pseudo R2	0.5082	0.3633	0.1840	0.1085	0.1827	0.0398	0.0635	0.0718	0.0256
sigma _cons							210.5***	258.9***	191.6***

Notes: ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. z-statistics for probit and passion model and t-statistics for Tobit model are in parentheses.

Concerning other variables, the positive coefficients of household size across all measures of off-farm participation, point to the importance of the labor endowment for off-farm labor supply. In particular, the influence on labor supply is prominent. Having one more member in the household is predicted to result in a 24 percent increase in individuals with off-farm pursuits, and an increase in household off-farm labor supply by 128 days. Specifically, it would increase the number of migrants by 44 percent, and migrant workdays by 159. It would also increase the number of individuals engaged in local off-farm work by 10 percent, and the supply to local off-farm labor markets by 32 days. However, the number of dependents in a household significantly reduces the household migration propensity but has no influence on its local off-farm employment decision. To be specific, one additional dependent leads to an 11 percent decrease in migration propensity, a 75 percent decline in number of migrants and 266 fewer days supplied to off-farm labor markets. These findings confirm the results of earlier studies, which show that larger households and households with fewer dependents tend to provide more migrants (DE BRAUW ET AL., 2002; ROZELLE ET AL., 1999; FENG AND HEERINK, 2008).

Generally, average adult age negatively affects the off-farm labor supply, while the size of this impact is tiny, and particularly prominent in local off-farm employment. On average, one additional year in average adult age leads to a 4.8 percent decrease in the likelihood of assuming a local off-farm job, a 1.8 percent decline in individuals pursuing such jobs, and a seven days decrease of labor supplied to that market. Furthermore, higher levels of education emerge as being positively correlated with higher levels of off-farm participation. On average, each additional year of education translates to a 23 percent increase in total off-farm participation probability, four percent more individuals, and 32 more labor-days supplied to all non-farm sectors. In particular, this effect is mainly driven by the impact on migration. Specifically, one additional year of education increases the propensity to migrate by 15 percent, the number of migrants by seven percent as well as migration days by 38.

The fact that assets are predicted to reduce the likelihood of migration while increasing the propensity to engage in local off-farm employment is in line with the notion that a lack of assets or local demand for labor is a key reason for households to decide in favor of migration rather than participate in local off-farm employment (DEININGER ET AL., 2012). From a policy perspective, this reinforces the importance of policies favoring local asset accumulation. According to the estimates, increases in the number of assets lead to a decrease in the number of individuals migrating by 4.5 percentage points on average, migration days by 20, supply of labor to the local off-farm sector by 3.8 percent or 20 workdays. Income

deprivation is significant and negatively related to off-farm labor supply as well as migration, which is opposite to relative deprivation theory. One possible explanation for this phenomenon is that the calculation of current income in this study includes remittance, which increased the income ranking of the household in the village. Therefore, households who do not have migrants are relatively deprived in the village. Differences in signs and magnitudes of the coefficients on county dummies also point towards marked inter-regional variation in non-agricultural labor market participation. Compared to Wenxian, moves into off-farm occupations are less likely in Mengzhou, whereas the supply of labor days to local off-farm labor market in Huaxian is less.

5.5 Summary

This chapter investigated the impact of land tenure arrangements on off-farm labor market development. Based on the notion of tenure security and transferability as the main ways through which land tenure affects behavior, the hypothesis is that reallocations may impede a smooth transfer of labor from agriculture to other sectors, whereas certificates could make it easier to transfer land and leave the current residence to join the non-agricultural labor force on a temporary basis.

The empirical results show a number of land-related factors to be statistically significant in affecting the development of off-farm labor markets. First, experiencing more reallocations reduces the incentive to exit agriculture, while the affect is more noticeable on migration than on temporary local non-agricultural labor supply. Second, certificates seem to affect participation in non-agricultural labor markets mainly through their impact on increasing the duration of off-farm work. In this case, the estimated coefficients are large, having certificates for all households in a village would increase an average household's supply of labor days to the off-farm sector by 59. Therefore, issuance of more official means of contracting, e.g. promoting a nationwide rural land registration and certification program will stimulate rural labor migration, which will further facilitate the structural transformation of the Chinese economy. Third, households with more land transfer rights have greater propensity for and longer duration of participation in off-farm labor markets. Limiting the direct intervention of village committees in household land transfers will not only promote the development of land transfer markets but also benefit the off-farm labor supply. Finally, investing in irrigation and drainage facilities will have spill-over benefits for off-farm employment. Developing infrastructure in irrigation and drainage will not only facilitate agricultural development, but will help release more labor from the agricultural sector.

In sum, policies aimed at improving land tenure security and promoting land transfer (e.g. rural land registration and certification programs, limiting village regulation of land transfer, developing infrastructure in irrigation and drainage etc.), together with other policies, such as further reform of the Hukou system, improved rural social security etc., will promote market-based rural labor transfer, which will improve allocative efficiency and rural economic development and further facilitate the structural transformation of the Chinese economy.

6 LAND TENURE, OFF-FARM EMPLOYMENT AND LAND-RENTAL MARKETS

With the economy gradually moving from one in which resources were allocated by planners to one in which markets play a major role, commodity, input and labor markets have gradually developed in China, leading to higher efficiency and welfare gains for its population (ROSEN ET AL., 2004). Rural off-farm labor markets, which feature large amounts of rural to urban migration and a booming rural industry, have thrived ever since the late 1980s (FENG, 2006; SHI, 2007). However, development of land-rental markets was most evident in the late 1990s (KUNG, 2002). As mentioned in previous chapters, the Chinese agricultural economy is based on 200 million farms with on average fewer than 0.5 hectares (GAO ET AL., 2012). This small scale has become the main obstacle for agricultural economic development in China, while land-rental markets play a uniquely important role in allocating resources efficiently across farm households (KUNG, 2002; DEININGER AND JIN, 2002). The incredibly low incidence of land-rental transactions could be explained by the type of land tenure system and the development of other factor markets in China, e.g. off-farm labor markets (KUNG, 2002; HUANG ET AL., 2012).

6.1 Introduction

As mentioned in the previous chapters, agricultural land in China is very scarce and the land-labor ratio is very small, demand for land is immense while supply of it is very limited (TU, HEERINK AND LI 2006). Considering the current land tenure system in China, where agricultural land is collectively owned by villagers, land rental seems to be the main way in which operational land holdings are supposed to expand (CAI ET AL., 2008). Moreover, the development of well-functioning land-rental markets is one of the most feasible means to increase factor allocation and raise the efficiency of land use in rural areas of developing countries by facilitating transfers of land to more productive farmers and facilitating the transfer of labor to the non-farm economy (DEININGERAND JIN, 2002; LOHMAR ET AL., 2001; KUNG, 2002; ZHANG ET AL., 2004). This is especially true in a developing country experiencing a rapid growth in the number of out-migrants and off-farm workers (HOKEN, 2012).

Rapid economic growth in China has induced a huge demand for labor from rural areas. High productivity in the manufacturing sector has been achieved by using cheap labor from the rural sector (CHEN ET AL., 2004). By 1995, there were more than 150 million farmers who had off-farm jobs (ROZELLE ET AL., 1999), this rose to 279 million by September 2008, accounting for 37 percent of total employment (HUANG ET AL., 2011). In contrast to the burgeoning development of China's urban

manufacturing sector, development of rural land utilization, notably the rental market for farmland, has lagged (HOKEN, 2012). The appearance of land-rental markets was not evident until the late 1990s. In the late 1980s and 1990s few farmers engaged in rental activities (TURNER ET AL., 1998; BRANDT ET AL., 2004; DEININGER AND JIN, 2005); after the promotion of the RLCL, land-rental activities started to expand. According to a nationwide survey, GAO ET AL. (2012) found that by 2008, 19 percent of cultivated land was rented. Among that, over 20 percent transactions were in the developed coastal provinces (SC and NBS, 2008). However, most of the rental contracts remain verbal, informal, often annual and frequently made with relatives (DEININGER ET AL., 2007; GAO ET AL., 2012).

The purpose of this chapter is to analyze the factors affecting the development of land rental markets in the study area, particularly the impact from land tenure arrangements and off-farm labor markets. The study focuses on both the demand and supply side of a land-rental market. In view of these, section 2 reviews literature on determinants of rental transactions in China. Information on model specification and variable description is presented in section 3, while section 4 and section 5 present the empirical results of the determinants for both land rental and renting-out. Finally, brief concluding remarks are presented in section 6.

6.2 Determinants of the Emergence of Land-Rental Markets

6.2.1 Land Tenure Arrangements and Land-rental Markets

The low incidence of land-rental activity in rural China can be explained largely by a number of institutional factors, of which the land tenure arrangement is the most important (KUNG, 2002). Property rights to land were vested in villages or village-centered small-groups, local cadres, particularly those at the township and village levels still exert control over land allocation and reallocation (WANG ET AL., 2011). This is one of the reasons why many studies have regarded greater tenure security as capable of reducing the probability of administrative reallocation (Brandt et al., 2004; JACOBY ET AL., 2002; KUNG , 2006; WANG ET AL., 2011). The literature holds that tenure insecurity can hinder land rental market development in two ways. Insecure property rights discourage households from renting out land, because doing so can be seen as a signal that the household no longer needs the farmland, which will potentially result in negative repercussions, such as receiving less land or land of inferior quality in future reallocations (LOHMAR ET AL., 2001).

In addition, some researchers consider administrative land reallocation as a substitution for land-rental markets. BRANDT, ROZELLE AND TURNER (2004) argued that since village leaders' chances of promotion and bonuses are closely related to

aggregate village farm output, they have incentives to reallocate land from low productive households to high productive ones through periodic land reallocation. In contrast, the function of land-rental markets is also to transfer land from low-intensity users to higher-intensity ones. Consequently, administrative land reallocation and land-rental markets are substitutes and land reallocation should have a discouraging effect on household land-rental behavior. This view is also supported by DEININGER AND JIN (2005). They found that households with high farming ability receive more land administratively and households with low farming ability are more likely to lose their land during the process of land reallocation.

Lack of transferability, e.g. low coverage with land certificates and local government intervention in land transactions, are also obstacles that deter the development of land rental markets. A certificate of land ownership can allay fears that rental land can be taken away, either by the government through redistribution or by a tenant who does not vacate it at the end of the lease period. Certificates can help when migration requires land owners to be absent temporarily or if the number of registration transactions increases beyond the capacity of informal, local mechanisms to handle them transparently (DEININGER ET AL., 2009). Land-use certificates can also reduce the transaction cost of renting land. In a situation where land loss by cultivators is unlikely and use of rural land as collateral not allowed, holding certificates makes land transactions more formal and possible with individuals who are not close kin (DEININGER ET AL., 2012). In contrast, government intervention will increase the transaction cost of land rental. A number of recent studies provide partial empirical support for these arguments. KIMURA, OTSUKA AND ROZELLETHE (2007) found transaction costs in tenancy markets lead to smaller numbers of rental transactions. CARTER AND YAO (2002) employ an agricultural household model to prove that uncertainty in land transfer rights and high transaction costs prevent efficient farmland reallocation through the rental market.

6.2.2 Off-farm Employment and Land-rental Markets

The development of off-farm labor markets is also considered to be a significant determinant of the emergence of land-rental markets (KUNG 1995; DEININGER AND JIN 2005). Predicated on the premise that the demand for rental transactions is essentially a derived demand that is contingent upon the rate at which households with alternative off-farm economic opportunities leave the farms (KUNG, 2002).

In China, with both access to off-farm employment and wages rising (DE BRAUW ET AL., 2002), it is possible that the rise of off-farm employment is one of the forces

that have been driving the rise of cultivated land-rental. When farmers are able to earn substantially more off the farm, they begin to consider ways to rent-out their land to those with less opportunity to work off the farm (or to those relatively better at farming).

YAO (2000) theoretically formalized the effect of the imperfect labor market on the farmland lease market using a general equilibrium model and household panel data. He showed empirically that product heterogeneity and a freer labor market promote more land leasing. This impact of off-farm employment on the land-rental market has also been examined by KUNG (2002), who examined the impact of administrative land reallocation and unevenly developed off-farm labor markets on farm efficiency, and concluded that inefficiency in labor allocation is alleviated to some extent by administrative land reallocation and development of the off-farm labor market. KIMIRA ET AL. (2011) also empirically suggest that higher off-farm wage rates increase off-farm employment opportunities inducing a more active land-rental market.

6.3 Analytical Framework

The econometric estimates below identify the influence of land tenure and off-farm employment, as well as other household and village characteristics on household land rental market participation decision.

6.3.1 Model Specification

Farmers in the survey villages are assumed to follow sequential decisions; first, whether to participate in a land-rental market or not; second, how much land to rent or rent-out. For these, the dependent variables are decisions of land-rental market participation expressed as a dichotomous variable and its intensity, expressed as a continuous variable. The censored regression model (tobit) which captures both the limit (zero) and non-limit (continuous) observations seems suitable. However, the decisions on whether to transfer land and how much land to transfer can be made jointly or separately. The assumption here is that the decision to transfer land may precede the decision on its intensity. In such a situation, it is more suitable to apply Cragg's double hurdle model in which a probit regression on participation (using all observations) is followed by a truncated regression on the non-zero observations (CRAGG, 1971).

If we let D_i^* as a latent variable describing the household's decision to participate in a land-rental market, Y_i^* as a latent variable describing household's decision on the amount of land to rent or rent-out, and D_i and Y_i as their observed counterparts,

then based on the specification by CRAGG (1971), and MOFFATT (2003), the double-hurdle model essentially contains two equations as follows:

$$D_i^* = \alpha' Z_i + v_i \quad (6.1)$$

$$Y_i^* = \beta' X_i + \varepsilon_i \quad (6.2)$$

where,

$$D_i = \begin{cases} 1, & if\ D_i^* > 0 \\ 0, & if\ D_i^* \le 0 \end{cases} \quad and$$

$$Y_i = \begin{cases} Y_i^*, & if\ Y_i^* > 0\ \ and\ \ D_i^* > 0 \\ 0, & otherwise \end{cases}$$

Cragg's double-hurdle model is perhaps the most flexible of the two-stage models as it allows for censoring at either stage of the model (BROUHLE AND KHANNE 2005). The advantage of the Cragg model over the Tobit model is that the former allows variables to have differing effects on the land-rental market participation and the land transfer amount decisions (BROUHLE AND KHANNA 2005; BURKE, 2009). This means that the land-rental intensity equation and the participation equation are allowed to have different coefficients (KETEMA AND BAUER, 2012; GROUND AND KOCH, 2007; BROUHLE AND KHANNA, 2005; DRAMMEH ET AL., 2002 ; YEN AND HUANG, 1996).

The double-hurdle model postulates that to observe positive level of land transfer, the farmer must pass two hurdles: (i) be a participator in a land-rental market, and (ii) actually rent or rent-out land in the market.

In the Cragg model, Equations (6.1) and (6.2) are assumed to be independent, and therefore, the error terms are randomly and independently distributed, v_i-$N(0,1)$ and ε_i-$N(0,\sigma_\varepsilon^2)$. This means:

$$\begin{pmatrix} v_i \\ \varepsilon_i \end{pmatrix} \text{-} N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & 0 \\ 0 & \sigma^2 \end{pmatrix}\right]$$

In the first stage we run a probit model to capture the decision of whether the farmer participates in a land-rental market or not. The second stage is a truncated model for land transfer amount, conditional on participation in the rental market (i.e. for participators).

The log-likelihood function for the version of Cragg's model that assumes the probit and truncated regressions to be uncorrelated is given as follows (CARROL ET AL. 2005):

$$L = \prod_{Y_i=}\left[1-\Phi\left(Z_i\alpha\right)\Phi\left(\frac{X_i\beta}{\sigma}\right)\right]\prod_{Y_i>0}\Phi\left(Z_i\alpha\right)\sigma^{-1}\phi\left(\frac{Y_i - X_i\beta}{\sigma}\right) \qquad (6.3)$$

Where Φ and ϕ are the standard normal cumulative distribution function and density function, respectively. The first portion is the log-likelihood for a probit, while the second portion is the log likelihood for a truncated regression, with truncation at zero. Therefore, the log-likelihood from the Cragg model is the sum of the log-likelihood from a probit and a truncated regression. More useful, however, is the fact that these two components are entirely separable, such that the probit and truncated regression can be estimated separately. This means that the probit parameters are not included anywhere in the truncated regression, while the truncated regression parameters are not included anywhere in the probit regression (KETEMA, 2010).

It is also obvious that the double-hurdle model reduces to the tobit model when the probit mechanism (i.e., $D_i^* > 0$) is absent in Equation (6.2). This is also seen in the likelihood function (Equation 6.3) when $\Phi\left(Z_i\alpha\right) = 1$. The tobit model arises if $\alpha = \beta/\sigma$ and $X = Z$ (Martinez-Espineira, 2004). Cragg's model allows the parameters to differ in the two decisions and tobit model allows the same parameters in these decisions. In fact, it is possible to compare the tobit model and the Cragg's double-hurdle model.

The appropriateness of each of these models can be tested by comparing the log likelihood estimates of the Tobit, probit and truncated models (GREENE, 1997). The underlying assumption of the Tobit model may be tested using the following likelihood ratio statistic (LRT):

$$LRT = -2\left[\ln L_T - \left(\ln L_P + \ln L_{TR}\right)\right] \approx \chi^2\left(k\right) \qquad (6.4)$$

Where L_T is the likelihood of the Tobit model with the same coefficients, L_P is the likelihood of the probit model, L_{TR} is the likelihood of the truncated regression model, and k is the number of independent variables in the equations.

The procedure involves separate estimation of the probability model for the decision to make transactions or not (probit model), OLS with zero observations excluded (truncated regression model) and a regression with observations of zero included using maximum likelihood technique (tobit model). The test is based on the fact that the tobit log-likelihood is the sum of the log-likelihood for the truncated and the probit models separately.

If the LRT of L_{TR} is significantly higher than the theoretical X^2 distribution, this leads us to reject the null hypothesis that the regressors have the same effect on the

decision to transfer land and the amount of land to transfer.

Equation (6.3) is estimated using the Maximum Likelihood Estimation (MLE) technique. However, the estimates of the double hurdle model might not be efficient if the error term is homoscedastic across observations. However, this problem can be further improved by allowing the standard deviation to vary across observations (YEN AND SU, 1995). Heteroskedasticity is integrated into the model by assuming that the variance of the error term is an exponential function of a set of exogenous variables k_i, a subset of X_i. In, particular, the standard deviation σ_i is parameterized as follows:

$$\sigma_i = \exp(k_i^{'} h)$$

Where h is a conformable parameter vector (CARROLL ET AL., 2005; KETEMA AND BAUER, 2012; NEWMAN ET AL., 2003).

6.3.2 Variables

The variables used in the double hurdle model are specified in this section. Consistent with the previous section, the four variables indicating land tenure arrangements are former land reallocation times, expectation of land reallocation, village-level share of certificates and land transfer rights. As discussed in the previous section, weak tenure security would discourage households from renting out their land by increasing the expected loss of losing tenure rights in the future, also, from renting their land by increasing the risk of losing the investment in the rental land. Lack of certificates would increase the transaction cost, thus discouraging both the land renting and renting-out decision. A high value of the land-transfer rights indicator is expected to have a positive impact on both renting and renting out of land (LI AND YAO, 2002).

In order to figure out the effect of off-farm employment on households' land-rental activity, two variables are used in the model, they are migration days and local off-farm days. The former refers to the total number of days that all migrants in a household work. Similarly, the latter represents the total number of days that all members in a household work in a local off-farm sector. These two factors are expected to have a positive influence on land renting-out but a negative influence on renting land.

Different from labor market participation, land-rental decisions are assumed to be made in particular by the household head. As a consequence, household head sex, age and education level are used to specify the land-rental model. Other household characteristic variables include household labor and land endowment and the cadre dummy. Households with relatively more labor endowment are expected to rent

more land and rent-out less land. Households with relatively more land are expected to rent more land and rent-out less land as they have the inclination to become a specialized farmer by achieving economies of scale.

For both the demand and supply sides, an active village land transfer markets, which can reduce transaction costs, is an important determinant of the efficiency of the land-rental market. Therefore, a village's land transfer rate is introduced in the regression model as a proxy for this transaction cost. If the village land transfer rate is high, the transaction cost to rent or rent-out the same size of land is expected to be low because the households that want to transfer land are easy to find and negotiate with by other households seeking to rent or rent-out land. Thus, a positive relationship is expected between village land transfer rate and household land rental transfer decisions and its amount.

The development of village non-farm employment is an important prerequisite for a land transfer market. In order to test the effect of village non-farm employment on household land transfer behavior, village-level off-farm employment rates, which is the ratio of migration and local off-farm participants to the total labor in the village, is used as a proxy for the active level of the off-farm labor market in a village. It is expected to have a negative relationship with the land rent decision and its amount, and a positive relationship with land rent-out decision and its amount.

In a well-developed land-rental market, land-rental prices play a vital role in determining land transactions. However, the land-rental market in the field study area is just in the emerging stage. As analyzed in chapter 4, the potential land-rental demand is much greater than land-rental supply in the study area. Consequently, land-rental prices have little impact on household land rent-in decision, while it has more impact on household land rent-out decision. Thus, we only involve the rental price in the land rent-out model. Village average land-rental rates are used as a proxy for measure of land rental rates. It is expected to have a positive relationship with the land rent-out decision and its amount.

Finally, two regional dummy variables for Mengxian and Wenxian Counties reflect the economic development and other factors that systematically differ between the counties.

6.4 Determinants of Household Land Rent Decision

The first step of the analysis consisted of testing the double-hurdle model (probit plus truncated regression models) against the tobit model. The results of the formal test based on the log-likelihood functions (Equation 6.4) between the tobit and the two-step modeling favors the use of the double-hurdle model. The test statistic

LRT=68.32 exceeds the critical value ($\chi^2(17) = 33.41$) at the one percent level of significance. For comparison purposes, both the tobit results and the double-hurdle results are presented at the end (see Appendix 1). Here, discussions are based on the results of the Cragg's double-hurdle model presented in Table 6.1.

The analysis reveals that there are some differences in terms of the magnitude and direction of determinants significantly affecting household decisions to rent land and its corresponding amount.

The development of an off-farm labor market correlates negatively with both land rent participation and its amount. The two off-farm employment variables, migration days and local off-farm days, are negative and highly significant at the one percent level in both estimations. Only migration days has a negative impact on land rent amount significantly. Since the dependent variable is whether a household participates in land-rental markets or not and a measure of the demand for land rent, households that participate more actively in off-farm activities are predicted to be less likely to participate in land rental activity, moreover, households that participate more actively in migration work are predicted to rent less land. Albeit the small size of the coefficients indicate that the effects are in only a marginally significant way.

The effect of land reallocation practices on land rent-in activity is mixed. The coefficients for previous land reallocations are found to be negative and significant at the one percent level in both of the land rent participation and rent amount estimations, whereas the perceptions of tenure security (the expectation of land reallocation in the near future) have no significant effect on land rental and its amount. The negative sign of the coefficients of the land reallocation times suggests households that have experienced more land reallocations have a decreased propensity to participate in land rental activity by 18.6 percent and a decrease of land rent amount by 0.77 mu.

The share of certificates at village level, as a proxy for the transaction costs of land transfer appears to affect both participation decisions and the scale of demand for land-rental. Availability of certificates significantly contributes to participation in land-rental activity. The estimated coefficients for share of certificates indicate that compared to a village with no land certificates, issuance of land-use certificates to every household in the village is predicted to result in a 4.6 percent increase in the likelihood of participating in land rent activity, and a 0.1 mu increase in land rent amount. Another finding of interest is that land transfer rights only have a positive significant impact on land rent amount. Households with more land transfer rights would rent 1.07 mu more land compared to households with less land transfer rights.

Table 6.1: Estimates of Double Hurdle Model for household land rent decision

Variables	Land rent participation			Rent amount (mu)		
	Coef.	z	S. E.	Coef.	t	S. E.
Off-farm employment						
Migration days	-0.002***	-5.64	0.0003	-0.002**	-2.25	0.001
Local off-farm days	-0.001***	-2.66	0.0005	-0.001	-1.32	0.001
Land tenure variables						
Land reallocations[1] (number)	-0.186***	-2.87	0.065	-0.770***	-4.51	0.171
Expectation of reallocation[2] (dummy)	-0.009	-0.07	0.134	-0.532	-1.51	0.352
Share of certificates[3]	0.046***	4.09	0.011	0.105***	3.93	0.027
Land transfer rights[4]	-0.535***	-4.40	0.121	1.070***	3.15	0.340
Household variables						
Labor (number)	0.329***	3.7	0.089	0.148	0.72	0.205
Farm size (mu)	0.273*	1.72	0.158	1.434***	5.82	0.246
Plot number	-0.048	-0.94	0.051	0.061	0.50	0.122
HH head's gender dummy	0.058	0.23	0.249	0.174	0.28	0.624
HH head's age (yrs)	-0.006	-0.76	0.008	-0.054***	-2.78	0.019
HH head's education (yrs)	-0.012	-0.32	0.037	-0.144	-1.64	0.088
Cadre dummy	0.008	0.03	0.286	0.399	0.57	0.697
Village variables						
Village land transfer rate[5]	0.038***	5.3	0.007	0.064***	3.64	0.018
Village off-farm employment rate[6]	-0.014	-0.84	0.017	-0.192***	-5.11	0.038
County dummy (cf. Huaxian)						
Mengxian	0.332	0.89	0.375	3.001***	4.37	0.687
Wenxian	0.186	0.46	0.406	3.346***	4.49	0.745
Constant	-1.828*	-1.94	0.941	0.983	0.46	2.130
No. of observations			479			152
Chi-square			209.75***			108.52***
Log likelihood			-194.425			-273.250
sigma						2.432***

Notes: [1]Past land reallocations that a household has experienced; [2] 1 if household expect land reallocation in the near future, 0 otherwise; [3] Share of households with certificates in a village; [4] The freedom of household land transfer rights, from 1 to 4, the higher the value the greater the right; 5share of households participate in land rental market in a village (%); 6 share of households participate in off-farm employment in a village (%). ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively. The first model (selection equation) is a probit for land rent-in participation, and the second model (intensity equation) is a truncated regression for land rent-in amount.

Concerning other household characteristic variables, the positive coefficients of household laborers to land rent participation point to the importance of the labor endowment for agricultural production. Households gaining one more laborer are predicted to increase their land rent-in participation propensity by 33 percent.

The positive coefficient of farm size confirms that the demand for rental land is likely to be higher among households with larger farm size. Households with large land endowment are more likely to become specialized farmers with the intent to rent more land, seeking economies of scale. One additional mu of farm size should increase the likelihood of participating in land rent-in activity by 27 percent, the amount of land rent-in by 1.42 mu. Household head age only has significant impact on land rent amount, suggesting that households with older heads rent less land since they become physically less capable of engaging in farming.

For the two village-level variables, village land transfer rate is positively related to land rent-in participation and its amount, while the village off-farm employment rate only significantly affects land rental scale. The coefficients for size indicate that a household in a village with a more active land transfer market is predicted to have an increase in the probability of pursuing land rental activity by 3.8 percent, and an increase in the amount of land rented by 0.06 mu. Whereas, households in a village with a more active off-farm labor market would reduce the amount of land rental activity.

Finally, the results for the two county dummy variables indicate that county-specific factors such as the wage rate and land rent make households in Mengxian and Wenxian rent larger amounts of land than households in Huaxian.

6.5 Determinants of Household Land Rent-out Decision

Similar with the last section, in this session the double-hurdle model is tested against the tobit model. The result of the formal test favors the use of the double-hurdle model. The likelihood ratio statistic is 69.35, substantially exceeding the critical chi-squared statistic (33.41) at a one percent level. For comparison purposes, both the tobit results and the double-hurdle results are presented at the end (see Appendix 1). Here, discussions are based on the results of the double-hurdle model presented in Table 6.2.

There are big differences in terms of the magnitude and direction of determinants significantly affecting land rent-out participation and its amount. Local off-farm days and family labor only affect the decision to participate in land rent-out activity in a significantly positive and negative way, respectively. While land transfer rights only significantly and positively affect the decision of how much land to rent-out. Both farm size and land fragmentation affects the decision to participate and the decision of how much land to rent-out in different directions.

The effects of off-farm employment on participation in rent-out activity are remarkably strong and robust. The two variables, migration days and local off-farm

days, are positive and highly significant at the one percent level in the participation estimation. This result confirms findings of previous studies that improved off-farm job opportunities increase the supply of land and are a major factor driving the development of village land-rental markets (TU, HEERINK AND LI, 2006). Only migration days positively impacts land rent-out amounts significantly. Since the dependent variable is whether or not a household participates in a land-rental market and a measure of the supply for land rent-out, households that participate more actively in off-farm activities are predicted to be more likely to participate in land rent-out activity, moreover, households that participate more actively in migration work are predicted to rent-out more land.

Regarding the effect of the tenure security on rent-out activity, former reallocations negatively and significantly affect both rent-out participation and its amount, whereas the perceptions of tenure security (the expectation of land reallocation) was found to have no significant effect on rent-out activity. The negative sign and the coefficients of land reallocation occurrences suggest households that experience more land reallocations have a decreased propensity to participate in land rent-out activity of 28 percent and a decrease of land rent-out amount of 0.25 mu.

The impact of land transferability on household land rent-out activity is mixed. The two variables, share of certificates at village level, which is a proxy for the transaction cost of land transfer, appears to positively affect both participation decisions and the supply of land rent-out scale at the one percent significant level. Meanwhile, land transfer rights only have a significant and positive impact on land rent-out amount. The size of estimated coefficients for share of certificates is small, which indicates that compared to a village with no land certificates, issuance of land-use certificates to every household in a village is predicted to result in a 9.1 percent increase in the likelihood of participating in land rent-out, and a 0.03 mu increase in land rent-out amount. Moreover, land transfer rights were found to influence land rent-out amount in a way that households with more land transfer rights would rent-out 0.23 mu more land compared to households with less land transfer rights.

A number of the coefficients on the household characteristic variables are found to be significant. Family labor significantly and negative affects land rent-out participation. Households with one more laborers are predicted to decrease the land rent-out participation propensity by almost 40 percent. Similarly, the sign of education is consistent with other research findings by KUNG (2002) AND FENG (2008). The positive coefficient of household head's level of education means that households with a more educated head are more likely to rent-out, and possibly

tend to rent-out more land, because of higher returns to off-farm work. This finding highlights the importance of education in enhancing income generation, because households with higher-educated heads earns higher income from off-farm employment and therefore have less incentive to earn income from agriculture.

Table 6.2: Estimates of Double Hurdle Model for household land rent-out decision

Variables	Rent-out participation			Rent-out amount		
	Coef.	z	S. E.	Coef.	t	S. E.
Off-farm employment						
Migration days	0.003***	6.29	0.0005	0.0007**	2.02	0.0004
Local off-farm days	0.003***	4.70	0.0005	0.0002	0.60	0.0004
Land tenure variables						
Land Reallocations (number)	-0.281**	-2.98	0.094	-0.245**	-2.21	0.111
Expectation of reallocation (dummy)	0.215	1.31	0.165	0.044	0.49	0.090
Share of certificates	0.091***	6.63	0.014	0.030**	2.52	0.012
Land transfer rights	-0.180	-1.58	0.113	0.229**	2.77	0.083
Household variables						
Labor (number)	-0.396***	-3.38	0.117	-0.028	-0.34	0.082
Farm size (mu)	-0.231**	-2.93	0.078	0.600***	9.45	0.063
Plot number	0.162**	2.01	0.081	-0.213***	-3.61	0.059
HH head's gender dummy	0.065	0.23	0.284	-0.097	-0.47	0.207
HH head's age (yrs)	0.017	1.51	0.011	0.0003	0.04	0.009
HH head's education (yrs)	0.079*	1.79	0.044	0.064**	2.04	0.031
Cadre dummy	-0.231	-0.58	0.399	0.152	0.58	0.264
Village variables						
Village land transfer rate	-0.008	-1.01	0.008	-0.002	-0.23	0.007
Village average rent price	0.001*	1.87	0.0006	0.0007*	1.81	0.0004
County dummy (cf. Huaxian)						
Mengxian	0.220	0.52	0.426	-0.744**	-2.41	0.309
Wenxian	0.316	0.71	0.446	-0.984**	-2.99	0.329
Constant	-5.099***	-4.16	1.227	-0.319	-0.34	0.934
No. of observations			479			90
Chi-square			205.84			416.99
Log likelihood			-128.507			-76.205
sigma						0.573***

Notes: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively. The first model is a probit for land rent-out participation, and the second model is a truncated regression for land rent-out amount.

Two very interesting findings are that farm size negatively impacts land rent-out participation and positively impacts land rent-out amount, whereas, land

fragmentation is found to have the opposite influence, it affects land rent-out participation positively and land rent-out amount negatively. One possible explanation is that farmers with large farms may have the intention to become specialized farmers, who are less likely to engage in off-farm employment, and thus have little impetus to rent-out land. While large farm households, especially those with fewer plots, find it easy to rent-out land. The estimated coefficients suggest that a household with one additional mu of land, is 23 percent less likely of renting out their farmland, but for those households who actually rent-out land, one additional mu of land increases land rented out by 0.6 mu.

Various researchers have pointed out that land fragmentation is causing productivity losses (NGUYEN ET AL., 1996; WAN AND CHENG 2001; CHEN ET AL., 2009). Therefore, in reality, farmers usually voluntary consolidate land within a village through exchanging or renting out land. However, fragmented land is difficult to rent-out. The coefficients reveal that compared to households with a larger average plot size, households with small plots are 16 percent more likely to rent-out land, albeit among those actually renting-out land, an increase in average plot size would reduce the amount of land rented out by 0.21 mu.

With regard to the two village-level variables, village average rental price is positively related to land rent-out participation and its amount, while village land transfer rate is found to have no significant effect on either land rent-out or its amount. The coefficients sizes indicate that households in a village with a 100 Yuan higher land-rental price is predicted to have an increase in the possibility of renting-out land by ten percent, and an increase in the amount of land rented-out of 0.07 mu.

Finally, the results for the county dummy variables indicate that county-specific factors such as the level of economic development and wage rate make households in Mengxian and Wenxian rent-out smaller amounts of land than households in Huaxian.

6.6 Summary

Land-rental markets provide benefits for both the farmers that want to dispose of their land to move to non-farm sectors and those who wish to expand their farm size. Thus, the development of well-functioning land-rental markets is critically important for facilitating the structural transformation of an economy from an agricultural-based one to an industrialized one.

In this chapter, the key factors that influence the decision to transfer land and the amount of land transactions, particularly the impact from land tenure arrangements

and off-farm labor markets, were analyzed. Considering the demand and supply side of land-rental markets, this study investigates separately the behavior of renters and those renting-out land in the study area.

The main finding of the research is that the land-rental market is mainly driven by off-farm employment. Households with active participation in off-farm labor markets are more likely to rent-out land, and among those who have already rented out land, active participation in off-farm employment also increases their land rent-out amount. Without off-farm job opportunities, households are unlikely to rent-out their land, and the land-rental market does not work if there is no supply. This finding confirms the results of previous studies on land rental market development in China (TU, HEERINK AND LI, 2006; KIMURA, OTSUKA AND ROZELLE, 2007).

Institutional factors such as land tenure arrangements also play a significant role in land transactions. More reallocations in the past reduce both the propensity and the magnitude of rental market transactions. Households that experience more reallocations decrease their rental market participation, since they may feel insecure concerning their land use rights. Land-use certificates significantly contribute to participation in land-rental markets and the rental amount. Possession of land-use certificates reduces the transaction costs on both sides of a land-rental market, thus making land transactions easier. In addition, land transfer rights only positively impact the land transfer amount.

A number of other variables are also found to be statistically and significantly affecting land-rental participation and its intensity in a different way. Households with high land availability may tend to rent more land to extend farm size and specialize in agricultural production. Whereas, household heads with higher education rent-out more land since it is easier for them to move off the farm. Households in a village with a more active land market and less active labor market tend to rent more land. While average land-rental rates are positively related to land renting-out and its amount.

In order to promote land-rental market development in China, policies should aim to provide more off-farm work opportunities and further strengthen individual land rights. Under the current administrative land reallocation system, individual land-use rights can be taken away and this appears to be thwarting incentives for farmers, including relatively unproductive part-time farmers who cultivate tiny plots of land, to rent-out their land. Hence, according to the empirical results, granting and protecting individual land rights is one of the major remaining institutional reforms that must be implemented in China in order to sustain China's rapid economic transformation. Specific measures such as issuance of more official

means of contracting, e.g. certificates, and reduce village-level land transfer regulation, will strongly stimulate the development of land-rental markets. Special training programs which aim to provide rural migrants with the necessary knowledge to find off-farm job opportunities will also benefit land rent-out activity. Finally, policy related to promoting a market based land-rental market should be pursued.

7 OFF-FARM EMPLOYMENT, LAND RENTAL MARKET AND AGRICULTURAL PRODUCTIVITY

Well-functioning factor markets are crucial for the sustainability and growth of agriculture and for rural development (DONNELLAN ET AL., 2012). However, imperfections in these markets are common in developing countries. For economies in transition, most notably China, the problem of factor-market imperfections are even more severe (BENJAMIN AND BRANDT, 2002). Empirical evidence shows that agricultural factor markets in rural China, particularly land and labor, face many institutional obstacles and remain underdeveloped (CARTER AND YAO, 2002; BOWLUS AND SICULAR, 2003). Imperfect factor markets may constrain households' ability to exchange land and labor, and so generate inefficient resource allocation, which further causes productivity loss (BENJAMIN AND BRANDT, 2002; FENG AND HEERINK, 2008).

7.1 Introduction

The impact of land tenure arrangements on the development of off-farm employment and land rental markets has been analyzed in previous chapters. This chapter will further investigate its effect on agricultural production. Basically, this influence is through property rights' effect on investment incentives and the way land is allocated across households (KHANTACHAVANA ET AL., 2012). Security of tenure is likely to improve long-run productivity through increasing the incentives to invest in and properly manage land. When farmers feel more secure in their right or ability to maintain long-term use over their land, the return on long-term land improvements and conservation measures is higher, and they have therefore a greater incentive to undertake investments (BRASSELLE, ET AL., 2002). Additionally, when productivity differentials exist among households, the development of land rental markets can enhance allocative efficiency and agricultural productivity by facilitating transfers of land from less productive households to more productive ones (CARTER AND YAO, 2002; DEININGER ET AL., 2003; FARUQEE AND CAREY, 1997; FENG AND HEERINK, 2008; YAO, 2003). However, in present-day China land rental arrangements are generally informal, short-term, and between households living in the same village. The underdeveloped land rental markets that generate high transaction costs may limit the number of rentals, and in general, these constraints on rentals will affect productivity.

The effect of off-farm employment on agricultural production is ambiguous. Participation in off-farm activities changes resource endowments of households, especially labor and capital used for financing off-farm employment move out of farm production (SHI ET AL., 2005). Households may need to restructure their farm

production by changing factor use and variable input use. Off-farm employment reduces the labor available for agricultural production, especially if hiring agricultural labor incurs transaction costs and if hired labor is not as efficient as family labor. But off-farm employment also enables households to increase their income, to overcome credit and insurance constraints and to increase their investment in agricultural production (ROZELLE ET AL., 1999; TAYLOR ET AL., 2003). In addition, the reduction in food consumption by household members working off-farm (e.g. the migrants) may have an impact on agricultural production decisions if household production and consumption decisions are non-separable (BURGER, 1994; WOUTERSE, 2006).

Previous studies on the effect of land tenure on agricultural production have focused on South Asia (BINSWANGER ET AL., 1995; OTSUKA AND HAYAMI, 1988; SHABAN, 1987) and Africa (AHMED ET AL., 2002; BENIN ET AL., 2005; GAVIAN AND EHUI, 1999; GAVIAN AND FAFCHAMPS, 1996; PENDER AND FAFCHAMPS, 2006; PLACE AND OTSUKA, 1997). The focus of these studies has been on to compare the relative efficiency of owner-operated, rented, or sharecropped plots. Many studies find an efficiency loss on sharecropped land relative to owner-operated land.

Land tenure research in China focuses on the land tenure insecurity resulting from frequent land reallocations, and the impact of this insecurity on household investment and agricultural productivity (KUNG AND LIU, 1997; LI ET AL., 1998; YAO, 1998; BENJAMIN AND BRANDT, 2002; JACOBY ET AL., 2002). Most studies found that land tenure insecurity had a significant but small effect on investment (e.g. green manure, organic manure), but no significant effect on productivity. This may be attributed to the fact that long-term investment on land plays a minor role in agricultural production compared to other agricultural inputs such as land, labor, and chemical fertilizers (YAO, 2003).

Little research has targeted the effect of land rental market development on allocative efficiency and agricultural productivity in rural China. LOHMAR ET AL. (2001) found that allocative efficiency and aggregate agricultural production was improved because households that rent land have a significantly higher marginal product of land than households that do not rent additional land. JIN and DEININGER (2009) found that net revenue on rented plots was some 60 percent higher than what the landlord would have obtained under self-cultivation. A productivity-enhancing role of land markets is also inferred from the fact that in a more limited sample from Southern China, productivity on leased plots is consistently highest (FENG ET AL. 2010).

Many empirical studies investigated the effect of off-farm employment on agricultural production in rural China. The studies by ROZELLE ET AL. (1999) and

TAYLOR ET AL. (2003) applied the "new economics of labor migration" (NELM) framework developed by STARK AND BLOOM (1985), through a simultaneous equation model, they found a negative lost-labor effect and a positive income effect on agricultural production. However, WU AND MENG (1997) did not find this lost-labor effect; they only found a positive income effect of off-farm work on grain productivity. Some recent research has focused on off-farm employment's effect on technical efficiency. CHANG AND WEN (2011) estimate Cobb-Douglas stochastic production frontiers (SPF) for rice farmers in Taiwan to find that technical efficiency of households without off-farm workers is slightly higher than that of households with off-farm workers. YUE AND SONADA (2012) had similar findings that the average production frontier of households without a wage worker was higher in their study region. While FENG (2008) found that participation in migration did not have any effect on technical efficiency.

The purpose of this chapter is to analyze the effects of land tenure arrangements, off-farm employment and land rental market participation on agricultural production in rural China. The remainder of the chapter structures as follows. Section 7.2 reviews theoretical approaches of measuring agricultural productivity and efficiency. Section 7.3 presents a theoretical framework for the analysis. Section 7.4 introduces the estimation procedures. Estimation results are presented in section 7.5. Moreover, section 7.6 discusses the variation of productivity and technical efficiency. An extended discussion about factor markets, productivity and rural income is illustrated in section 7.7. Finally, section 7.8 concludes the chapter with summarizing the main findings and drawing some policy implications.

7.2 Theoretical Approaches of Measuring Agricultural Productivity

7.2.1 Productivity and Efficiency

Following LOVELL (1993), the productivity of a production unit can be measured by the ratio of its output to its input. Thus, agricultural productivity is measured as the ratio of agricultural outputs to agricultural inputs. While individual products are usually measured by weight, their varying densities which make measuring overall agricultural output difficult. Therefore, output is usually measured as the market value of final output, excludes intermediate products such as corn feed used in the meat industry. This output value may be compared to many different types of inputs such as labor and land in terms of yield. These are called partial measures of productivity. Agricultural productivity may also be measured by what is termed total factor productivity. This method of calculating agricultural productivity compares an index of agricultural inputs to an index of outputs. This measure of agricultural productivity was established to remedy the shortcomings of the partial

measures of productivity; notably that it is often hard to identify the factors that cause them to change. Changes in TFP are usually attributed to technological improvements (LIPSEY AND CARLAW, 2004).

However, productivity varies according to differences in production technology, production process and differences in the environment in which production occurs. The main interest here is in isolating the efficiency component in order to measure its contribution to productivity. Producers are efficient if they produce as much as possible with the inputs they have actually employed and if they have produced that output at minimum cost (GREENE, 1997). The concept of technical efficiency entails a comparison between observed and optimal values of output and inputs of a production unit (SADOULET AND JANVRY, 1995). This comparison takes the form of the ratio of observed to maximum potential output obtainable from the given input, or the ratio of the minimum potential to observed input required to produce the given output, or some combination of the two. These two give rise to the concepts of technical and allocative efficiency. A productive entity is technically inefficient when, given its use of inputs, it is not producing the maximum output possible (output distance), or given its output, it is using more inputs than is necessary. Similarly, a production unit is allocative inefficient when it is not using the combination of inputs that would minimize the cost of producing a given level of output (SADOULET AND JANVRY, 1995).

Efficiency and productivity are closely related. Changes in productivity are due to differences in production technology, differences in the efficiency of the production process, and differences in the environment in which production takes place (GROSSKOPF, 1993). Productive efficiency is therefore an important determinant of productivity and should be incorporated in productivity analyses. The empirical challenge is to measure productive efficiency and to apportion its share in the productivity variations (ODHIAMBO AND NYANGITO, 2003). Considering the data available, this study analyzed productivity through land productivity, labor productivity and technical efficiency.

7.2.2 Efficiency Measurement

Based on the seminal work of DEBREU (1951), KOOPMANS (1951) and FARRELL (1957), who developed a conceptual model to measure efficiency, which is known as frontier analysis. According to BOGETOFT AND OTTO (2011), each productive unit can be described by its employed production plan, i.e. the input-output-combination. The basic idea of frontier analysis is to derive a reference performance, i.e. a best-practice frontier, from a given set of different input-output-combinations, to which each observation is compared. The distance to

that frontier is then interpreted as the waste of resources or the omission of potential outputs and provides a measure of inefficiency or the degree of efficiency, respectively (NIESWAND, 2012).

Additionally, most of the research on efficiency of small farms has been triggered by the very influential work of SCHULTZ's (1964) "efficient but poor" hypothesis. Since then, many studies have been conducted in different countries to analyze the technical efficiency level of farmers (AIGNER ET AL., 1977). In microeconomics of production, technical efficiency is defined as "the maximum attainable level of output for a given level of inputs, given the current range of alternative technologies available to the farmer" (ELLIS, 1993). Technical efficiency can be analyzed using two approaches. These are the output-oriented and input-oriented approaches. The first one has an output-augmenting orientation, whereas the second one is targeted toward conservation of inputs.

As indicated in Figure 7.1, "x" is inputs on the X-axis and "q" is output on the Y-axis. There is a frontier line in the center of the diagram. The production frontier represents the maximum output attainable from each input level. Hence, it reflects the current state of technology in the industry. Farms operate either on that frontier if they are technically efficient or beneath the frontier if they are not. Point A represents an inefficient point whereas points B and C represent efficient points. A farm operating at point A is inefficient because technically it could increase output to the level associated with point B without requiring more input. The distance to the frontier line measures the inefficiency of farms.

Generally, measurement of technical efficiency can be done using either parametric (econometric) approaches or non-parametric (mathematical programming) techniques. Econometric approaches developed by AIGNER AND CHU (1968) are among the first to use stochastic frontier methods of estimation. Their model acknowledges the influence of random errors and data noise on agricultural production. This approach assumes that deviations from the production frontier may not be entirely under the control of farmers (AIGNER ET AL., 1977). In doing so, the model helps in distinguishing the effects of stochastic noise from the effects of other inefficiency factors. It also allows hypothesis testing on the production structure and efficiency. However, this approach imposes a distributional assumption of the inefficiency term and the frontier technology. On the other hand, a non-parametric approach (Data Envelopment Analysis) does not impose such restrictions, but assumes the absence of measurement or sampling errors, and deviations from the production frontier are under the control of the production unit being considered. They are, thus, deterministic. In farming systems where production is highly bound to the natural environment, the effect of stochastic noise

is clearly observable. Therefore, the current study followed a stochastic frontier approach.

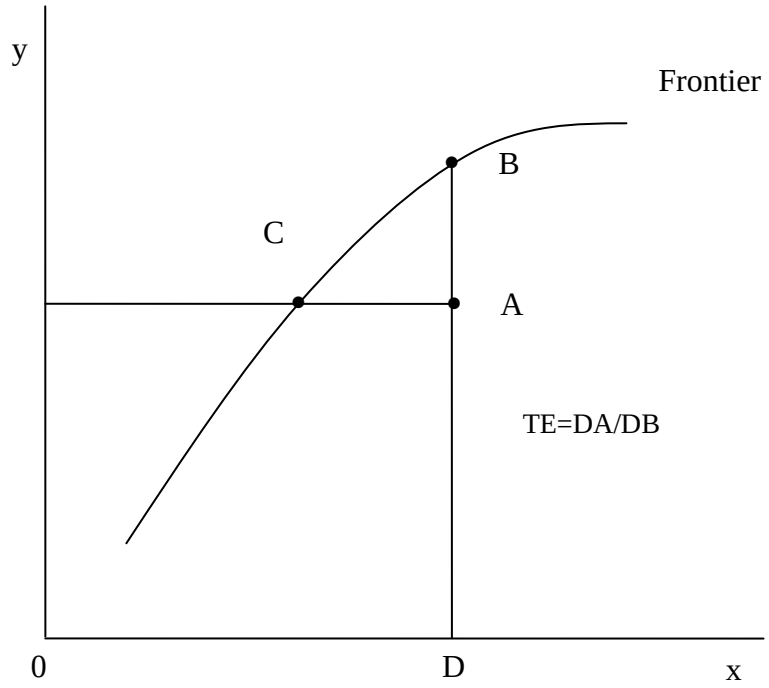


Figure 7.1: Production frontiers and technical efficiency
Source: FENG AND HEERINK (2008)

7.3 Econometric Models and Estimation Methods

7.3.1 Specification of the Frontier Production Function

Stochastic frontier models (SFM) developed simultaneously by AIGNER ET AL. (1977) and MEEUSEN ET AL., (1977) are made up of three components: the deterministic production function, the idiosyncratic error and the inefficiency error component. Since the error term has two components, the stochastic frontier models are often referred to as "composed error models". The general version of the stochastic frontier production function can be written in the following way:

$$Y_i = f(x_i, \beta)\exp(v_i)\exp(-u_i) \qquad i = 1, 2, ..., I. \qquad (7.1)$$

Where Y_i is the single output, β is a vector of technology parameters and x_i is a vector of inputs used. The model specifies two random disturbance terms v_i and u_i. The random disturbance term v_i is intended to capture the effects of the stochastic noise. It is assumed to be independently distributed with a mean equal to zero and standard deviation of σ_v^2. The disturbance term u_i captures technical inefficiency and is assumed to be independent of v_i. Its distribution is assumed to be half normal, being identically and independently distributed as $N(0, \sigma^2)$.

Let σ_v^2 and σ_u^2 be the variances of the symmetric (v) and one-sided (u) error terms. It then follows that:

$$\sigma^2 = \sigma_v^2 + \sigma_u^2 \qquad (7.2)$$

and the ratio of the two standard errors is as used by JONDROW, ET AL. (1982):

$$\lambda = \sigma_v + \sigma_u \qquad (7.3)$$

According to BATTESE AND CORRA (1977), the variance ratio parameter γ, which relates the variability of u_i to total variability (σ^2) can be calculated in the following manner:

$$\gamma = \lambda^2 / \left(1 + \lambda^2\right) \qquad or \quad \gamma = \sigma_u^2 / \left(\sigma_u^2 + \sigma_v^2\right) \qquad (7.4)$$

So that $0 \le \gamma \le 1$.

This means that if the value of γ is equal to zero, the difference between farm outputs is entirely due to statistical noise. On the other hand, a value of one would indicate that the difference is attributed to technical inefficiency (BATTESE AND CORRA, 1977; COELLI, 1995).

LOVELL (1993) shows that technical efficiency (TE) can be expressed as a reciprocal of Dubreau-Farrel output-oriented technical efficiency. This can be written as:

$$TE_i = \frac{y_i}{f(x_i, \beta)\exp(v_i)} = \exp(-u_i) \qquad i = 1, 2, ..., n. \qquad (7.5)$$

The production model will usually be linear in the logs of the variables, so for estimation purposes the model in (7.3) usually becomes:

$$\log y_i = \log f(x_i, \beta) + v_i - u_i \qquad i = 1, 2, ..., I. \qquad (7.6)$$

Where $u_i = \log \frac{1}{e_i^{sf}}$ and $f(x_i, \beta)$ can assume many functional forms; the two most used in empirical works are the Cobb-Douglas and the translog function. The relatively large number of inputs that were distinguished in this study greatly complicates the application of a translog function. Therefore, the Cobb-Douglas production function has been chosen for the analysis of the data.

Estimation of technical efficiency was first accomplished by Aigner, Lovell and Schmidt (1977), Battese and Corra (1977) and Meeusen et al., (1977). These studies provide estimates of the average technical efficiency over all the observations. The data used was cross-sectional in nature. To estimate the equations, a number of assumptions were necessary. First, it was assumed that

$v_i = 0$ and then an estimate of a deterministic production frontier was made. The maximum likelihood method (MLE) can then be used as an estimation procedure in this case.

The stochastic frontier model can be estimated using a one or two-stage approach. In the two-stage procedure, the frontier production function is estimated first and the values for technical inefficiency are derived subsequently, ignoring a set of variables (z) that affect technical inefficiency. In the second stage, these derived inefficiency levels are regressed to a vector of household and other socioeconomic variables (z) to see how efficiency levels vary with these variables (FENG 2008; ALEMU, 2010). However, it is suggested to use caution with this approach, because it violates the distributional assumptions of the error terms. In other words, the two-stage procedure lacks consistency in assumptions about the distribution of the inefficiencies. In step one, it is assumed that inefficiencies are independently and identically distributed in order to estimate their values. In step two, estimated inefficiencies are assumed to be a function of a number of household-specific factors, violating the assumption in step one (COELLI ET AL., 1998; WANG AND SCHMIDT, 2002). A single stage maximum likelihood model (BATTESE AND COELLI, 1995) is suggested as a way to solve this problem, in which the relationship between technical inefficiency and the variables is imposed directly in estimating the frontier production function and the household inefficiency levels (KUMBHAKAR ET AL., 1991; WANG AND SCHMIDT, 2002). In this study, the one-stage approach is used because of its advantages. The maximum likelihood estimates were computed using the statistical package STATA 10.1.

Agricultural production depends, in general, on land area, labor, seed, fertilizers, herbicides and pesticides, mechanical power, and irrigation. The descriptive statistics of the variables used in the stochastic frontier production function estimation, subdivided by participation in land rental markets are presented in Table 7.1. Among the 382 households used for the productivity and technical efficiency analysis, 151 households rented land from others.

Households in the survey area grow mainly grain crops, winter wheat and summer maize together in one year. The yields vary between varieties. For our study the gross value has been aggregated and measured in monetary units. The average value was 6868 Yuan per household, and the mean value for households that rented land was higher than households without land rental participation. Results from the ANOVA test further confirmed that the variation is substantial. Additionally, the average land area per household used for grain production was about 8.4 mu and the average labor input was around 59 days (Table 7.1). Seed, fertilizers, herbicides and pesticides, mechanical power and irrigation used for production were

measured in monetary units. From the results of ANOVA test, there is a statistically significant difference in all of the input variables among the two groups. Basically, all inputs in the Cobb-Douglas production function were expected to have a positive effect on grain production, except for herbicides and pesticides. Their effects on land productivity depend on whether they are applied for the prevention or control of weeds or pests.

Table 7.1: Descriptive statistics of the variables used in the SFM estimation

	HH rent land		HH not rent		F	Total	
	Mean	S.D	Mean	S.D		Mean	S.D
Gross value of output (Yuan)	8657.9	5573.0	5691.3	4426.0	33.7***	6867.9	5218.5
Labor (man-days)	67.6	28.6	54.2	24.3	22.3***	59.2	26.6
Area planted (mu)	10.6	6.8	7.0	4.9	34.8***	8.4	6.0
Seed (Yuan)	323.1	238.9	202.2	160.6	33.2***	246.7	198.8
Pesticide (Yuan)	294.6	295.1	205.0	163.9	36.2***	239.8	229.5
Fertilizer (Yuan)	1489.9	991.6	991.3	617.4	14.6***	1182.7	821.7
Mechanical power (Yuan)	325.5	209.1	230.2	165.1	22.9***	265.7	188.9
Irrigation (Yuan)	372.4	275.4	240.7	187.3	29.0***	290.1	233.4
No. of observations		147		235			382

Source: Field survey (2009)

7.3.2 Specification of the Productivity and TE Determinant Function

In crop production, productivity and technical efficiency is likely to be affected by a wide range of factors that are associated with farm management practices (FORSUND ET AL., 1980), including indicators of land-tenure security, farm characteristics, household characteristics, household market participation, e.g. participation in land rental markets, off-farm employment and agricultural products markets and other village-specific factors.

Description of the variables used in productivity and technical efficiency determinant estimation are specified as following. Tenure security is represented by the number of previous reallocations and household expectations of land reallocation in the next few years. Households that have experienced more land reallocations in the past or expect land reallocation in the near future are less secure than household that have experience less, or expect to. Therefore, reallocation times and expectation of reallocation are expected to be negatively correlated with productivity and technical efficiency. The share of households with certificates in a village and land transfer rights possessed by a household are used to indicate household land transferability. Issuance of land-use certificates to every household

in the village would reduce transaction costs of land rental. If land can be easily transferred between farmers, productivity will increase. Thus, land transferability is expected to be positively related to productivity and efficiency.

Land characteristics are represented by farm size, plot number and rating of soil quality. An inverse relationship between productivity and farm size is a common empirical finding in developing country agriculture (BENJAMIN, 1995). CHAYANOV (1926) first documented that small farms produce more output per cropped area in the Russian agriculture. Later, the same evidence was found by SEN (1962), BARDHAN (1973), and ROSENZWEIGAND BINSWANGER (1993) in other developing countries. For China's agriculture, by reviewing the relationships between farm size, productivity, and factor markets, BRANDT (1985) had similar findings in pre-war (1930s) northeastern China. Later, BENJAMIN AND BRANDT (2002), CHEN, HUFFMAN AND ROZELLE (2005) also found this inverse relationship in Chinese agriculture. Hence, a farm size variable is used here to test whether small farms are more efficient in the study area.

The number of plots in a household is an indicator of land fragmentation, which can have either negative or positive effects on productivity and technical efficiency (TAN, 2005). On the one hand, a larger number of plots needs more labor (NGUYENET AL., 1996) and may be more difficult to manage. On the other hand, it enables households to optimize their labor allocation over different crop species and seasons, especially if there is no market for agricultural labor (FENOALTEA, 1976). Grain production is influenced by the quality of the soil. In this study, farmers' rating of their land's soil quality is used as a soil quality indicator. It is expected that grain production is positively correlated with soil quality.

Household characteristics include average adult age, average adult education level and number of agricultural assets. Average age of household adults is used as a proxy for the family's farming experience. The effect of age on productivity and technical efficiency is ambiguous, depending on whether older farmers are more experienced or more likely to stick to farming traditions and less likely to adopt new technologies. Average education of adults represents the management skills of a family. Productivity and technical efficiency are expected to increase with education, as education increases the household's ability to utilize existing technologies and make better farm management decisions (BATTESE AND COELLI, 1995). In the research area, mechanical power such as mechanical seeders, mechanical traction, and combines are very commonly used. Households either possess or hire these machines for their agricultural production. Thus, the number of agricultural assets in a household is expected to have a positive impact on productivity and technical efficiency.

Household markets participation covers off-farm labor markets participation, land rental markets participation, and agricultural products markets participation. A dummy variable whether a household participates in off-farm employment represents household off-farm labor markets participation. Off-farm employment affects productivity and efficiency in three ways. The first one is through the lost-labor effect. Off-farm employment can be expected to reduce productivity and efficiency, especially if hiring agricultural labor incurs transaction costs and hired labor is not as efficient as family labor. The second one is through the income effect. Off-farm employment is expected to increase household incomes, and thereby facilitate the use of material inputs and improve technical efficiency (ROZELLE ET AL., 1999; TAYLOR ET AL., 2003). The third one is through the reduced-consumption effect. Household members working off-farm (e.g., off-farm employment by migrated members) means less food consumption and therefore reduces agricultural production if household production and consumption decisions are non-separable (BURGER, 1994; WOUTERSE, 2006). Therefore, the effect of off-farm employment on technical efficiency is ambiguous.

Household land rental market participation is measured by the possibilities of household renting decisions that is predicted with a probit model (see Appendix 2). In principle, all explanatory variables in the determinant function should be exogenous. However, household participation in land renting as well as off-farm employment may be endogenous as they depend on tenure security, land characteristics, household characteristics, market rent, wages and other prices. As mentioned earlier, data on household participation in off-farm employment were collected for the year 2008, whereas data on household participation in land renting and agricultural production were collected for the year 2009. Household participation in off-farm employment is therefore treated as exogenous. Decisions on land renting were made in the year 2009 and may therefore be considered endogenous.

Inclusion of endogenous variables in the estimation may result in biased estimates. Instrumental variables are used to address this endogeneity problem. First, a probit model was used to estimate land renting at the farm household level, and to predict the probability of household participation in land renting. The predicted probability was then used as an instrument for the actual participation in the land rental market in determinant estimation of land and labor productivity, as well as technical efficiency. As mentioned previously, households renting land are expected to achieve a higher productivity and technical efficiency because developed land rental markets enable the transfer of land from less efficient to more efficient households.

For household participation in agricultural products markets, this study uses the ratio of sold output to total output as a proxy. Following SCHULTZ's (1964) 'poor-but-efficient' hypothesis, small farmers in traditional agricultural settings are reasonably efficient in allocating their resources by responding positively to price incentives. As part of the market economy, farmers are profit maximization motivated production units. Efficiency and profit maximization are two sides of the same coin; at the level of individual production unit we cannot have one without the other (KEBEDE, 2001). Therefore, the ratio of sold output to total produced output is used here to measure the influence of participation in products markets on agricultural productivity and technical efficiency.

To capture the variation in other factors that systematically differ between the counties, two dummy variables for the Mengzhou and Wenxian counties are included. It is assumed that the production frontier may shift by county.

7.4 The Determinants of Land and Labor Productivity

The results of the determinant function for land and labor productivity are presented in Table 7.2. As expected, reallocations have a significant and negative impact on land productivity, indicating that tenure security does influence productivity. Share of certificates is positively related to both land and labor productivity, and significantly so. Share of certificates represent land transferability, therefore the results suggest that land transferability significantly affects productivity. This finding confirms the results of earlier research by LOHMAR ET AL. (2001) and FENG (2008), i.e., that land transfer markets facilitate the transfer of land from less to more productive households. However, the other two variables for land tenure arrangements, namely expectation of reallocation and land transfer rights were found to have no significant impact on land productivity. For all of these four institutional variables, only the coefficient of land transfer rights is significantly much different from zero in the labor productivity determinants function, suggesting that households in a village with little intervention in farmer land transactions are predicted to have higher labor productivity.

Regarding land characteristics, farm size was found to have no significant impact on land productivity, but a highly significantly effect on labor productivity. The positive sign indicates an increasing return to scale; the bigger the farm, the more easily the formation of appropriate scale, and the higher the labor productivity of farmers. Moreover, plot number negatively affects land productivity, which indicates that land fragmentation leads to higher probability of land productivity reduction. As expected, soil quality rating positively affects land productivity.

However, these two variables have no significant impact on labor productivity.

Table 7.2: OLS estimates of determinants for land and labor productivity

Explanatory Variables	Land productivity			Labor productivity		
	Coef.	t	S. E.	Coef.	t	Robust S.E.
Land tenure variables						
Land reallocations	-13.91**	-2.37	5.877	-25.50	-0.78	32.62
Expe. of reallocation	15.43	0.86	17.91	-10.72	-0.10	104.21
Share of certificates	3.035*	2.04	1.487	-17.55	-1.49	11.75
Land transfer rights	-14.34	-0.86	16.64	153.9*	1.76	87.44
Household variables						
Farm size (mu)	1.993	0.40	5.044	217.2***	3.44	63.12
Plot number	-9.859*	-1.74	5.608	80.15	1.45	55.45
Soil quality rating	96.78***	7.75	12.50	51.53	0.69	74.40
Average adult age	3.431**	2.28	1.507	-6.124	-0.59	10.40
Average adult education (yrs)	18.89***	3.59	5.260	-0.809	-0.03	29.04
Agricultural assets	8.834*	1.89	4.678	63.60**	2.58	24.66
Market parti. variables						
Off-farm labor market (1=yes)	40.56	1.10	36.91	-514.9**	-1.86	277.3
Land rental market[1]	45.43*	2.06	43.54	969.9***	3.28	295.4
Agriculture products market	31.61*	0.70	45.09	872.6***	4.02	217.2
County dummy (cf. Huaxian)						
Mengzhou	29.60	0.82	36.19	-1142.5***	-3.15	362.5
Wenxian	-121.7***	-3.25	37.42	-1403.4***	-3.94	356.0
constant	1214.2***	10.46	116.05	1986.3**	2.33	853.0
Number of observations			382			382
R squared			0.403			0.604
Adj-R-squared			0.379			
F(15, 366)			16.49			30.35
Prob > F			0.000			0.000

Notes: [1]Household renting in decisions are predicted probabilities by estimating a probit model in Appendix 2. ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively. Tests for homoskedasticity and multicollinearity for variables used in productivity analysis are in Appendix 3.

For household characteristics, average adult age and average adult level of education were both found to positively, significantly, affect land productivity. The positive effect of age suggests that older farmers are more experienced. In addition, more education means more management skill and greater ease learning and accepting new technology. Surprisingly, these two variables have an insignificant

impact on labor productivity. One explanation for this might be that younger and more educated farmers more easily engage in migration or local off-farm work, they may only pursue part-time farming, thus the effect of average age and education have no significant impact on labor productivity. Household agricultural assets have a significantly positive impact on both land productivity and labor productivity. Households with more agricultural assets are expected to face fewer obstacles in agricultural production, besides, agricultural assets, especially mechanical assets, show a substitutive effect with labor input.

Concerning off-farm employment, the OLS results show that it significantly effects labor productivity. The negative sign indicates that households who participate in off-farm employment have low labor productivity compared to households who do not. Households that rent land achieve higher land and labor productivity, because a well-developed land rental market enables the transfer of land from less productive households to more productive ones. Furthermore, the participation in product sales markets significantly increases both land and labor productivity. When involved in a sales market, as a production unit, households are also motivated by profit maximization, which results in optimizing resource allocation and improving productivity. Finally, the two county dummy variables indicate that households in Mengzhou have lower land productivity than households in Huaxian, and households in Mengzhou and Wenxian have low labor productivity than households in Huaxian.

7.5 Results for SFP and the Determinants on Technical Efficiency

7.5.1 Results for Stochastic Frontier Production Function

The results of the stochastic frontier production function are presented in the upper part of Table 7.3. The inefficiency component of the disturbance term (u) is significantly different from zero, which indicates that there is statistically significant inefficiency in the data. Besides, the value of gamma (γ) indicates that 47.2 percent of the variation in output is due to technical inefficiency. This means that technical inefficiency is likely to have an important effect in explaining output among farmers in the sample.

As expected, output responded significantly and positively to land, fertilizers, and mechanical power. The elasticity of output with respect to land, fertilizers and mechanical power are 0.894, 0.030 and 0.052 respectively, indicating the importance of land as a scarce resource for agriculture production in China. Output responses to herbicides and pesticides are negative and statistically significant. The over-use of herbicides and pesticides is a common phenomenon in China, which

causes the diminishing return to production effect and environmental problems as well. The sum of the elasticity is 1.001. A test for constant returns to scale is support for agriculture production in study area.

The average technical efficiency score for the sample was 0.85. This indicates that on the average 85 percent of the potential output is obtained by using the current mixture of production inputs. It also reveals the challenge and potential for improving agricultural production in Northwest Henan Province. The technical efficiency estimates ranged from 0.60 to 0.99. Of all the households in the sample, around 43 percent had technical efficiency scores below 0.85. This suggests that substantial gains in production can still be obtained by improving farm management practices under the existing technologies.

7.5.2 Determinants of Technical Efficiency

The results for the determinants of technical efficiency are presented in the lower part of Table 7.3. As proposed, land reallocation is found to be positively related to inefficiency, thus negatively related to technical efficiency. Because of tenure insecurity, farmers tend to invest less, especially for long term input such as organic fertilizers, which results in the decrease of soil quality and other related environmental problems and further leads to efficiency loss in production. Whereas, expectations of land reallocation was found to positively affect technical efficiency. A possible explanation is that when farmers assume that there will be a land reallocation in the near future, they tend to use more variable inputs, such as chemical fertilizer, herbicides and pesticides to maximize short-term agricultural profits on the current land. Therefore, in a short period, those households seem to achieve a higher technical efficiency. As with the impact on land and labor productivity, shares of certificates, land transfer rights have no significant impact on technical efficiency.

Among the three land characteristics, only soil quality rating was found to have a positive impact on technical efficiency at the one percent significance level. Average adult age and average adult education level showed positive correlation to technical efficiency, indicating that more experienced and educated farmers are more efficient. As expected, agricultural assets have a positive effect on technical efficiency. With agricultural assets, especially those modern machines which are effective tools to improve technical efficiency, the use of mechanical power in production essentially makes farming less labor intensive and hence reduces the cost of production substantially.

Table 7.3: MLE estimate of the SFPF and inefficiency determinants

Dependent variable: Ln Aggregate output of Grains (Yuan)			
Explanatory Variables: Production function part	Coef.	z	Std. Err
Ln labor input (man-days)	0.025	1.29	0.019
Ln area planted (mu)	0.894***	29.16	0.031
Ln seed (Yuan)	0.015	1.45	0.010
Ln herbicides and pesticides (Yuan)	-0.031*	-1.88	0.017
Ln fertilizer (Yuan)	0.030*	1.71	0.018
Ln machinery used (Yuan)	0.052***	3.43	0.015
Ln irrigation (Yuan)	0.016	1.45	0.011
Constant	6.459***	49.21	0.131
Inefficiency determinants			
Land tenure variables			
Land reallocations	0.008*	1.94	0.004
Expectation of reallocation	-0.026*	-1.88	0.014
Share of certificates	-0.003*	-1.99	0.001
Land transfer rights	0.005	0.39	0.014
Household variables			
Farm size (mu)	-0.006	-0.95	0.007
Number of plots	0.003	0.56	0.005
Soil quality rating	-0.081***	-6.99	0.011
Average adult age (yrs)	-0.003**	-2.11	0.001
Average adult education (yrs)	-0.016***	-3.55	0.004
Agricultural assets	-0.006*	-1.75	0.003
Market participation variables			
Off-farm labor market (1=yes)	-0.038	-1.21	0.031
Land rental market	-0.064*	-1.78	0.038
Agriculture products market	-0.042	-1.28	0.033
County dummy (cf. Huaxian)			
Mengzhou	0.023	0.65	0.036
Wenxian	0.111**	3.11	0.036
Constant	0.517***	5.17	0.100
lnsigma2	-4.503***		
Number of observations			382
Gamma			0.472
Wald chi2(7)			4020.31
Loglikelihood			342.90

Notes: ***, **, and * indicate significance at 1%, 5%, and 10% levels, respectively.

Regarding household land rental market participation behavior, it was found to be positively related to technical efficiency, indicating that households that rented land achieved higher technical efficiency than households that did not rent land. This finding confirms that land resources could be transferred to higher efficiency

farmers through land rental markets (LOHMAR ET AL., 2001; FENG, 2008). Other market participation, off-farm labor markets and agricultural products markets were found to have no effect on technical efficiency.

7.6 Variation of Productivity and Technical Efficiency

Technical efficiency scores obtained from the stochastic frontier production function and calculated productivity scores are summarized in Table7.4. When we look at the situation across regions, both the productivity and efficiency scores for Huaxian are higher, the results showing that households in Huaxian are the most productive among all the three counties. Second are households in Mengzhou County, while farmers in Wenxian are the least productive. From a Kruskal-Wallis test[8] (table 7.4), it is observed that the mean difference in productivity and technical efficiency scores among households of the three counties is statistically different to zero, which means that there is productivity and technical efficiency variation among the regions.

Table 7.4: Kruskal-Wallis test of productivity and efficiency variation in counties

County	Land productivity		Labor productivity		TE	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Mengzhou (N=149)	1679.25	196.64	1583.20	921.27	0.88	0.06
Wenxian (N=119)	1486.17	199.78	1175.70	732.39	0.79	0.07
Huaxian (N=114)	1644.82	180.93	3432.40	1800.62	0.92	0.07
H statistic		60.5		165.9		114.0
Sig.		0.000		0.000		0.000

By looking at the situation according to land rental market participation, households that rent land have higher productivity and efficiency scores. In particular, labor productivity for households who rent-in land is 1.5 times greater than that of households without land rental participation. The Man-Whitney test shows this variation to be statistically significant. This finding once again confirms the results of earlier research by DEININGER AND JIN (2005) i.e. that land rental markets have a positive impact on land transfer to more agriculturally able famers, also, technical efficiency can be improved at the same time (FENG, 2008).

[8] Data did not meet the prerequisition of normality distribution and homogeneity of variance for applying ANOVA or T tests, therefore the non-parametric Kruskal-Wallis test and Man-Whitney test are suitable. The detailed test of normality and variance homogeneity can be found in appendix 4.

Table 7.5: Man-Whitney test of productivity and efficiency variation in land rental market participation

County	Land productivity		Labor productivity		TE	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Land rent HH (N=147)	1640.73	181.44	2526.56	1646.08	0.88	0.07
No rent HH (N=235)	1588.86	224.16	1683.81	1365.1	0.84	0.09
Z statistic	-2.367		-6.547		-3.952	
Sig.	0.018		0.000		0.000	
Total (N=382)	1608.83	210.03	2008.11	1533.4	0.86	0.08

7.7 Factor Markets, Productivity and Rural Income

The Chinese authorities have identified promoting agricultural productivity, raising farmers' incomes and narrowing the rural-urban income gap as top priorities for the near future (FENG, 2008). Raising productivity involves the production of greater outputs and higher earnings using lower quantities of inputs and through value-addition and innovation to cater to customer needs. Improvement of productivity would therefore bring down unit costs of agricultural products, while raising incomes of about 6.5 billion people living in rural areas. Reducing the rural-urban income gap is likely to depend on increases in the productivity of land and labor, and therefore on the development of rural land and off-farm labor markets (NYBERG AND ROZELLE, 1999).

The development of rural land rental markets can improve agricultural productivity and equity by facilitating transfers of land to more productive farmers and facilitating participation in the non-farm economy by less productive farmers (TU, HEERINK AND LI 2006). Whereas the development of off-farm labor markets could facilitate the smooth movement of labor out of the agricultural sector into higher-paying non-agricultural jobs and provide land rental supply to farmers who want to stay in the agricultural sector (DEININGER ET AL, 2012).

The analysis from the previous sections reveals that household land rental activity positively affects productivity and technical efficiency. This confirms that land rental markets facilitate the transfer of land to more productive farmers. Higher productivity will lead to higher income. However, this is just the short-run effect of land rental markets. From the long-run perspective, even if land productivity decreases, as long as household farm size increases, by renting land from other farmers, farm income could still continue to grow. Therefore, in the long-run, there is a need for structural change in agriculture and an increase in farm size.

Moreover, this simultaneous process of structural adjustment and farm size increase depends very much on the labor market situation outside agriculture.

Because of the restrictions in total land availability, individual farm growth by the means of additional land can only be achieved when other farms reduce or give up their farming activities (BAUER AND MICKAN, 1997). Within the overall process of economic development, an increasing proportion of the people has to be employed in the industry or service sectors for the average farm size to be able to increase, in order to earn parity income from agriculture (BAUER AND KESTING, 1993). Thus, for the policy aim of increasing rural household incomes and reducing the rural-urban income gap, the development of both land rental and off-farm labor markets are vital.

7.8 Summary

Land rental market development and off-farm employment have important implications for agricultural production. This chapter investigated the productivity and technical efficiency in agricultural production and examined the effect of land tenure arrangements, land rental market participation and off-farm employment on productivity and efficiency for 382 sample households in the study area.

The empirical results allow drawing several main conclusions. The technical efficiency estimates ranged from 0.59 to 0.98 in agricultural production in Northeast Henan Province, with a mean value of 0.86, suggesting that there is a 14 percent scope for increasing crop production under the existing technological conditions. Results from summarization of the mean productivity and technical efficiency scores by counties show that Huaxian earns the highest scores in both productivity and efficiency while Wenxian earns the lowest scores and Mengzhou ranks in between, indicating a regional difference in agricultural production.

Results from determinants of productivity and technical efficiency show that secured land-use rights are positively related to land productivity and technical efficiency. This finding has strong policy implication that increasing tenure security, by prohibiting land reallocation and readjustment, facilitating formal land registration, and creating an efficient system of land administration in rural areas will increase agricultural production.

The findings also show that participation in off-farm employment does not have an effect on land productivity and technical efficiency. A possible explanation of this finding is that agricultural production in the research area is characterized by small farm size and a large labor surplus and that the remittances sent home by migrants are mainly used for non-agricultural purposes, such as building houses and marriage. While off-farm employment is negatively related to labor productivity due to the substitution effect of labor allocation between farm and off-farm work. There is significant income difference between farm work and off-farm work in

China (LI, 2003), rational peasants (POPKIN, 1979; SCHULTZ 1964) would without doubt choose work in the off-farm sector to maximize their profit. Although off-farm employment decreases agricultural labor productivity, policies aimed at improving access to off-farm employment opportunities may improve household incomes and release more land rental supply in rural China.

Participation in land rental markets positively affects productivity and technical efficiency. Compared to households with no land rental market participation, households that rent land are more productive and technically more efficient. Therefore, the development of land rental markets allows land to be transferred to those who are more capable of earning a higher return from agricultural production; which suggest that policies to stimulate the development of land rental markets would contribute significantly to agricultural production in rural China. Hence, in order to facilitate the realization of this transfer, measures to reduce the transaction costs of exchanging land would be appropriate.

Participation in agricultural products markets increases both land and labor productivity. Rural households normally diversify into a range of farm, non-farm and off-farm activities (ELLIS, 2000) and consequently are integrated into the market through participation in multiple input markets as well as multiple output markets. Overall, increased market orientation moves rural households from subsistence production to profit and (cash) income-oriented decision making units, which can result in increased production.

8 CONCLUSIONS AND POLICY IMPLICATIONS

This chapter summarizes the main findings of the study, highlights the policy implications and provides recommendations for future research. The discussion is presented in three sections. The first section deals with a summary of issues related to the research problem and approaches followed. The second section discusses major results of the study and implications for policy. Finally, the third section indicates limitations of the study and recommends areas of future research.

8.1 Summary of the Study

8.1.1 Problem Statement and Methodological Approach

As a result of over three decades of economic reform, China has made rapid progress in increasing agricultural productivity and farmer incomes and alleviating rural poverty. However, agricultural productivity and rural industrial growth have slowed down in recent years, and the income disparity between rural and urban households has widened rapidly. The development of land and labor markets, which facilitate the smooth movement of labor out of the agricultural sector into higher-paying, non-agricultural pursuits and market-based land transfers from less to more productive farmers who can expand the scale of their operations, may contribute both to increasing agricultural productivity and rural household incomes and to reducing the income inequality between rural and urban areas.

Nevertheless, rural labor and land rental markets still face many institutional obstacles and remain largely underdeveloped (FENG, 2008). The current Hukou and land tenure systems are the most crucial. Better appreciation of how these institutional factors affect the direction and pace of rural structural change and productivity will be critical to understanding the underlying dynamics and helping design policies that can avoid the rising rural-urban inequality without having to resort to very costly and potentially distorting transfer payments (JIN, ET AL., 2012). However, even though China is at a critical point in terms of policy design, empirical studies in this area are lacking.

To help close this gap, this study uses data collected from 479 randomly selected farm households in Henan province to explore the impact of land tenure arrangements on off-farm labor markets and land rental markets development and the combined effects of land institutions and factor markets development on agricultural production.

Based on the notion of tenure security and transferability as the main ways through which land tenure affects behavior, this study uses four variables to measure land

tenure arrangements. Two variables have been chosen to represent tenure security: the number of reallocations that have taken place in a village since the HRS was established and household expectations of land reallocation in the next few years. The share of households with certificates in a village and land transfer rights possessed by a household are used to indicate household land transferability.

The determinants of off-farm employment participation, off-farm employment labor allocation as well as their work duration were analyzed using probit, poisson and tobit models. Factors affecting land rental market participation and its transaction amount were analyzed using Cragg's double-hurdle model with the assumption that the decision to participate in land rental markets may precede the decision on its transaction amount. Simple Ordinary Least Square (OLS) regressions were used to investigate the impact of land tenure, off-farm employment and land rental participation on land and labor productivity. Finally, a one-step Stochastic Frontier Production model was employed for examining the determinants of technical efficiency.

8.1.2 Empirical Findings

In an effort to attain the major objectives of this study, important findings were obtained from the different employed analytical tools.

The analysis of the determinants of off-farm labor market development indicates that tenure insecurity reduces incentives for exiting agriculture (mainly by migration), but have no influence on local off-farm employment, while certificates seem to increase participation in non-agricultural labor markets through their impact on both migration and local off-farm employment. Farm size significantly reduces off-farm employment, whereas fragmentation increases migration, but reduces local off-farm work. The quality of irrigation and drainage facilities, derived via farmer ratings, has a strong effect on both migration and local off-farm work. The finding of previous research that larger households and households with fewer dependents tend toward migration is further confirmed in this study. Farmer age reduces off-farm labor market participation and education promotes off-farm employment, especially migration, which is also consisting with earlier research findings. However, income deprivation is significantly and negatively related to off-farm labor supply, which is opposite to relative deprivation theory. One possible explanation is that the calculation of income in this study includes remittances, which makes households who do not have migrants are relatively deprived in the village.

The analysis on factors affecting household land rent decisions indicated that both land rent and its transaction amount are positively affected by share of certificates,

farm size, and village land transfer rates; and negatively by migration days and tenure insecurity. There are also variables significantly affecting one decision and not the other. For instance, local off-farm work days and household labor endowment negatively and positively affect land rent participation, respectively, but have no significant influence on its rental amount. Similar analysis on the supply side of land rental markets indicates that both households land rent-out and its amount are positively affected by migration days, share of certificates and village average rent prices and negatively by land reallocation. Two very interesting findings are that farm size discourages land rent-out participation, but encourages the land rent-out amount, whereas land fragmentation works in the opposite way, it affects land rent-out participation positively and land rent-out amount negatively.

In the analysis of determinants of land and labor productivity, it is verified that both land and labor productivity are positively affected by the share of certificates, a land rent-in dummy variable, agricultural assets and ratio of sold agricultural products. The positive influence of share of certificates and land rents indicates that land transfer markets could facilitate the transfer of land from less productive households to more productive ones. Additionally, land reallocation and land fragmentation negatively affect land productivity, while soil quality rating, average adult age and education positively affect land productivity. In contrast, farm size and off-farm employment positively and negatively affect labor productivity, respectively.

Results from a one-step stochastic frontier model showed that output responded significantly and positively to land area, fertilizers, and mechanical power. While output responses to herbicides and pesticides were negative and statistically significant, indicating the problem of herbicides and pesticides overuse. The analysis also revealed that technical efficiency is positively related to the expectation of land reallocation, soil quality rating, average adult age and education and a land rent-in dummy, while negatively related to land reallocations. Furthermore, summarizing land and labor productivity and technical efficiency indicated that productivity and technical efficiency varies by region and land rent-in participation.

8.2 Conclusions and Policy Implications

China has witnessed a massive movement of labor away from the farm and an increasing incidence of land rental activities over the past decades. Institutional mechanisms, however, still impose substantial restrictions on the development of land rental markets and off-farm employment. The empirical analyses indicate that

land tenure security and land transferability incentive household's off-farm labor market and land rental market participation, while migration could facilitate land rental market development by releasing more land rental supply, and finally, the development of land rental markets improves the efficiency of land allocation, agricultural productivity, as well as technical efficiency. By summarizing the policy recommendations in previous chapters, a number of policy options can be formulated as follows.

Further reform of land tenure and Hukou systems.

These two systems have, for a long time, served as China's strategy to support and stimulate industrial growth. However, they have also limited the development of land and labor markets and thereby constrained increases in agricultural land and labor productivity.

The current land tenure system, characterized by tenure insecurity and restrictions on land transfer rights, prevents rural households from marketing their land (and labor) resources as land remains the most important asset for farm households in terms of providing basic consumption needs (BURGESS, 2001), generating part of their income, and serving as a social safety net (DONG, 1996). Specific measures for emphasizing land tenure reforms are as follows. First, prohibit administrative land reallocation and promote a market-based land transfer system so that land resources can be allocated efficiently. Second, the government needs to set-up land offices in rural China and issue long-term land use rights certificates to farmers. Third, local government should reduce village level land transfer regulation through limiting the direct intervention of the village committee in household land transfers.

The empirical results suggest that engagement in off-farm work, especially migration will promote the development of land rental markets. However, the difficulty of achieving urban Hukou status impedes most farmers from becoming permanent migrants, so they are reluctant to give up their farmland in their home villages, which further dampens land rental supply. Therefore, it is also necessary to further reform the Hukou system. Specifically, local city governments need to define reasonable entry criteria for gaining urban Hukou for migrants (for example, the migrants have worked in the city for 2-3 years and earned a monthly income above a certain level). At the same time, the city governments can establish a welfare package for migrants who are granted urban Hukou. This package would include basic social security, public housing and children's educational arrangements. Then, if a migrant reaches the entry criteria as defined above, and is willing to give up his or her rural lands on a voluntary basis, the migrant can be granted an urban Hukou, and automatically be eligible for the welfare package.

The above reforms and their specific measures are very important prerequisites for developing land rental markets and stimulating off-farm employment, thereby increasing agricultural productivity and rural household incomes.

Build local institutions that facilitate land transfer and off-farm employment

The second set of policy options is to build local institutions that facilitate land transfers and off-farm employment. Land rental market participation and off-farm employment often involve high uncertainty and risk. Land rental transactions tend to be informal, short term, and involve little or no payment. Institutions that provide credit and/or help build information networks may therefore be instrumental in reducing the uncertainty and risk involved in land rental market participation and off-farm employment. These local institutions could provide information for households willing to participate in land rental transactions, and ensure long-term transactions that consolidate land and stipulate appropriate rents and written land rental contracts.

Local institutions could also provide information for households interested in working off-farm, offer specialized training, and intervene in the negotiation with urban employers to ensure a fair salary, insurance, appropriate working conditions and written work contracts. They could provide interested households with relevant information and other help, such as credit to cover the initial costs of starting their own business or investing in farming or other industries.

3. Promoting rural industry

As is the case in many other less-developed areas in China, migration is still a dominant choice of households in the research area. Results from the descriptive analysis show that over 60% of households have migrant members. Given that population levels in Shanghai, Beijing, Guangzhou and other mega-cities in China are approaching their limits, future off-farm income-earning opportunities for rural households should, wherever possible, be created within their own region or even more locally. In other words, local off-farm employment should be stimulated. The development of rural industry plays an important role in creating job opportunities and increasing incomes. The development of local-based secondary and tertiary sectors and the growth of small towns and cities are crucial for absorbing future surplus rural labor. Rural areas should make use of their comparative advantages, as geographical concentration of specialized farms could lead to agricultural product processing enterprises in their region. Rural areas that are near cities and have attractive scenery can development rural tourism.

4. Investments in infrastructure constructions and social service

Most rural areas in China are characterized by poor infrastructure, underdeveloped social services, and a fragile natural environment (OECD, 2005b). The conditions not only limit the potential for improving agricultural production, but also threaten farmer livelihoods. The empirical results reveal that developing infrastructure in irrigation and drainage will not only facilitate agriculture development, but also help release more labor from the agricultural sector. Moreover, educated farmers find it easy to engage in off-farm employment, even those who left in agriculture as productive farmers. Therefore, public investment in terms of improving rural infrastructure and social services in rural areas and providing free education and training may assist households to obtain access to off-farm employment and stimulate local land transfers. In this way, these interventions provide an important contribution to reducing income gaps and improving farmer livelihoods.

8.3 Limitations of the Study and Suggestions for Future Research

The study used data from 479 farm households in three counties in Henan province. They were selected in such a way that the findings are assumed to be applicable to a much larger area of Henan province, and probably much of the North China Plain with winter wheat and summer maize-based production systems. However, the empirical results evidently do not allow up-scaling of the conclusions to China as a whole. Further research in other regions of China is needed to assess the extent to which the findings have more general validity.

It is evident that this study uses cross-sectional household-level data. As a result, the linkages of variables across time are not investigated. This study examines the impact of land tenure arrangements on rural off-farm and land rental market development, and the consequences of that market participation on agricultural productivity and technical efficiency. Another important way that land property rights can impact agricultural production is through long-term investment in land, was not able to be investigated due to the crop rotation system, farmers' preferable use of chemical fertilizers and data limitation.

Finally, there are two areas for follow-up research. First, future research might use panel data and develop a systems approach to fully investigate the impacts of land tenure arrangements on agricultural production through long-term investment and land transferability. Second, land and labor are undeniably linked and it is generally believed that household land rental and off-farm employment decisions are often made jointly. Some of the recent land reform pilots also involved the loosening of residency requirements and thus allow study of the interaction between the two markets.

ZUSAMMENFASSUNG (GERMAN SUMMARY)

1. Hintergrund und Arbeitsziel

Nach drei Jahrzehnten der ökonomischen Reformanstrengungen in China ist die landwirtschaftliche Produktivität und das Einkommen der Landwirte gestiegen, wodurch die Armut in ländlichen Regionen gemildert wurde. Gleichsam verlangsamte sich der landwirtschaftliche Produktivitätsanstieg in den letzten Jahren genauso wie der Industrialierungsprozess im ländlichen Raum. Die Kluft zwischen ländlichen und urbanen Einkommen wuchs stetig. Die Entwicklung der regionalen Arbeitsmärkte erleichterte den Übergang von Arbeitskräften heraus aus dem landwirtschaftlichen Sektor, hinein in besser bezahlte außerlandwirtschaftliche Beschäftigung. Kleinere Grundbesitzer treten ihr Land auf Basis marktwirtschaftlicher Regeln an produktivere Großgrundbesitzer ab. Diese können ihre Produktionen erweitern, während die anderen in neuen Wirtschaftszweigen anwandern. Beide Entwicklungen leisten ihren Beitrag zur Reduzierung der Einkommensungleichheit zwischen ländlichen und urbanen Gebieten.

Nichtsdestotrotz stehen sowohl dem regionalen Arbeitsmarkt als auch dem Landpachtmarkt bürokratische Hindernisse entgegen, die die Dynamik des landwirtschaftlichen Strukturwandel abbremsen. Das aktuelle *Hukou* [9] - und Landbesitzregister spielt dabei eine entscheidende Rolle. Um die Eigendynamik dieser Prozesse zu begreifen, ist eine bessere Einschätzung dieser Faktoren in Bezug auf Geschwindigkeit der ländlichen Strukturveränderungen und Produktivitätssteigerungen von großer Bedeutung. Darauf basierend, lassen sich Strategien entwickeln, wie die Schere zwischen ländlichen und städtischen Regionen verringert werden kann, ohne kostspielige Finanzausgleichszahlungen in Kauf nehmen zu müssen. Obgleich sich China diesbezüglich an einem kritischen Punkt befindet, gibt es kaum empirische Erhebungen in diesem Bereich.

Um diese wissenschaftliche Lücke zu schließen benutzt die vorliegende Studie Daten von 479 zufällig ausgewählten Haushalten in der Provinz Henan, um den Einfluss von Grundbesitzvereinbarungen auf Einnahmen außerhalb des Landwirtschaftsbetriebs (außerlandwirtschaftliche Beschäftigung) und die Strukturveränderungen in der Landwirtschaft zu untersuchen. Unter Bezugnahme auf die kombinierten Effekte regionaler Institutionen und die Entwicklung der Faktorenmärkte werden Veränderungen der landwirtschaflichen Produktion untersucht.

[9] Hukuo ist eine staatliche Wohnsitzkontrolle die entscheidet zwischen urbanen und ländliche Zugehörigkeit.

2. Datenerhebung und methodische Auswertung

Die empirische Studie basiert auf Daten einer Einkommenserhebung zufällig ausgewählter Haushalte in Henan, einer der landwirtschaftlich bedeutsamsten Provinzen in Zentral-China. Erhoben wurden die Daten im Jahr 2009. Methodisch umfasst die Erhebung vier-augige Interviews zu Fragen zu Pachtverträgern, zur landwirtschaftlichen Produktion, zur einkommensrelevanten Arbeitsverteilung (einschliesslich Migration in die Stadt und ländliche auserlandwirtschaftliche Beschäftigung) sowie zu demographischen und ökonomischen Charakteristika der Haushalte. Die meisten Befragten waren Haushaltsvorstände. Waren diese nicht verfügbar, wurde der Ehegatte/die Ehegattin befragt.

Die Befragung umfasste drei Distrikte: Mengzhou, Wenxian und Huaxian – alle in der Henan-Provinz. Unter Berücksichtigung des ökonomischen Entwicklungsniveaus wurden drei Gemeinden in Mengzhou und Huaxian sowie zwei Gemeinden in Wenxian ausgewählt. Zudem wurden zwei bis drei Dörfer je nach topographischer Lage in jeder Gemeinde untersucht. In jedem Ort wurden 30 Haushalte nach dem Zufallsprinzip befragt. Insgesamt umfasst die empirische Erhebung acht Gemeinden, 17 Dörfer und 479 Haushalte.

Abhängig von der Grundbesitzsicherheit und deren Übertragbarkeit als Parameter des Verhaltens bei Pachtvertragsabtretungen benutzt die Studie vier Variablen, um den Prozess sich verändernder Grundbesitzvereinbarungen zu untersuchen. Zwei der Variablen repräsentieren das Maß der Besitzsicherheit: die Anzahl an umgesetzten Neuverteilungen pro Dorf, seit dem die HRS dort eingeführt wurde, sowie von den Haushalten erwartete Landumverteilungen in den nächsten Jahren. Die Anzahl von Haushalten mit entsprechenden Zertifikaten in einem Dorf und die freiheitliche Abtretung von Landnutzungsrechten indizieren die marktwirtschaftliche Funktionalität bei der Übertragbarkeit von Landbesitz.

Die Determinanten von außerlandwirtschaftlicher Teilnahme am Arbeitsmarkt, von nicht-wirtschaftlicher Beschäftigungsneuzuteilung, sowie von der Arbeitsdauer wurden mit dem Probitmodell, der Poissonverteilung und dem Tobitmodell analysiert. Dem hingegen wurden Faktoren, die die Teilnahme am Landpachtmarkt und die Anzahl stattfindender Transaktionen erklären, mit Craggs Double-Hurdle-Modell untersucht. Angenommen wurde dabei, dass die Entscheidung, im Pachtmarkt aktiv zu werden, der Entscheidung voran steht, wie intensiv sich die Menge an Transaktionen gestaltet. Mithilfe der Ordinary-Least-Square-Regression (OLS) wurde der Einfluss auf den Grundsbesitz, die außerlandwirtschafliche Beschäftgigung und die Teilnahme an Pachtvertragsveränderungen und Arbeitsproduktivität untersucht. In einem letzten Schritt wurde eine „Stochastic Frontier Analysis“ (SFA) herangezogen, um den

Bestimmungsgröße von technischer Effizienz zu überprüfen.

3. Empirische Ergebnisse

Die Resultate der Untersuchungen belegen, dass es im Untersuchungsgebiete einen aktiven Arbeitsmarkt außerhalb der Landwirtschaft gibt. 93 Prozent der befragten Haushalte gaben an, dass sie im Jahr 2008 Arbeitsbeschäftigungen außerhalb des Agrarbereichs nachgegangen sind. Zudem hat sich der Pachtvertragsmarkt robust weiter entwickelt. Die Untersuchung brachte zum Vorschein, dass 49 Prozent der Haushalte im 2009 auf dem Grundbesitzmarkt aktiv wurden - obgleich die Haushalte noch immer viele Hindernisse überwinden müssen, um daran zu partizipieren.

Die analysierten Determinanten zur Entwicklung des außerlandwirtschaftlichen Arbeitsektors zeigen, dass die rechtliche Besitzsicherung die Anreize reduzieren, die einen Ausstieg aus der Landwirtschaft ermöglichen sollen, während Zertifikate die Anreize steigern, da sie gleichermaßen auf Migration und regionale Arbeitsplatzwechsel einwirken. Die Größe der Bauernhöfe verringert die Wahrscheinlichkeit, dass ein Bauer eine außerlandwirtschaftliche Arbeit sucht, wohingegen die Flächenaufspaltung die Migrationsbewegungen bewirken, gleichsam aber lokale außerlandwirtschaftliche Beschäftigung vermindern. Die Qualität des Be- und Entwässerungsanlagen beeinflussen die Anreize gleichermaßen, wenn es um Migration und Branchenwechsel geht. Die Ergebnisse früherer Untersuchungen konnten innerhalb dieser Studie belegt werden, wonach größere Haushalte und Haushalte in geringen Abhängigkeitsverhältnissen eher zur Migration bereit sind. Höheres Alter beeinflusst die Teilnahme an außerlandwirtschaftliche Beschäftigung negativ, während höhere Bildungsabschlüsse begünstigend wirken. Das gilt vor allen Dingen für Migrationsbewegungen - ein Befund, der sich ebenfalls mit früheren empirischen Erhebungen deckt.

Die Analyse jener Faktoren, die eine Entscheidung zur Verpachtung von Ländereien in den individuellen Haushalten bedingen, brachte zu Tage, dass Pachtverträge und der Pachtpreis in etwa gleichem Maße durch Zertifizierungsscheine, die Größe der Bauernhöfe und die Ausstattung der Arbeit beeinflusst werden. Außerdem verpachten Haushalte in Dörfern, in denen ein aktiver Landpachtmarkt floriert, ihr Land mit einer größeren Wahrscheinlichkeit. Demhingegen übt die Teilnahme an einer außerlandwirtschaftlichen Beschäftigung einen gegenteiligen Einfluss aus. Ähnliche Untersuchungen der Angebotsseite auf dem Landpachtmarkt haben gezeigt, dass Pachtverträge, Pachtpreishöhe und Migration die Entscheidung zur Landverpachtung positiv beeinflussen. Pachtverträge führen dazu, dass Haushalte ihr Land bereitwilliger

abgeben. Landaufteilungen und die Anzahl der Arbeitskräfte üben einen gegensätzlichen Einfluss aus.

Die Analyse der verschiedenen Parameter von Land- und Arbeitsproduktivität hat ergeben, dass beide positiv durch Landzertifizierungsscheine und Partizipation an agrarkulturellen Erzeugnissen beeinflusst werden. Dies zeigt, dass die Landpachtmärkte den Verkauf von Ländereien von weniger produktiven Betrieben hin zu produktiveren erleichtern können. Weitere Variablen, die einen positiven Effekt ausüben, sind landwirtschaftlicher Besitz und die Teilhabe am Gütermarkt. Zudem wurde deutlich, dass Landumverteilungen und die Fragmentierung von Grundbesitz die Produktivität lähmen, während die Bodenqualität, das Durchschnittsalter der Erwachsenen und der Bildungsgrad die Produktivität steigern.

Die Ergebnisse des SFA zeigten, dass Outputs deutlich positiv auf Landbeschaffenheit, Düngemittel und mechanische Leistungskraft reagierten. Durch die übermäßige Verwendung von Herbiziden und Pestiziden kristallisierte sich ein deutlich negativer Einfluss auf die Outputs heraus. Die Analyse offenbarte des Weiteren, dass Neuverteilung des Landes die technische Effizienz negativ beeinflußt, während Bodenqualität, das Durchschnittsalter der Erwachsenen, der Bildungsgrad und verpachtete Ländereien effizienzsteigernd wirken.

Die oben aufgezählten empirischen Ergebnisse lassen verschiedene Schlussfolgerungen zu. Erstens, schaffen Landbesitzsicherheit und Landbesitzübertragbarkeit Anreize zur Partizipation der Haushalte an einer außerlandwirtschaftlichen Beschäftigung und am Landpachtmarkt. Zweitens, kann Migration die Entwicklung der Landpachtmärkte durch eine Zunahme des Pachtangebots erleichtern. Und drittens, verbessert die Entwicklung von Landpachtmärkten die Effizienz von Landaufteilungen, der landwirtschaftlichen Produktivität und der technischen Effizienz.

4. Schlussfolgerungen für die Politik

Basierend auf den empirischen Ergebnissen schließt diese Studie mit einer Reihe von politischen Vorschlägen zur weiteren Verbesserung der Entwicklung von Pachtmärkten und außerlandwirtschaftlicher Beschäftigung, sowie zur Förderung des Wachstums der landwirtschaftlichen Produktivität und der ländlichen Haushaltseinkommen.

a. Weitere Reformen der Bodenordnung und des Hukuo-Systems

Das aktuelle Bodenordnungssystem ist gekennzeichnet von unsicheren

Besitzverhältnissen und Restriktionen im Landtransferrecht. Es verhindert, dass ländliche Haushalte ihr Land- und ihre Arbeitskraftressourcen auf dem Markt anbieten, weil Boden noch immer das wichtigste Kapital für sie ist, wenn es um die Sicherstellung der persönlichen Grundversorgung geht (BURGESS, 2001). Das Land generiert große Teile ihres Einkommens und funktioniert als soziales Sicherheitsnetz (DONG, 1996). Spezifische Maßnahmen für Bodenreformen könnten wie folgt aussehen: Erstens, sollte die Regierung die administrative Landumverteilung verbieten ein marktorientierten Landaustauschsystem fördern. Dadurch könnte die Ressourcen des Landes effizienter genutzt werden. Zweitens, muss die Regierung regionale Ämter ins Leben rufen und die Herausgabe langjähriger, zertifizierter Bodennutzrechte für Landwirte in den Mittelpunkt stellen. Drittens, sollten lokale Regierungen auf Dorfebene die Regulierung der Märkte zurückfahren, indem Ortsvorstände keinen direkten Einfluss mehr auf Landverkäufe nehmen dürfen.

Das Hukou-System schränkt die Arbeitnehmermobilität und die Bodenressourcen ein, weil es im städtischen Raum schwer eine Hukou-Lizenz zu bekommen ist. Der Großteil der Landwirte migriert daher nicht auf Dauer. Sie weigern sich die landwirtschaftlichen Flächen in ihrer Heimat aufzugeben, was wiederum das Landpachtangebot mindert. Bei weiteren Reformen des Hukou-Systems müssen die lokalen Stadtverwaltungen dafür Sorge tragen, dass die Aufnahmekriterien für Migranten realistisch definiert werden. (z.B. für den Fall, dass ein Migrant in einer Stadt seit zwei oder drei Jahren mit einem bestimmten monatlichen Mindesteinkommen gearbeitet hat). Dies schafft Rechtssicherheit. Gleichzeitig könnten Stadtverwaltungen Sozialleistungen für Migranten einführen, die in der jeweiligen Stadt einen Arbeitsplatz angenommen haben. Die Leistungen könnten Sozialversicherungen, Sozialwohnungen und Bildungsangebote für die Kinder beinhalten. Erfüllen Migranten die Aufnahmekriterien, wie sie oben skizziert wurden, und sind freiwillig dazu bereit ihre Heimat und ihren Grundbesitz aufzugeben, treten die Sozialleistungen automatisch in Kraft.

b. Aufbau Institutionen, die die Grundstücktransfers und die außerlandwirtschaftliche Beschäftigung erleichtern

Die Partizipation an Pachtmärkten und die Aufnahme von Beschäftigung außerhalb der Landwirtschaft sind häufig von hoher Unsicherheit und Risiko geprägt. Verpachtungen sind informell, kurzbefristet und beinhalten eine geringe oder ganz ausbleibende Bezahlung. Institutionen, die Kredite bereitstellen und Informationsnetzwerke aufbauen, können dabei helfen, das Risiko zu schmälern. Sie sollten Informationen für die Haushalte bereitstellen, die bereit sind, an Pachttransaktionen teilzunehmen, und langfristige Rechtssicherheit zu angemessen

Mieten und schriftlich vorliegenden Verträgen sicherzustellen. Die Institutionen könnten auch Informationen für interessierte Haushalte bereitstellen, die außerlandwirtschaftlich Arbeit wollen, ihnen eine spezialisierte Ausbildung anbieten und in Verhandlungen mit städtischen Arbeitgebern eingreifen, um ein faires Gehalt, Versicherungen, angemessene Arbeitsbedingungen und schriftliche Arbeitsverträge zu gewährleisten. Sie könnten interessierten Haushalten Informationen und andere Hilfe zukommen lassen – etwa Kredite zur Gründung eigener Geschäfte oder zur Investition in landwirtschaftliche und andere Industrien.

c. Förderung ländlicher Industrie

In der Untersuchungsregion ist, wie in vielen anderen wenig entwickelten Regionen Chinas, Migration immer noch gängige Praxis. Die Ergebnisse der deskriptiven Analyse zeigen, dass es in über 60 Prozent der Haushalte Migranten gibt. Vor dem Hintergrund, dass sich die Bevölkerungsdichte in chinesischen Millionenstädten wie Shanghai, Beijing, Guangzhou und anderen ihren Grenzen nähert, sollten wenn möglich regionale oder lokale, außerlandwirtschaftliche Einkommensmöglichkeiten geschaffen werden. Mit anderen Worten, lokale, nicht landwirtschaftliche Arbeitsstellen sollten gefördert werden. Die Entwicklung ländlicher Industrie spielt eine wichtige Rolle für die Schaffung von regionalen Arbeitsstellen und für die Einkommenserhöhung ländlicher Haushalte. Die Entwicklung regional und lokalbasierter sekundärer und tertiärer Sektoren sowie das Wachstum kleiner Dörfer und Städte sind entscheidend, um Überschüsse an ländlicher Arbeitskraft aufzufangen. Ländliche Regionen sollten ihre Wettbewerbsvorteile nutzen um mögliche Entwicklungsschritte zu forcieren. Dies könnte zur räumlichen Konzentration spezialisierter landwirtschaftlicher Betriebe und zur Entwicklung gemeinsamer Verarbeitungs- und Vermarktungsunternehmen führen. Ländliche Regionen in Stadtnähe könnten sich zu Naherholungsbieten entwickeln.

d. Investitionen in Infrastruktur und soziale Dienste

Die meisten ländlichen Gebiete in China sind charakterisiert von einer mangelnden Infrastruktur, unterentwickelten Sozialsystemen und schwachen Umweltbedingungen (OECD; 2005b). Die Bedingungen schränken nicht nur das Potenzial zur Verbesserung der landwirtschaftlichen Produktion ein, sondern bedrohen zudem auch die Lebensgrundlage der Bauern. Durch die empirischen Analysen wurde herausgefunden, dass Infrastrukturentwicklungen bei Be- und Entwässerung nicht nur die Entwicklung der Landwirtschaft fördern können, sondern auch den Übergang von landwirtschaftlichen in nicht-landwirtschaftliche Beschäftigung foroieren. Darüber hinaus können gut ausgebildete Landwirte leicht

in neue Arbeitssektoren integriert werden. Gleichzeitig können die in der Landwirtschaft verbleibenden produktiver arbeiten. Demzufolge tragen öffentliche Investitionen zur Verbesserung der ländlichen Infrastruktur und der sozialen Dienste bei, eröffnen den Zugang zur kostenlosen Bildung und Ausbildung. Dies unterstützt den Übergang landwirtschaftlicher Haushalte in außerlandwirtschaftliche Beschäftigung und regt zur Abtretung von Grundbesitz an. Durch diese Maßnahmen wird ein wichtiger Beitrag geleistet, um Einkommenslücken zwischen Regionen und Städten zu reduzieren und die Lebensgrundlage der Landwirte zu verbessern.

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APPENDICES

Appendix 1: Comparison of Tobit and Cragg's double-hurdle model for household land rental decision and the transaction amount

Table A1.1: Comparison of Tobit and Double-hurdle model for household land rent decision

Variables	Tobit			Probit for participation		Truncated reg. for rent amount	
	Coef.	t	S. E.	Coef.	S. E.	Coef.	S. E.
Migration days	-0.005***	-4.50	0.001	-0.002***	0.0003	-0.002**	0.001
Local off farm days	-0.002	-1.50	0.001	-0.001***	0.0005	-0.001	0.001
Reallocations	-0.528**	-2.83	0.186	-0.186***	0.065	-0.770***	0.171
Expectation of reallocation dummy	-0.186	-0.51	0.366	-0.009	0.134	-0.532	0.352
Share of certificates	0.114***	4.10	0.027	0.046***	0.011	0.105***	0.027
Land transfer rights	-0.672**	-2.26	0.297	-0.535***	0.121	1.070***	0.340
Labor	0.712***	3.14	0.227	0.329***	0.089	0.148	0.205
Farm size	1.842***	6.40	0.288	0.273*	0.158	1.434***	0.246
Fragmentation	-0.277**	-2.10	0.132	-0.048	0.051	0.061	0.122
Sex dummy	0.382	0.59	0.643	0.058	0.249	0.174	0.624
Age (yrs)	-0.041*	-1.84	0.022	-0.006	0.008	-0.054***	0.019
Education (yrs)	-0.186*	-1.91	0.097	-0.012	0.037	-0.144	0.088
Cadre dummy	0.195	0.25	0.787	0.008	0.286	0.399	0.697
Village land transfer rate	0.109***	5.56	0.196	0.038***	0.007	0.064***	0.177
Village off-farm employment rate	-0.078*	-1.91	0.041	-0.014	0.017	-0.192***	0.038
Mengxian	1.654**	2.02	0.818	0.332	0.375	3.001***	0.687
Wenxian	1.945**	2.20	0.885	0.186	0.406	3.346***	0.745
Constant	-4.838**	-2.04	2.376	-1.828*	0.941	0.983	2.130
No. of observations	479			479		152	
Chi-square	246.55			209.75		108.52	
Log likelihood	-501.839			-194.425		-273.250	
sigma	3.171***					2.432***	
χ^2 test Double-Hurdle versus Tobit, $\lambda = 68.32 > \chi^2(17) = 33.41$ (double-hurdle is preferable)							

Notes: ***, ** and * indicate significance at 1%, 5 % and 10% levels, respectively.

Table A1.2: Comparison of Tobit and Double-hurdle model for household land rent out decision

Variables	Tobit			Probit for rent out participation		Truncated reg. for rent out amount	
	Coef.	t	S. E.	Coef.	S. E.	Coef.	S. E.
Migration days	0.007***	6.71	0.001	0.003***	0.0005	0.0007*	0.0004
Local off farm days	0.006***	4.63	0.001	0.003***	0.0005	0.0002	0.0004
Reallocations	-0.835***	-3.67	0.227	-0.281**	0.094	-0.245*	0.111
Expectation of reallocation dummy	0.530	1.61	0.329	0.215	0.165	0.044	0.090
Share of certificates	0.218***	6.74	0.032	0.091***	0.014	0.030*	0.012
Land transfer rights	-0.042	-0.16	0.259	-0.180	0.113	0.229**	0.083
Labor	-0.966***	-3.59	0.269	-0.396***	0.117	-0.028	0.082
Farm size	-0.306	-1.87	0.163	-0.231**	0.078	0.600***	0.063
Fragmentation	0.262	1.52	0.172	0.162*	0.081	-0.213***	0.059
Sex dummy	0.093	0.14	0.663	0.065	0.284	-0.097	0.207
Age (yrs)	0.047	1.83	0.025	0.017	0.011	0.0003	0.009
Education (yrs)	0.194	1.95	0.100	0.079*	0.044	0.064*	0.031
Cadre dummy	-0.575	-0.68	0.850	-0.231	0.399	0.152	0.264
Village land transfer rate	-0.0246	-1.34	0.018	-0.008	0.008	-0.00152	0.007
Village average rent	0.002	1.88	0.001	0.001	0.001	0.001	0.0004
Mengxian	0.283	0.30	0.947	0.220	0.426	-0.744*	0.164
Wenxian	0.346	0.34	1.004	0.316	0.446	-0.984**	0.329
Constant	-13.17***	-4.55	2.895	-5.099***		-0.319	0.329
No. of observations	479			479		90	
Chi-square	220.36			205.84		416.99	
Log likelihood	-297.864			-128.507		-76.205	
sigma	2.684***	11.64				0.573***	
						-0.556***	
χ^2 test Double-Hurdle versus Tobit, $\lambda = 186.304 > \chi^2(17) = 33.41$ (double-hurdle is preferable)							

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

Appendix 2: Results of the determinants of land rent probit model

Table A2.1: Determinants of land rent in probit model

	Coef.	z	S.E.
Reallocation times	-0.277***	-4.64	0.060
Expectation of reallocation	-0.216	-1.46	0.148
Share of certificates	0.079***	6.89	0.011
Land transfer rights	-0.471***	-4.06	0.116
Farm size (mu)	0.014	0.35	0.040
Number of plots	0.024	0.37	0.064
Soil quality rating	0.231**	2.17	0.106
Average adults' age (years)	-0.0098	-0.70	0.013
Average adults' education (years)	-0.078*	-1.71	0.046
Participate in off-farm labor market (1=yes)	-0.002	-0.01	0.336
Agricultural assets	0.099**	2.53	0.039
Ration of sold agriculture products	0.560	1.54	0.365
Mengxian	-0.101	-0.32	0.315
Wenxian	-0.148	-0.42	0.351
Constant	-1.115	-1.17	0.954
No. of observations	382		
Chi-square	139.23		
Log likelihood	-184.94		
Pseudo R2	0.28		

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels, respectively.

Appendix 3: Test for homoskedasticity and multicollinearity for variables used in productivity analysis

Table A3.1: Cameron & Trivedi's decomposition of IM-test for variables used in land productivity analysis

Source	Chi2	df	p
Heteroskedasticity	132.03	130	0.434
Skewness	14.61	15	0.480
Kurtosis	3.23	1	0.072
Total	149.86	146	0.396

Note: White's test for H0: homoskedasticity; against H1: unrestricted heteroskedasticity. p value has to be less than the given significance level to reject the null hypothesis, therefore there is no severe homoskedasticity problem.

Table A3.2: Cameron & Trivedi's decomposition of IM-test for variables used in labor productivity analysis

source	Chi2	df	p
Heteroskedasticity	239.24	130	0.000
Skewness	38.36	15	0.008
Kurtosis	3.21	1	0.073
Total	280.81	146	0.000

Note: White's test for H0: homoskedasticity; against H1: unrestricted heteroskedasticity. p value has to be less than the given significance level or Chi2 = 239.24 > χ^2(15) = 32.80 to reject the null hypothesis, therefore there is homoskedasticity problem.

Table A3.3: Variance Inflation Factor (VIF) for variables used in productivity analysis

variables	VIF	1/VIF
Mengxian	4.60	0.218
Wenxian	4.25	0.236
Land transfer rights	3.31	0.302
Share of certificates	2.52	0.397
Farm size (mu)	2.31	0.433
Ration of sold agriculture products	1.53	0.653
Average adults' age (years)	1.34	0.748
Average adults' education (years)	1.31	0.765
Number of plots	1.30	0.770
Participate in land rental market	1.21	0.829
Soil quality rating	1.20	0.833
Reallocation times	1.15	0.873
Participate in off-farm labor market (1=yes)	1.12	0.893
Expectation of reallocation	1.10	0.908
Agricultural assets	1.08	0.922
Mean VIF	1.95	

Note: Using the available rules of thumb (i.e. average VIF Has to be less than 2; individual VIF has to be less than 10), there is no severe multicollinearity problem.

Appendix 4: Test for Normality and Homogeneity for land productivity, labor productivity and technical efficiency by county and land rental participation

Table A4.1: Komogorov-Smirnov Test of Normality for productivity and TE by county and land rental participation

County	Land productivity		Labor productivity		TE	
	Statistic	Sig.	Statistic	Sig.	Statistic	Sig.
Mengzhou (N=149)	0.909	0.380	1.786	0.003	1.126	0.159
Wenxian (N=119)	0.486	0.972	1.669	0.008	0.489	0.970
Huaxian (N=114)	0.776	0.583	1.260	0.084	1.631	0.010
Land rent HH (N=147)	1.034	0.235	1.764	0.004	1.363	0.049
No rent HH (N=235)	0.601	0.863	3.043	0.000	1.164	0.133

Note: Significance of data means the distribution is significantly different from a normal distribution, i.e. it is non-normal.

Table A4.2: Test of Homogeneity of Variance for productivity and TE by county and land rental participation

County	Land productivity		Labor productivity		TE	
	Statistic	Sig.	Statistic	Sig.	Statistic	Sig.
Mengzhou (N=149)	2.840	0.094	3.755	0.055	6.304	0.013
Wenxian (N=119)	1.835	0.178	9.586	0.002	6.977	0.009
Huaxian (N=114)	2.722	0.102	0.289	0.592	2.879	0.093
Land rent HH (N=147)	0.111	0.895	6.438	0.002	0.172	0.842
No rent HH (N=235)	0.101	0.904	44.7	0.000	0.744	0.476

Note: Significance of data means the variances in different groups are significantly different, data are not homogenous

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