

Does Tenure Security Matter?
Rural Household Responses to Land Tenure
Reforms in Northwest China

Xianlei Ma

Thesis committee

Promotors

Prof. Dr E.C. van Ierland
Professor of Environmental Economics and Natural Resources
Wageningen University

Prof. Dr X. Shi
Professor of Land Management
Nanjing Agricultural University, P.R. China

Co-promotors

Dr N.B.M Heerink
Associate professor, Development Economics Group
Wageningen University

Prof. Dr J.H.H. Wesseler
Professor of Agriculture and Food Economics
Weihenstephan Technische Universität München, Germany

Other members

Prof. Dr T.J. Herzfeld, Leibniz Institute of Agricultural Development in Central and Eastern Europe (IAMO), Halle, Germany

Dr L. Jia, University of Bonn, Germany

Prof. Dr W.J.M. Heijman, Wageningen University

Prof. Dr J.D. van der Ploeg, Wageningen University

This research was conducted under the auspices of the Wageningen School of Social Sciences (WASS)

**Does Tenure Security Matter?
Rural Household Responses to Land Tenure
Reforms in Northwest China**

Xianlei Ma

Thesis

submitted in fulfillment of the requirements for the degree of doctor
at Wageningen University
by the authority of the Rector Magnificus
Prof. Dr M.J. Kropff,
in the presence of the
Thesis Committee appointed by the Academic Board
to be defended in public
on Monday 9 December 2013
at 11 a.m. in the Aula.

Xianlei Ma

Does Tenure Security Matter? Rural Household Responses to Land Tenure
Reforms in Northwest China

186 pages.

PhD thesis, Wageningen University, Wageningen, NL (2013)

With references, with summaries in English and Dutch

ISBN: 978-94-6173-763-2

Table of contents

1. INTRODUCTION	1
1.1 PROBLEM STATEMENT	1
1.2 LITERATURE REVIEW	3
1.2.1 <i>Land tenure security and land investment incentive</i>	3
1.2.2 <i>Land tenure security and land rental market development</i>	4
1.2.3 <i>Land tenure security and rural-urban migration</i>	6
1.2.4 <i>Land tenure security and agricultural productivity</i>	6
1.3 OBJECTIVES AND RESEARCH QUESTIONS.....	7
1.4 RESEARCH METHODOLOGY	9
1.4.1 <i>Study area</i>	9
1.4.2 <i>Sample data description</i>	12
1.4.3 <i>Methods of analysis</i>	12
1.5 RELEVANCE OF THE STUDY.....	14
2. LAND TENURE IN CHINA: LEGAL, ACTUAL AND PERCEIVED SECURITY	16
2.1 INTRODUCTION	17
2.2 LAND TENURE SYSTEM REFORM IN CHINA.....	19
2.2.1 <i>Legal tenure security and the HRS</i>	19
2.2.2 <i>Legal tenure security and the market-oriented reforms</i>	20
2.3 AN INTEGRATED CONCEPTUAL FRAMEWORK	21
2.3.1 <i>Legal tenure security</i>	22
2.3.2 <i>Actual tenure security</i>	23
2.3.3 <i>Perceived tenure security</i>	24
2.3.4 <i>Integrated conceptual framework</i>	24
2.4 METHODOLOGY.....	26
2.4.1 <i>Data collection</i>	26
2.4.2 <i>Choice of indicators</i>	28
2.5 RESULTS	29
2.5.1 <i>The status of land tenure security</i>	29
2.5.2 <i>Causes of land tenure insecurity</i>	31
2.6 CONCLUSIONS	36
3. LAND TENURE REFORMS AND LAND CONSERVATION INVESTMENTS IN CHINA: THEORETICAL CONSIDERATIONS	38
3.1 INTRODUCTION	39
3.2 RURAL SOCIAL STRUCTURE AND LAND TENURE IN CHINA.....	40
3.2.1 <i>Rural social structure</i>	40
3.2.2 <i>Land tenure under the HRS</i>	41
3.2.3 <i>Reforms of the land tenure system</i>	42
3.3 CHARACTERISTICS OF LAND CONSERVATION INVESTMENTS IN CHINA	44
3.4 LAND TENURE REFORMS AND LAND CONSERVATION INVESTMENT INCENTIVES: A REAL OPTION VALUE ANALYSIS.....	45
3.4.1 <i>Real option value theory and land conservation investments</i>	45
3.4.2 <i>Effect of land tenure reforms on land conservation investments</i>	45
3.4.3 <i>Land tenure reforms and the timing of land conservation investments</i>	48
3.5 CONCLUSION.....	51
4. LAND TENURE SECURITY AND LAND INVESTMENTS IN NORTHWEST CHINA.....	53
4.1 INTRODUCTION	54
4.2 LAND TENURE SECURITY IN CHINA	57
4.2.1 <i>Legal tenure security in China</i>	58
4.2.2 <i>Perceived tenure security in China</i>	59

4.3 THE RESEARCH SITE AND DATA	60
4.3.1 <i>Research site</i>	60
4.3.2 <i>Data description</i>	60
4.4 MODEL SPECIFICATION	61
4.4.1 <i>Basic model</i>	61
4.4.2 <i>Definition of variables</i>	61
4.5 ESTIMATION METHODS	65
4.5.1 <i>Investment equations</i>	65
4.5.2 <i>Perceived land tenure security equation</i>	67
4.5.3 <i>Identification strategy</i>	68
4.6 ESTIMATION RESULTS	69
4.6.1 <i>Land investments</i>	69
4.6.2 <i>Perceived land tenure security</i>	73
4.6.3 <i>Robustness checks</i>	75
4.7 CONCLUSIONS	76
5. LAND TENURE SECURITY AND LAND RENTAL MARKETS IN NORTHWEST CHINA	81
5.1 INTRODUCTION	82
5.2 FACTORS AFFECTING LAND RENTAL MARKET DEVELOPMENT	84
5.3 MODEL CHOICE AND ESTIMATION STRATEGY	87
5.3.1 <i>Model choice</i>	87
5.3.2 <i>Estimation strategy</i>	88
5.4 DATA SET	88
5.4.1 <i>Data collection</i>	88
5.4.2 <i>Definitions and descriptive statistics of variables</i>	89
5.5 ESTIMATION RESULTS	93
5.5.1 <i>Probability of participation</i>	93
5.5.2 <i>Formal / informal contract choice</i>	95
5.5.3 <i>Area of rented land</i>	97
5.6 CONCLUSIONS	98
6. LAND TENURE SECURITY AND RURAL-URBAN MIGRATION IN NORTHWEST CHINA	106
6.1 INTRODUCTION	107
6.2 ROLE OF LAND TENURE SECURITY IN MIGRATION DECISIONS	110
6.2.1 <i>Land tenure security in China</i>	110
6.2.2 <i>Theoretical considerations</i>	112
6.3 DATA SET	114
6.3.1 <i>Data collection</i>	114
6.3.2 <i>Definitions, descriptive statistics and expected effects</i>	114
6.4 ESTIMATION STRATEGY	120
6.5 ESTIMATION RESULTS	121
6.6 CONCLUSION	126
7. LAND TENURE SECURITY AND AGRICULTURAL PRODUCTIVITY & TECHNICAL EFFICIENCY IN NORTHWEST CHINA	130
7.1 INTRODUCTION	131
7.2 CONCEPTUAL MODEL LINKING TENURE TO AGRICULTURAL PRODUCTIVITY	133
7.3 DATA	136
7.4 MODEL CHOICE AND ESTIMATION STRATEGY	137
7.4.1 <i>Agricultural productivity model</i>	137
7.4.2 <i>Technical efficiency model</i>	140
7.4.3 <i>Estimation strategy</i>	141
7.5 ESTIMATION RESULTS AND DISCUSSION	142
7.5.1 <i>Agricultural productivity</i>	142
7.5.2 <i>Technical efficiency</i>	143
7.5.3 <i>Empirical linkage between land tenure security and agricultural productivity</i>	146
7.6 CONCLUSIONS	148

8. DISCUSSION AND CONCLUSIONS	154
8.1 INTRODUCTION	154
8.2 KEY FINDINGS	155
8.2.1 Actual and perceived tenure security are weaker than legal tenure security	155
8.2.2 Land tenure reforms improve long-term investment environment	155
8.2.3 Causal relationships exist between perceived tenure security and investment	155
8.2.4 Tenure security induces land rental market development.....	156
8.2.5 Tenure security has a mixed impact on rural-urban migration	156
8.2.6 Tenure security has a mixed impact on agricultural productivity	156
8.3 OVERALL CONCLUSIONS	156
8.3.1 Perceived tenure security matters for household decisions	157
8.3.2 Tenure reform performance is limited by imperfect factor markets	157
8.4 SCIENTIFIC DEBATES.....	158
8.4.1 What matters for household decisions, perceived tenure or legal tenure?.....	158
8.4.2 Tenure security and investment: a reverse causal relationship?	159
8.4.3 Are household decisions linked to each other?	159
8.4.4 Tenure security and productivity: incentive or disincentive?	160
8.5 POLICY IMPLICATIONS.....	161
8.5.1 Land tenure reforms that focus on enhancing tenure security perceptions.....	161
8.5.2 Institutional reforms that improve the functioning of rural land rental and labor markets	162
8.6 LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH	162
8.6.1 Limitations of this study	162
8.6.2 Suggestions for further research.....	163
REFERENCES	165
SUMMARY	177
SAMENVATTING.....	182
ACKNOWLEDGEMENTS	187
CURRICULUM VITAE	188
FUNDING.....	190

List of tables

Table 2.1 Socio-economic situations in two case study regions and rural China, 2009-2010.....	28
Table 2.2 Links between security indicators and questions asked in household surveys	28
Table 2.3 Actual and perceived land tenure security in the two case study regions.....	30
Table 2.4 Reasons for weak actual and perceived land tenure security in China.....	33
Table 4.1 Variable definitions and descriptive statistics	62
Table 4.2 Instrumental variable estimates of determinants of land leveling	70
Table 4.3 Instrumental variable estimates of determinants of canal investment	72
Table 4.4 Instrumental variable estimates of determinants of perceived tenure security	74
Table A4.1 Instrumental variable estimates of determinants of land leveling	78
Table A4.2 Instrumental variable estimates of determinants of canal investment	79
Table A4.3 Instrumental variable estimates of determinants of perceived tenure security	80
Table 5.1 Definition of variables and descriptive statistics.....	90
Table 5.2 Regression results for participation decision.....	94
Table 5.3 Regression results for contract choice.....	96
Table 5.4 Regression results for rented land area.....	97
Table A5.1 Regression results for participation decision, lagged rented area excluded	104
Table A5.2 Regression results for rented land area, lagged rented area excluded	105
Table 6.1 Definition of variables and descriptive statistics.....	116
Table 6.2 Regression results for perceptions about land reallocations.....	122
Table 6.3 Regression results for perceptions about land certificates.....	124
Table 6.4 Regression results for perceptions about land reallocations and land certificates	126
Table 7.1 Definition of variables and descriptive statistics.....	138
Table 7.2 Estimation results for agricultural production function, OLS	143
Table 7.3a Estimation results for stochastic production frontier, maximum likelihood.....	144
Table 7.3b Estimation results for technical efficiency model, maximum likelihood	145
Table A7.1 Definition of variables and descriptive statistics for land rental market and migration regressions	151
Table A7.2 Regression results for participation in land rental market	152
Table A7.3 Regression results for determinants of rural-urban migration	153

List of figures

Figure 1.1 Conceptual model linking land tenure reforms and agricultural production in China	8
Figure 1.2 Location of Minle County, Zhangye City, and Gansu Province, People's Republic of China	10
Figure 2.1 Conceptual framework of land tenure reforms, tenure security and household decision making	26
Figure 3.1 Impact of land tenure reforms on land conservation investments: a framework.....	48
Figure 3.2 The value of land conservation investment under high uncertainty in ROV and NPV analysis..	49
Figure 3.3 Changes in the real option value of land conservation investments induced by lower uncertainty in ROV and NPV analysis.....	50
Figure 5.1 Structure of potential tenant's decision to participate in land rental market	103
Figure 7.1 Conceptual model linking land tenure security and agricultural production in China	135

1. Introduction

1.1 Problem statement

The ability of agriculture to support growing population has been a concern for generations and continues to be high on the global policy agenda. As the world's largest developing economy, China's long-term food prospects have an important impact on global food security. Although the contribution of agricultural technology and institutions to the expansion of grain output and income growth in China was substantial during the past 40 years, since 1998 the country's grain production has declined for five consecutive years, and reached its lowest point (430.6 million tons) in 2003, leading to a negative balance of food supply and demand in China. The declining trend reversed from 2004 onwards, with significant annual increases in grain production between 2004 and 2012, and reached 589.6 million tons in 2012. Increasing grain production to meet the increasing demand caused by its growing population and rising per capita income remains an important challenge for the future. It is estimated that China's cereal production must continue to rise by about 40 percent as compared to the level in 1997 to satisfy the demand of the nation's population by 2020 (Rosegrant *et al.* 2001). By meeting this demand, China's grain production can provide an important contribution to global food security, which will remain a worldwide concern for the next 50 years and beyond (Rosegrant and Cline 2003).

Given its very limited land resources, further growth in China's grain production requires agricultural intensification through intensified land management and introduction of new technologies. However, the current system of agricultural production is based on high and unsustainable use of mineral fertilizer¹, plant protection chemicals and irrigation water on a declining cultivated land area. The cultivation of crops in hilly and mountainous areas has been an important factor in China's rising land degradation in the 20th century. In order to reverse the growing trend in land degradation, the Chinese government has implemented a number of large-scale ecological recovery programs, such as the Sloping Land Conversion (or Grain for Green) program, since 1999. These programs, however, have been the main cause of the rapid decline in the land area available for agricultural production since the turn of the century (Qu *et al.* 2011).

The very intensive agricultural system also contributes to water shortages and pollution in China. The water available for agricultural production and other purposes is very limited, especially in northern China. The average availability of renewable water resources (surface water and groundwater) in China has declined from 2849 m³ per person per year in 1980 to 1785 m³ in 2009 (NBS, 2010a), and is rapidly approaching the internationally accepted threshold for defining water stress (1700 m³ per

¹ China is the world's largest producer and user of chemical fertilizers and manure (OECD 2005).

Does Tenure Security Matter?

person per year). In the 3-H (Hai and Luan, Huai and Huang) river basins in northern China, per capita water availability was estimated at only 499 m³ in 1999 (World Bank 2001). The major factor for severe water scarcity in the 3-H basins is farmers' increased reliance on groundwater for irrigation (Qu *et al.* 2011). Massive usage of mineral fertilizer, pesticides and herbicides has caused severe non-point source pollution of water resources. Available evidence in official statistics shows that the pollution of surface water is very serious and is getting worse since the beginning of the 1990s in two major lakes in southern China and, until recently, in the major rivers in northern China (Qu *et al.* 2011).

The increasing scarcity and degradation of available land and water resources is negatively affecting the long term agricultural production capacity. National food security is an important policy priority of China's government. Former premier Wen Jiabao commanded in 2007 that China's cultivated land area, estimated at 121.7 million hectares at that time, should not become less than 120 million hectares in the future in order to meet its food security goal. The main purpose of China's agricultural and rural policy is therefore to maintain national food security and to contribute to global food security. Sustainable use of natural resources and increasing the long term agricultural production capacity are important preconditions for reaching this goal.

Apart from using more advanced agricultural technologies, effective institutions are needed for simultaneously stimulating agricultural production growth and sustainable use of natural resources. Among rural and agricultural institutions, the land tenure system plays a very important role in this respect. It has received much attention in scientific research, in China and in other regions in the world (Besley 1995; Wen 1995; Deininger *et al.* 2002; Jacoby *et al.* 2002; Abdulai *et al.* 2011; Mullan *et al.* 2011).

Since 1998, the Chinese government has implemented a number of land tenure reforms that aim to improve tenure security and stimulate transferability of rural land. Relevant laws include the Land Administration Law of 1998, the Rural Land Contract Law of 2002, the Property Law of 2007, and the Mediation and Arbitration of Rural Land Contract Disputes Law of 2009. Although these reforms have contributed to improved formal tenure security, it is not clear to what extent they contribute to agricultural production and sustainable land resource use. Several recent studies (Jansen and Roquas 1998; Sjaastad and Bromley 2000; Broegaard 2005) stress that the tenure situation as perceived by landholders forms the basis upon which landholders can be expected to take decisions and to act, whatever the legal situation of a piece of land. Therefore, what matters for household decisions associated with natural resource use and agricultural production in China is the tenure security as perceived by its rural households. This may differ from formal tenure security, as it depends on the way land laws and land titling are being implemented, and on how information about these laws is being distributed among stakeholders. Available studies on the importance of perceived tenure

security have examined in particular its role in housing improvement in South-American countries, such as Argentina and Brazil (de Souza 1998; de Souza 2001; Van Gelder 2007; Van Gelder 2009). Little attention has been paid so far to the role of land tenure security perceptions in household decisions on agricultural production and natural resource use. This study aims to contribute to this literature by examining the relationship between perceived tenure security and (sustainable) agricultural production in China.

1.2 Literature review

The literature in the field mainly focuses on the linkages between land tenure system, household decisions and agricultural productivity. First, the land tenure system has an impact on household decisions associated with natural resource use, including land investment, participation in the land rental market and rural-urban migration. Second, these household decisions affect land and water use and agricultural productivity. The literature in the field can be categorized into four strands, which are reviewed separately. In doing so, issues will be identified that have received insufficient attention in the literature so far and which will be addressed in this thesis.

1.2.1 Land tenure security and land investment incentive

Available theoretical studies claim that secure property rights over land encourage land investments through strengthening claims to the fruits of the investment (assurance effect) (Banerjee and Ghatak 2004), allowing for gains from trade (transferability effect) (Besley 1995; Deininger and Jin 2006) and increasing access to capital (collateralizability effect) (Feder and Feeny 1991). However, these effects do not take into account the potential added value of more complete land property rights through changes in the real option value of exercising land-related investments. Due to the irreversibility of land investment costs, tenure reforms that increase land tenure security and transferability may not necessarily result in immediate increased land-related investments. They may, however, bring additional value to farmers caused of the increased time flexibility. What is lacking in the literature so far is a theoretical analysis that considers not only the assurance and transferability effects of land reforms in China² but also the effects through changes in the real option value.

Available empirical studies for different regions in the world give mixed evidence on the existence of a systematic influence of land tenure security on investment (Besley 1995; Brasselle *et al.* 2002; Ruttan 2002). In particular, the potential endogeneity of informal (customary) land rights in Africa has received increasing attention as a potential explanation of the mixed findings (Besley 1995; Brasselle *et al.* 2002; Ruttan 2002). In many traditional tenure systems in Africa, the primary purpose of households' investments, such as planting trees or terracing, is to establish implicit property rights to land and increase existing levels of tenure security (Deininger and Jin 2003).

² Because land cannot be used as collateral in China, there is no collateralizability effect.

Does Tenure Security Matter?

The literature on land tenure security and land investments in China generally does not address potential endogeneity of land tenure security³. The underlying argument is that land tenure arrangements are not indigenous as in Africa, but evolve within the national formal legal framework (Deininger and Jin 2003). In particular, land readjustments⁴ are usually decided at the village level and are independent from household land management and investment decisions (Liu *et al.* 1998; Keys and McConnell 2005). However, farmers' perceptions of tenure security may be endogenous. Farm households that have undertaken land investments are more likely to oppose land readjustments, unless they are fully compensated for their investments (which is usually not the case). Land investments thus may affect household perceptions on future land readjustments. In other words, it is necessary to take potential endogeneity of perceived land tenure in China into account in estimating the effect of land tenure security on land investments.

The types of investments examined in available studies in China tend to be relatively short-term land-related investments, such as fertilizers, green manure and organic manure (Yao 1995; Li *et al.* 2000; Jacoby *et al.* 2002; Feng *et al.* 2010). The obtained results indicate that a higher expropriation risk as a result of land readjustments has a significant but small negative effect on the application of organic fertilizer and green manure. Surprisingly little research has been carried out for China, however, on the impact of tenure insecurity caused by land readjustments on medium- to long-term investments in land quality.

Besides individual investments, self-governed investments may be affected by land tenure security. Self-governed investments are initiated and organized through a self-governed system in which farmers make joint decisions within collective-choice arenas, usually village groups or water users associations. This self-governed system identifies the investors and the beneficiaries of the investments as well as the size of the investments that each investor should make. Small-scale irrigation canal maintenance and improvements can be seen as such self-governed investments. The literature on tenure security and land investments has so far concentrated on individual investments. To our knowledge no studies have examined whether or not and to what extent land tenure security affects self-governed investments in land quality improvements in China.

1.2.2 Land tenure security and land rental market development

Several studies emphasize the role of transaction costs in land rental market development. High transaction costs in land rental markets often originate from insecure land rights. In Vietnam the provision of secure, long-term land rights, even at an informal level, increased the volume of rental

³ To our knowledge, Jacoby *et al.* (2002) is the only study on land tenure security and land investments in China that controls for potential endogeneity of tenure security.

⁴ The occurrence of land readjustments (or land reallocations) will be discussed in detail in Chapter 2.

transactions benefiting poor but productive households (Deininger and Jin 2003). In the Dominican Republic insecure property rights not only reduce the level of activity in the rental market, but also induce market segmentation, because rentals are restricted to pre-existing social networks (Macours and Swinnen 2002; Macours *et al.* 2004). In Nicaragua insecure tenure is found to reduce participation on the supply side of the land rental market (Deininger *et al.* 2003). In Ethiopia land certification is found to increase the level of participation in the land rental market (Holden *et al.* 2007), and to increase contract length (Bezabih and Holden 2006). In China land use regulations that allow village leaders to confiscate land that has not been utilized for one season are found to have a very significant and negative impact on the propensity to supply and demand land for renting; possession of land certificates, on the other hand, has no significant impact on rental market participation at either side (Jin and Deininger 2009).

The aforementioned literature mainly focuses on the impact of formal land rights derived from land laws and land titling. But, as mentioned in Section 1.1 above, what matters for household decision making is the perception of households on their land rights. Perceived land rights may be more important than formal land rights in explaining differences in land rental market development. In cases where formal land rights hardly or not differ across households, the variation in household perceptions of their land rights may still be considerable. Available research on China, however, has neglected the role of household perceptions of tenure (in)security in land rental market development.

High transaction costs in land rental markets may also originate from low levels of trust among tenants and landlords. Trust and land tenure security may jointly affect household land rental market participation decisions. Holden and Ghebru (2005) point out that inherent trust in kin relations helps to reduce transaction costs in land rental markets as the costs of acquiring information and negotiating and enforcing contracts tend to be much lower. Trust can be divided into two components: general (non-kinship or generalized) trust and kinship trust (Fukuyama 1995). Kinship trust refers to the trust among friends and family, and non-kinship trust refers to the trust toward the more broadly defined community. Different types of trust can have different effects on land rental market development. High levels of kinship trust help to reduce the transaction costs of land rental transactions that occur among kinship members. The existence of relatively high levels of kinship trust and low levels of non-kinship trust may be an important explanatory factor of land rental market segmentation. In such cases, landlords may rent their land out to their kinship members (family relatives) only. Conversely, high levels of non-kinship trust reduce the transaction costs of transactions that occur among non-kinship members. Therefore, high levels of non-kinship trust can reduce market segmentation and induce land rental market development. Therefore it is important to examine the role played by different types of trust when examining the relationship between land tenure security and land rental market development.

Does Tenure Security Matter?

1.2.3 Land tenure security and rural-urban migration

The literature on rural land tenure and rural-urban migration in China argues that frequent land reallocations within villages reduce migration because migrant households risk losing their rights to agricultural land during such reallocations (Yang 1997; de La Rupelle *et al.* 2010; Mullan *et al.* 2011). Land rental rights, on the other hand, reduce the opportunity cost of migration and can stimulate migration (de La Rupelle *et al.* 2010). The empirical evidence on the impact of land tenure security on migration in different parts of the world is scarce and also gives mixed results. Valsecchi (2010) finds that access to a formal land title increases Mexican emigration to the USA. De Brauw and Mueller (2012) find that improved land transferability rights have a modest negative effect on migration in Ethiopia. One study for China finds a significant impact of land rights insecurity caused by the threat of land reallocations on migration (de La Rupelle *et al.* 2010), while another study finds only weak (or insignificant) evidence of such an effect (Mullan *et al.* 2011).

According to our knowledge, the only research that examines the effect of perceived land tenure security on rural-urban migration is Mullan *et al.* (2011). They use village leader perceptions on future land reallocations for their study, and also examine the impact of land rental rights. A number of issues have received insufficient attention so far. Firstly, tenure insecurity perceptions depend not only on expected future land reallocations, but also on the perceived importance of land certificates in protecting land rights⁵. The latter aspect has become even more important after the issuance of land certificates to farm households in recent years and the official stipulation that land certificates serve to protect farmers' land rights. Secondly, whether a household possesses land rental rights or not is less relevant for rural-urban migration. Instead, the actual level of land rental market development in a village is what is likely to play a role in rural-urban migration decisions of households. Besides land rental rights, other factors like trust play a role in the development of local land rental markets.

1.2.4 Land tenure security and agricultural productivity

The available literature on tenure security and agricultural production suggests that more secure land property rights to land are expected to raise investments in land and the use inputs through reducing the risks of investments and through increasing capital availability as a result of better credit market access and income earned through land transfers (Feder 1988). Many empirical studies, therefore, focus on the effect of improved tenure security on land investments and input use and their consequences for productivity (Li *et al.* 2000; Jacoby *et al.* 2002; Smith 2004; Deininger and Ali 2008; Feng *et al.* 2010). Empirical results, based on data collected from the Asian and African continents, are mixed. Studies of Asian experiences suggests a positive, but small, effect of land tenure security on productivity (Feder 1988; Feder and Nishio 1998; Li *et al.* 2000; Jacoby *et al.* 2002). Some

⁵ Land titles (certificates) are likely to be of less importance for tenure security where enforcement is repeatedly lacking, where the formal juridical system is unfair and where there is simply a general distrust in the formal rights and enforcement system (Pagiola 1999).

studies on Uganda and Ethiopia find that tenure security has a positive impact on productivity (Deininger and Castagnini 2006; Deininger *et al.* 2008; Deininger and Jin 2006), while other studies on the same two countries find no evidence of productivity differences across different bundles of land rights (Place and Otsuka 2002; Pender *et al.* 2004; Gavian and Ehui 1999). The ambiguous results can often be related to the local context and the overarching macro and sectoral conditions within which tenure systems operate (Place 2009).

Besides the land investment and input effects, two other effects of tenure security can be distinguished that have received less attention in the literature so far. The first effect is the land market effect. The land rental markets can transfer land to more efficient farmers. It is also called the factor equalization effect (Deininger *et al.* 2003). The second effect is the migration effect. Improved land tenure security can induce household participation in rural-urban migration (De La Rupelle *et al.* 2010; Mullan *et al.* 2011), which might cause low efficient farm management practices for households with one or more migrated members. The land market effect is expected to raise agricultural production, just like the investment and input effects, while the migration effect will generally lower it. Empirical studies should take all four effects into account in order to contribute to a better understanding of the impact of land tenure security on agricultural production.

Due to the focus on land investment and input use effects, empirical studies in this field concentrate on the impact of tenure (in)security on either agricultural output or land productivity. Both land investments and input use do not affect agricultural productivity, defined as the ratio of agricultural output to the use of inputs, and technical efficiency. The land market and migration effects, on the other hand, primarily affect agricultural production by influencing agricultural productivity and technical efficiency. Empirical studies of tenure (in)security and agricultural production should therefore pay more attention to the consequences of changing tenure security for agricultural productivity and technical efficiency.

1.3 Objectives and research questions

The main objective of this study is to improve the understanding of the relationships between land tenure security, as affected by the recent market-oriented tenure reforms, and agricultural production in China. Based on the existing literature, four relationships will be examined, namely the relationships between tenure security and land investment incentives, land rental market development, rural-urban migration, and agricultural productivity, respectively. The four relationships and their linkages with the market-oriented tenure reforms and agricultural production are shown schematically in Figure 1.1. A better understanding of the impact of land tenure security on farmers' decisions and agricultural productivity can be used for assessing the potential implications of future reforms of the

Does Tenure Security Matter?

land tenure system. It may also contribute to the development of effective policies for reaching the dual goals of improving sustainability of rural natural resource use and national food security.

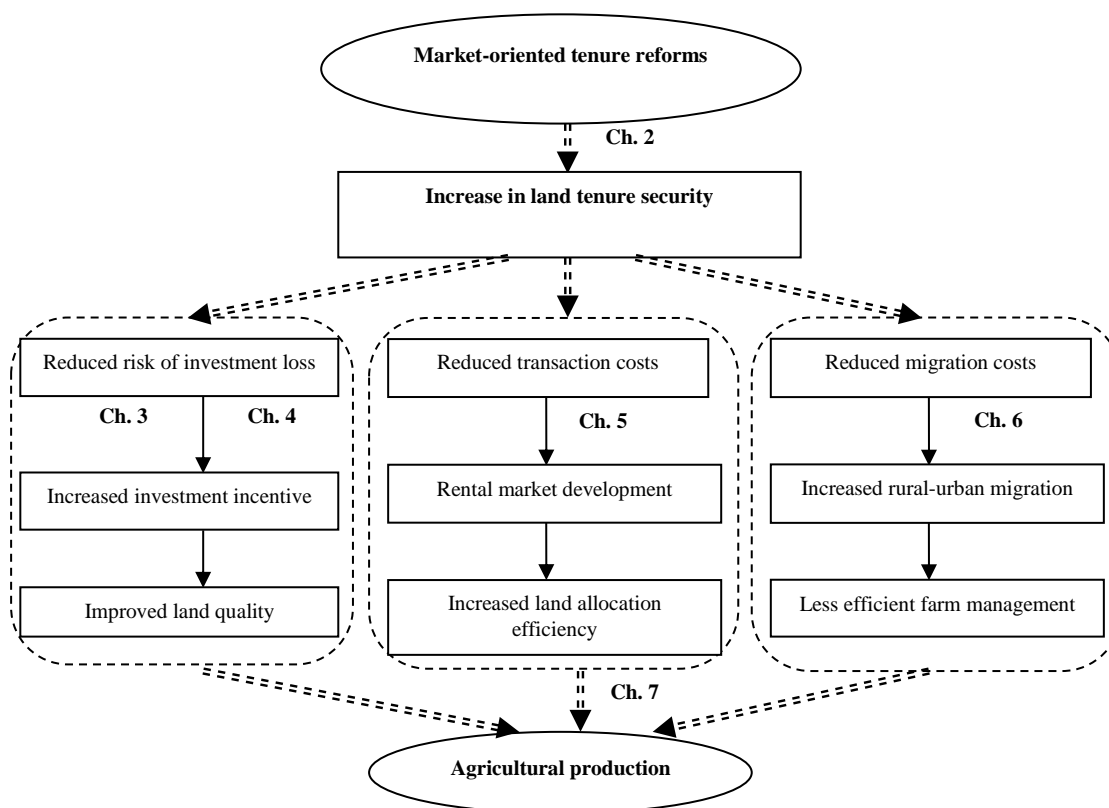


Figure 1.1 Conceptual model linking land tenure reforms and agricultural production in China

To fulfill the research objective, six research questions will be addressed in the following six chapters (that are also shown in the scheme of Figure 1.1). They take into account the knowledge gaps in the current literature identified in Section 1.2. The six research questions are:

Chapter 2: What are the magnitudes of legal, actual and perceived rural land tenure security in China, and what are the causes of the currently prevailing land tenure insecurity?

Chapter 3: What is the effect of the market-oriented land tenure reforms on farmers' land conservation investment decisions, taking into account the irreversibility of land investment costs and the indirect benefits obtained from increased time flexibility?

Chapter 4: What is the effect of perceived land tenure security on farmers' decisions to invest in long-term land quality improving measures in China, taking into account the potential endogeneity of tenure security?

Chapter 5: What is the impact of two major factors affecting transaction costs, i.e. (i) perceived tenure security and (ii) trust, on farm household decisions to rent in land in China?

Chapter 6: To what extent do rural household perceptions of land tenure security affect rural-urban migration decisions in China?

Chapter 7: What is the impact of perceived land tenure security on agricultural productivity and technical efficiency in China?

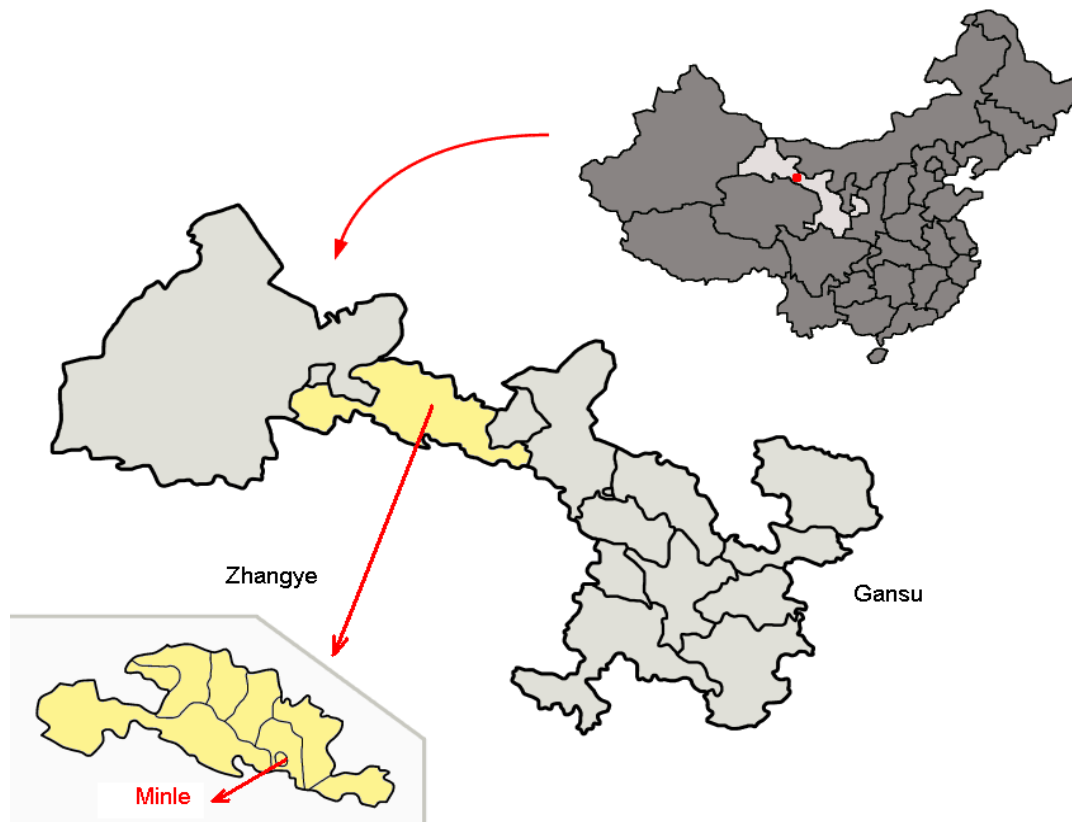
1.4 Research methodology

1.4.1 Study area

The empirical analysis in this study is largely based on data collected in Minle County, Gansu Province in northwest China. Minle County is one of six counties in Zhangye City, a prefecture-level city (Figure 1.2). Agriculture plays an important role in the economy of Gansu Province. In 2009, 25.8% of its GDP was from agriculture, which is higher than the average for the whole country (17.7%). Farmers' net income per capita (2,980 yuan) was much lower than the average for rural China (5,153 yuan), while the cultivated land area per capita (2.62 mu) was slightly higher than the average for the whole country (2.26 mu) (NBS 2010a,b).⁶

⁶ One hectare equals 15 mu, while one USD (Euro) was equal to 6.85 (9.53) yuan in 2009.

Does Tenure Security Matter?



Source: Adapted, by Zhang Lei, from

[http://en.wikipedia.org/wiki/File:Location_of_Zhangye_Prefecture_within_Gansu_\(China\).png](http://en.wikipedia.org/wiki/File:Location_of_Zhangye_Prefecture_within_Gansu_(China).png)

Figure 1.2 Location of Minle County, Zhangye City, and Gansu Province, People's Republic of China

Zhangye City is an oasis located in the Hexi corridor in the northwest of Gansu Province. The combination of a dry climate, plenty of sunshine, fertile soils and water flowing down the nearby Qilian Mountain have made Zhangye City very well suited for agriculture. It is an important commodity grain and vegetable production base in Gansu province, and also one of the ten commodity grain bases in China.

Due to the expansion of agricultural production in Zhangye City, water shortages have become a serious problem. The precipitation in Zhangye City is only 89-283 mm per year, while the evaporation is 1,700 mm per year. The water supply in Zhangye City is mainly from the Heihe River. As a consequence of water overuse for agriculture in Zhangye City, the downstream reaches of the Heihe River, located in Inner Mongolia, has increasingly suffered from severe desertification. In 2002, the government of China therefore introduced a pilot project called “Water-saving society in Zhangye city” to stimulate water savings in agriculture in the midstream reaches, and thereby ecological recovery in the downstream area of the river basin.

Minle County is a suitable area for the empirical analysis in this study for two reasons. First, Minle County is a region where high legal tenure security coexists with household perceptions of considerable land tenure insecurity. It therefore provides a suitable context to identify and examine the effect of tenure (in)security perceptions on farmers' decisions. Since 1998, legal tenure security has increased significantly in China (Wang *et al.* 2011). During the period 1979 – 2009, interviewed households in Minle County experienced on average 0.83 land reallocations, much less than in many other regions in China⁷. But, as we shall see in Chapter 2, only 38% of the respondents expect no land reallocations in the near future. All village leaders that we interviewed in Minle County state that they have issued land certificates to all households in their villages. However, only 80% of the respondents believe that a land certificate is an important document for protecting individual land rights.

Second, households in Minle County undertake long-term investments in their land. This allows examining the effect of land tenure security on long-term, rather than relatively short-term, investments. Measures taken within the pilot project include government investments in irrigation infrastructure and the introduction of water-saving irrigation technologies (Zhang 2007). Investments in irrigation canals are also made by farmers' groups at different levels. Large-scale investment decisions, such as the maintenance of second level canals that affect a large number of households, are normally made at water users association (WUA) level. Small-scale investment decisions, such as maintenance and improvement of third or lower level canals that normally concern a small number of households, are usually made at the water use group (WUG) level, i.e. groups of households having plots alongside the same canal. Another important land improvement investment in the region, apart from canal maintenance and improvement, is the leveling of land by farmers to increase water use efficiency. Land leveling is an important way to save water in irrigated agriculture (Wang *et al.* 2002).

In Chapter 2, data collected in Shangrao County and Yingtan County in Jiangxi Province in central-south China is used, in addition to data collected in Minle County, to examine the magnitudes of actual and perceived land tenure security after the implementation of the market-oriented land tenure reforms. The two counties are considered representative of the diversity of rural conditions that can be found in the hilly area of central-south China with rice-based production systems (Kuiper *et al.* 2001). Agriculture also plays an important role in the economy in that research area. In 2009, 22.7% of its GDP was from agriculture in Jiangxi province, which is higher than the average for the whole country (17.7%). Farmers' net income per capita (5,075 yuan) was close to the average for the whole country (5,153 yuan). The cultivated land area per capita (1.58 mu) was substantially lower than the average for the whole country (2.26 mu) (NBS 2010a,b).

⁷ Results from an almost nationally representative rural survey collected in 119 villages located in 6 provinces across China in 2008 show that the average frequency of (full-scale and partial) land reallocations within villages was 3.6 during the period 1979 – 2008 (Wang *et al.*, 2011).

Does Tenure Security Matter?

1.4.2 Sample data description

A farm household and village leader survey was held in Minle County in May 2008 and May 2010. Collected information refers to the years 2007 and 2009 respectively. In May 2008, a stratified random sampling technique was used to select 10 percent of the villages within each of the ten townships that make up Minle County. In each selected village, the village leader was interviewed and 15 households were randomly chosen to be interviewed⁸ (see Castro *et al.* 2010 for more information). The survey was repeated in the same villages in May 2010. The survey covered 21 villages, 317 households in 2008 and 315 households in 2010. Topics included in the household survey comprise farm production, off-farm employment, expenditures, land and water use in the preceding year. In the 2010 survey it also included questions about land tenure security at the time of the survey.

Out of the 315 households interviewed in 2010, 265 households were also interviewed in 2008. Taking out the households that were not involved in agricultural production, we obtained a two-years data set of 259 households. This data set is used for the empirical analysis in Chapter 2, 4, 5, 6 and 7. Unfortunately we cannot exploit the panel nature of the data for our analysis, because a) questions about subjective perceptions of land tenure were asked only in the May 2010 survey; b) we need introduce the investment data and trust data in 2007, as the lagged variables, into our analysis. Hence, we use a cross-section analysis based on the sample of 259 households that were interviewed in both years in our empirical analysis.

A similar farm household and village leaders survey was held in Shangrao County and Yingtan County in Jiangxi Province in August 2011. Included topics were similar to those in the survey held in Minle County in Gansu province, but refer to the year 2010 instead of 2009. The survey covered 526 households and 11 village leaders living in 11 villages and six townships. The survey was conducted according to the random sampling technique. For 175 of the interviewed households the survey was the follow-up of two similar surveys carried out in three villages, one in Shangrao County and two in Yingtan County, for the years 2000 and 2005 (see Kuiper *et al.* 2001 and Feng 2008 for details on the stratified random sampling technique used for the first survey). The earlier two surveys, however, did not contain information on land tenure security. The other 351 households were interviewed only in 2011. They were randomly selected within eight other villages in Shangrao County. This data set is only used in Chapter 2.

1.4.3 Methods of analysis

In this study, we use a variety of methodological approaches to provide answers to the specific research questions that we formulate in each chapter. We choose suitable empirical methods at our disposal to overcome methodological problems such as endogeneity. We also attempt to use some

⁸ In two villages, 16 instead of 15 randomly selected households were interviewed.

innovative theoretical methods, such as the real option value model, to examine the impact of land tenure reforms on household decisions. In particular, we use the following methods in each chapter.

Chapter 2 applies a case study approach to examine the magnitudes of legal, actual and perceived land tenure security. The household head's responses to questions about land tenure status are used to obtain measures of actual and perceived tenure security, and compare their values for two different regions. In-depth interviews with a limited number of village leaders and household heads are used to obtain more insights into the causes of tenure insecurity perceptions in the two research areas.

Chapter 3 employs real option value theory to examine the impact of the marketed-oriented tenure reforms on farmers' decisions with respect to land investments. The real option model is a suitable tool for analyzing the optimal rule of irreversible investments under uncertainty when entrepreneurs have the right, but not the obligation, to make such investments within a given period of time (McDonald and Siegel 1986; Dixit and Pindyck 1994). Given that long-term land investments are characterized by irreversibility, uncertainty and flexibility, the real option model is a suitable tool for examining farm-level land investment decisions.

In Chapter 4, the two-stage conditional maximum likelihood (2SCML) technique and the instrumental variable least squares (IVLS) method are used to estimate relationships between perceived land tenure insecurity and land investments. The 2SCML technique and IVLS method are suitable tools for overcoming endogeneity of discrete regressors when the dependent variables are discrete and continuous, respectively (Rivers and Vuong 1988; Brasselle *et al.* 2002; Wooldridge 2002).

In Chapters 5 and 6, the Heckman selection model is used to test for possible selection bias between household participation decision and participation intensity of land rental market and rural-urban migration. The Heckman selection model is a useful tool for examining behavioral relationships from non-randomly selected samples (Heckman 1979). Based on the Heckman selection test, a Probit model is used to estimate determinants of household land rental market participation and land rental contract choice in Chapter 5, and determinants of household migration participation decision in Chapter 6. A Tobit model is used to examine the factors affecting participation intensity in Chapter 5, and the factors affecting share of migrants and migration duration in Chapter 6.

In Chapter 7, the production function approach and the stochastic frontier approach are used to examine the impact of land tenure security on agricultural productivity and technical efficiency, respectively. The production function approach is widely used for examining the relative contributions of productive inputs to agricultural output and for measuring and analyzing agricultural productivity (Li *et al.* 2000; Smith 2004; Chand and Yala 2009). The stochastic frontier approach takes into

Does Tenure Security Matter?

account the possible influence of measurement error and other noise in the data, and permits the estimation of the determinants of inefficiency of households (Coelli 1995). The stochastic frontier model has been widely used to examine technical efficiency and its determinants (Feng 2008).

1.5 Relevance of the study

This study systematically investigates the relationships between land tenure security and agricultural production in China by considering the effect of tenure security on land investments, land rental market development, rural-urban migration, agricultural productivity and technical efficiency. Available theories are integrated and, where possible, expanded, and are tested using household-level data. The obtained insights are expected to be relevant for the ongoing reforms of China's rural land tenure system and for related agricultural and rural policies. They may also prove useful for a wider range of developing countries (e.g., Ethiopia, Vietnam) with similar tenure systems that aim to provide farmers with secure and long-term formal land rights. The chapters in this study consist of independent academic papers, each intended as stand-alone contributions to the literature.

Chapter 2 contributes to the debate in the literature about the roles of legal and perceived land tenure security by quantifying legal, actual and perceived land tenure security and exploring the causes of land tenure insecurity in China. It also intends to contribute to the future study of the effect of land tenure security on household behavior by integrating legal, actual and perceived land tenure security and their relationships with the land tenure reforms and with farm household behavior into a coherent framework.

Chapter 3 contributes to the theoretical literature on the effect of land tenure systems on land investment by integrating the so-called assurance effect and transferability effect into the real option value framework, and distinguishing between the present value effect and the option value effect. This analysis provides new insights into investment incentives created by the rural land tenure system and its reforms in China, and can serve as an appropriate basis for empirical analyses of the effects of land tenure reforms on land conservation investments in China and in countries where similar reforms take place.

Chapter 4 contributes to the empirical literature of the effects of tenure security on land investment by examining the impact of perceived land tenure security on household investments in land, and by considering the potential endogeneity of perceived tenure security. It adds to the literature on tenure security and land investments in China by focusing on medium- to long-term investments and by including self-governed investments in the analysis. The insights obtained from the empirical analysis for Minle County are likely to be relevant for other parts of China, and may also be useful for other

regions in the world where significant differences exist between legal and perceived tenure security and where relatively long-term investments in land are made.

Chapter 5 contributes to the literature on the effect of tenure security on land rental market development by examining the role of tenure security as perceived by rural households instead of legal tenure security. It presents a novel integrated three-stage decision model of land rental market participation, contract choice and rented land area. Another contribution is the distinction made between trust towards kinship, trust towards known people and trust towards strangers in analyzing land rental market development.

Chapter 6 contributes to the literature on the effect of tenure security on migration by focusing on the effect of perceived tenure security instead of legal tenure security, and by including the importance attached to land certificates as an important aspect of perceived land tenure security.

Chapter 7 contributes to the literature on the effect of land tenure security on agricultural production: (i) by focusing on the land rental market effect and migration effect of land tenure security, while controlling for the investment and input effects that are widely examined in the existing literature; (ii) by examining the effect of land tenure security on both agricultural productivity and technical efficiency; (iii) by examining the role of tenure security as perceived by rural households instead of formal tenure security as specified in land laws and land titling. A major novel finding of that chapter is that, under the existing land and labor market conditions in many parts of rural China, issuing land certificates may contribute to lower instead of higher agricultural productivity and efficiency.

2. Land Tenure in China: Legal, Actual and Perceived Security⁹

Abstract: This paper examines the magnitudes of legal security, actual security and perceived security of land tenure, and the causes of currently prevailing land tenure insecurity in China. Two farm household surveys conducted in Minle County, Gansu province in 2010 and in Shangrao County and Yingtan County, Jiangxi province in 2011 are used as case studies. Although recent market-oriented land tenure reforms have improved legal tenure security, we find that farm households still experience substantial insecurity of actual and perceived land tenure, especially in the case study region in Jiangxi province. The degrees of actual tenure security and perceived tenure security are closely correlated, but perceived tenure security is much weaker than actual tenure security in both case study regions. We argue that egalitarianism inherent in farmers' thinking, ambiguous formulations of laws, and village self-governance rules are three important factors contributing to actual and perceived insecurity of land tenure.

⁹ This chapter is based on an article submitted to *Land Use Policy* in October 2013, as Ma, X., N. Heerink, F. Qu, X. Shi. "Land Tenure in China: Legal, Actual and Perceived Security".

2.1 Introduction

The prevailing system of rural land tenure in a region can be an important factor in agricultural growth and farmers' welfare in that region. The available literature on rural land tenure has mainly focused on the impact of land tenure security on (1) land-related investments (e.g. Wen 1995; Jacoby *et al.* 2002; Deininger and Jin 2003), and (2) land rental market participation (Deininger and Jin 2005; Holden and Ghebru 2005; Holden *et al.* 2007; Jin and Deininger 2009), and consequently on (3) productivity and efficiency in agriculture (e.g. Li *et al.* 2000; Ahmed *et al.* 2002; Jacoby *et al.* 2002). Empirical tests of the impact of land tenure security on investment, land rental market participation and productivity have provided mixed results. Among others, different concepts and measures of tenure security play an important role in explaining these mixed empirical results (e.g. Fenske 2010; Arnot *et al.* 2011). For example, Besley (1995) pointed out that *de jure* rights may have little to do with *de facto* rights, and those rights that are measured may not be the ones that farmers take into account when deciding on investment. Jansen and Roquas (1998) and Sjaastad and Bromley (2000) argue that the perceived tenure situation forms the basis upon which a landholder can be expected to take land-related decisions, whatever the legal situation of a piece of land.

In the recent literature (e.g. Van Gelder 2009; Fenske 2010; Van Gelder 2010; Arnot *et al.* 2011), it is increasingly recognized that a re-recognition should be made about what constitutes tenure security and how to measure tenure security in empirical analysis¹⁰. Van Gelder (2010) argues that existing controversies over what constitutes tenure security and how it can be measured are a consequence of the indiscriminate use of different types of tenure security. He proposes a tripartite view in which tenure security is viewed as a composite concept with three constituent elements: legal (*de jure*) tenure security, actual (*de facto*) tenure security and perceived tenure security. The legal tenure security approach equates property rights with tenure security. Property rights reduce uncertainty regarding ownership and allow for the invocation of the coercive hand of the state when rights are being violated. The *de facto* tenure security is based on the actual control of property, regardless of the legal status in which it is held. It is often related to such factors as the length of time of occupation, the level and cohesion of community organization, and third-party support. Perceived tenure security refers to household perceptions of tenure security. It generally takes the form of household probability estimates of the chance of eviction by the state or landowner and other factors that may cause involuntary relocation (Van Gelder 2010:451).

Although Van Gelder's tripartite view on tenure security was developed for analyzing urban land tenure security and settlement development in the developing world, the approach seems equally

¹⁰ Arnot *et al.* (2011) discuss in detail the definitions and measures of tenure security used in the existing literature, and empirical results of the studies on the impacts of different measurements of tenure security on rural land investment and deforestation in developing countries; Van Gelder (2007, 2009, 2010) analyzes empirical results of the studies on the impacts of different measurements of tenure security on urban housing investment.

Does Tenure Security Matter?

relevant for land tenure security in rural areas, particularly in developing countries. In developed countries, the facts on the ground may largely be in accordance with the existing formal laws and regulations, and the three elements of the tripartite view may be highly related. In developing countries, where formal, customary, religious and other legitimate bases for claiming property rights frequently coexist and the state capacity in implementing the rule of law is often limited, there is no necessary connection between the three elements. The extent to which the three elements are related may vary from situation to situation and is ultimately an empirical question (Van Gelder 2009:130-131).

The recent literature on tenure security focuses on differences in the definitions and measurement of tenure security, the relationship between different elements of tenure, and the implications for linking tenure security with economic behavior (e.g. Bouquet 2009; Van Gelder 2009, 2010; Fenske 2010; Arnot *et al.* 2011). A study measuring and comparing the three different elements of tenure security, and explaining the observed differences between them, is lacking so far to our knowledge. China offers an interesting case for performing such a study. Since 1998, the Chinese government has implemented a series of legal land tenure reforms which aim to improve legal tenure security and transferability of rural land. Given its vast rural area and the limited implementation of the rule of law, important location-specific differences are likely to exist between legal, actual and perceived tenure security.

The objective of this paper is to derive estimates of the magnitudes of legal security, actual security and perceived security of rural land tenure in China, and to investigate the causes of currently prevailing land tenure insecurity. Available information obtained through two farm household surveys conducted in Minle County, Gansu province in 2010 and Shangrao and Yingtan County, Jiangxi province in 2011 is used to fulfill this objective.

This paper contributes to the debate in the literature about what constitutes tenure security. It extends Van Gelder's (2010) theoretical analysis of a tripartite view of tenure security by providing quantitative estimates of legal security, actual security and perceived security and exploring the causes of prevailing land tenure insecurity in China. The paper also intends to provide a basis for the future study of the effects of land tenure security on household behavior in China by integrating legal security, actual security and perceived security into a coherent framework which links to the recent land tenure reforms and to household economic behavior.

The paper is organized as follows. Section 2.2 discusses the rural land tenure system and its recent market-oriented reforms in China, with a focus on the consequences for legal tenure security. Section 2.3 reviews the literature about land tenure security and presents an integrated conceptual framework

for analyzing the relationship between land tenure reforms, (legal, actual and perceived) tenure security and rural household economic behavior in China. Section 2.4 and 2.5 examine the different magnitudes of existing legal, actual and perceived tenure security and discusses possible causes of existing discrepancies between them. The method of data collection in the two case study areas are introduced in Section 2.4, and is followed by discussion of the results in Section 2.5. The paper ends with concluding remarks in Section 2.6.

2.2 Land tenure system reform in China

Legal land tenure security in rural China is determined to a large extent by the formal land tenure reforms that have been implemented since 1978. Two main stages can be distinguished, namely the establishment of individual land use rights based on egalitarian principles under the household responsibility system (HRS), and the market-oriented land right reforms which are intended to increase (legal, actual and perceived) tenure security and land transferability.

2.2.1 Legal tenure security and the HRS

In the spring of 1979 a trial was started in Xiaogang Village, Fengyang County, Anhui Province, which allocated collective land resources to individual farm households according to equalitarian principles. Farmers were given land use rights and the right to obtain a portion of the income derived from the land. It closely linked farmers' income to their labor and land output. The central government affirmed the trial, called it the HRS, and implemented it across the country from 1981 onwards. By the end of 1984, 99% of the production teams of People's Communes across the country had adopted the HRS. The implementation of the HRS improved labor monitoring efficiency and gave farmers greater production incentives, leading to a sharp growth in land productivity (McMillan *et al.* 1989; Lin 1992).

Land use rights were assigned to rural households under the HRS for a period of 15 years, while land ownership remained with the collective (Tan *et al.* 2011). The size of the land assigned to households within a village was determined by the household size and/or the number of laborers in a household (Tan *et al.* 2006). The egalitarian principles underlying this system of land allocation had two important impacts on land tenure insecurity.

Firstly, administrative reallocations of land were used by village officials to address demographic changes that occurred within a village. These land reallocations could either be full-scale or partial. Under full-scale reallocations all farmland in the village was given back to the collective and, after subtracting proportional shares of land needed for other purposes, redistributed among village households. Under partial reallocations only the land of those households who experienced demographic changes (birth, death, marriage, migration) was reallocated among these households

Does Tenure Security Matter?

while leaving the rest of the land unaffected (Deininger and Jin 2009; Wang *et al.* 2011). The practice of frequent reallocations in response to changes in household sizes or composition, with households typically not being compensated for investments that they made in the land, is generally believed to contribute to tenure insecurity (Lohmar *et al.* 2001; Lohmar *et al.* 2003; Wang *et al.* 2011).

Secondly, the HRS regulations stipulated that land can only be allocated to households residing within a village. Consequently, the land use rights granted to a farm household could be dispossessed by its village when that household moved out of a village. Farmers therefore faced the risk of losing land use rights when they left a village for off-farm work.

2.2.2 Legal tenure security and the market-oriented reforms

The market-oriented land tenure reforms aim to stimulate land rental markets and enhance efficiency gains in agricultural production via improving tenure security and transferability of rural land. The first steps towards reforming the land tenure system in a market-oriented direction can be traced back to the early 1990s. The Land Administration Law (LAL) of 1986, which formally introduced the basis of the HRS, formally granted land rights to farmers. Farmers' land rights were supposed to be secure and extended. In practice, however, farmers' rights were frequently challenged and land transfers mainly took place through administrative reallocations (Vendryes 2010). The No. 11 Central Document of the Central Committee of the Communist Party of China (CCCPC), issued in 1993, specified that farmers' land rights will be extended by 30 years after the initial 15-years period had ended. And the No. 16 Central Document of the CCCPC published in 1997 strictly limited village land reallocations or takings. Although these regulations remained declarations of principles and lacked actual implementation procedures and were not binding on any of the parties, they provided important guidelines for the series of land laws that followed (Chen and Davis 1999).

The 1998 revision of the LAL stipulated that the duration of land use rights will be extended by another 30 years, that farmers' land use rights are protected by law, that land certificates will be issued to protect farmers' land use rights, that land transfer rights are offered to farmers, and that acceptance by two-thirds of villagers' representatives and approval of higher-level governments is needed for land reallocation within villages.

The Rural Land Contract Law (RLCL) of 2002 confirmed that farmland tenure security must be maintained for at least 30 years after the nationwide reallocation that started in 1998. It further stated that full-scale land reallocations within villages are completely prohibited and that partial land reallocations are only allowed in case of a natural disaster, land expropriation or other special circumstances, in which case they depend on acceptance by two-thirds of villagers' representatives and approval by higher-level (e.g. township) authorities. In addition, it specified that the collective

Chapter 2 Land Tenure: Legal, Actual and Perceived Security

cannot take (back) land from individual users without providing compensation. An important novel element of the RLCL is the specification of land transfer rights, including the rights of subcontracting (*zhuan bao*), leasing (*chu zu*), exchanging (*hu huan*), transferring (*zhuan rang*) and transferring land through “other means”. Land transferability can induce land transfer market development, and is an important way to increase land tenure security (Deininger 2003). The RLCL, however, did not provide clear rules for the inheritance of land use rights. Yet, the RLCL can be seen as important milestone marking a significant increase in transferability and in (legal) property rights security (Deininger and Jin 2009).

The Property Law (PL), adopted in 2007, further increased legal land tenure security in rural (and urban) areas. It implicitly granted farmers with perpetual rights, as it stated that farmers should retain and inherit their rights according to relevant rules when the 30 years period has passed. Moreover, the PL for the first time defined farmers’ land use rights as usufructuary. Usufruct rights allow a better protection of farmers’ interests (Ho 2005). Further legal support of farmers’ interests was provided by the Mediation and Arbitration of Rural Land Contract Disputes Law, adopted in 2009, which sets out principles related to the use of mediation or arbitration to settle land disputes.

In summary, land use rights could not be transferred freely and (actual) tenure security was impaired by frequent land reallocations and ambiguous land rights definition after the establishment of the HRS. Subsequent land tenure reforms significantly increased legal land tenure security and transferability. This was realized by: (1) extending farmers’ land rights with a period of 30 years in the 1998 LAL and the 2002 RLCL, and giving them a permanent status in the 2007 PL; (2) restricting land reallocations in the 1998 LAL, and prohibiting full-scale land reallocations and narrowing the scope of partial land reallocations in the 2002 RLCL; (3) mandatory issuing of land certificates to farmers in the 1998 LAL; (4) defining land use rights as usufruct rights and specifying farmers’ compensation for losing land use rights in the 2002 RLCL, and (5) specifying land transfer rights in the 1998 LAL, and identifying the modes of land transfers in the 2002 RLCL.

2.3 An integrated conceptual framework

Divergent views exist amongst development scholars and practitioners as to what constitutes land tenure security. In their study on Africa, Bruce and Migot-Adholla (1994) divide the concept of tenure security in Africa into three separate parts: breadth of rights, duration of rights and assurance of rights. Sjaastad and Bromley (2000) and Arnot *et al.* (2011) argue that this blending of three elements makes the concept of security intractable, and propose to define tenure security as the assurance of rights only. Breadth of rights and duration of rights refer to the content or substance of a right rather than its

Does Tenure Security Matter?

security¹¹. Sjaastad and Bromley (2000) define tenure security as perceived likelihoods associated with future changes in net benefits of a land tenure holder.

Previous studies that examine the effect of land tenure security on household decisions can be categorized into three groups based on the tenure security proxies that they use¹². The first group views legal tenure security as a necessary condition for households to undertake land investments and participate in the land market. This group uses legal title or land registration as proxies for tenure security (Deininger and Jin 2003; Smith 2004; Holden *et al.* 2007; Bouquet 2009; Kabubo-Mariara *et al.* 2010). The second group considers actual tenure security as the main driving force of household economic decisions. It uses indicators of the actual control of property to measure tenure security, e.g. the size of the bundle of rights (e.g. transfer rights, collateral rights), the duration of holding different rights, or past land readjustment experience (Krusekopf 2002; Kabubo-Mariara *et al.* 2006; Oostendorp and Zaal 2012). The third group uses perceived tenure security to examine tenure security, e.g. perceived likelihood of contract disruption and of retaining same plot, perceived (estimated) probability of eviction (Feder *et al.* 1992; Holden and Yohannes 2002; Gebremedhin *et al.* 2003; Benin *et al.* 2005; Van Gelder 2007; Van Gelder 2009). We will discuss all three views in turn.

2.3.1 Legal tenure security

The legal tenure security argument is rooted in the property rights paradigm. Private property rights are considered as crucial for protection against infringement, and in case of violation they allow for the invocation of state authority (Van Gelder 2009:128). Private property rights are expected to function as an incentive for undertaking investments due to the security they generate (Demsetz 1967). Land title or land registration have been considered as the main proxies of legal tenure security for decades, because they can reduce or eliminate uncertainty that landowners might have about land ownership (Feder 1988; Feder and Feeny 1991). This ‘titling rationale’ rests on three expected outcomes of land titling, namely: (1) the demarcation or clarification of physical boundaries of the property and associated property rights; (2) the availability of more information on property issues due to registration of property rights and cadastral information; and (3) a title-issuing entity and related institutional setup that ensures the enforcement of those property rights (Lemel 1988). Besides land title or land registration, other proxies of legal tenure security include tenure type or tenure categories (e.g. own land, fixed rent land, share-cropping land) and land laws or regulations that can reduce the risk of land expropriations (e.g. the Rural Land Contract Law in China, see Section 2.2).

¹¹ As we can see in Section 2.3.2, the substance of a right, i.e. breadth of land rights and duration of land rights, to large extent determines the actual control of land rights, and thus it is much related to actual tenure security.

¹² Some studies also use combination of three different concepts as proxies of tenure security (see e.g. Li *et al.* 1998; Gebremedhin *et al.* 2003; Towe *et al.* 2008).

Chapter 2 Land Tenure: Legal, Actual and Perceived Security

A basic assumption in the legal tenure security approach is that there exists a positive relationship between such proxies as land titling, tenure type, and tenure security. Numerous empirical studies have found supporting evidence that land titles create tenure security and provide higher levels of investment in the land (Feder 1988; Deininger *et al.* 2002; Carter and Olinto 2003). Land titles, however, are likely to be of less importance for tenure security where enforcement is repeatedly lacking, where the formal juridical system is unfair or where there is a lack of conflict-resolution mechanisms, and where there is simply a general distrust in the formal rights and enforcement system (Pagiola 1999).

2.3.2 Actual tenure security

Several studies show that a lack of individual land titles does not necessarily mean that the actual land tenure is insecure¹³ (Lemel 1988; Hazell 1993; Jansen and Roquas 1998; Broegaard 2005). Besides land titles, other factors like social, economic and political resources, local norms and duration of possession may actually create a high degree of tenure security, regardless of the possession of formal land titles (Roquas 2002)¹⁴.

Actual tenure security measures the actual control of property. Breadth of rights, duration of rights and assurance of rights can represent the actual control of property. Actual tenure (in)security depends on actual assignments of rights or duties which can alter the penalty and reward structure in such a way as to induce adjustments in household behavior. Effective rights assignments in reality allow agents to initiate or increase activities from which they benefit, or to terminate or reduce activities from which they do not (Sjaastad and Bromley 2000:4). A high level of legal tenure security indicates effective *de jure* assignments of rights and duties. However, these *de jure* assigning mechanisms might not be enforced effectively and thereby lead to low-efficient actual assignments of rights and duties.

In practice, whether legal rules are effectively enforced is influenced by e.g. legal rules themselves, characteristics of rights- or duties-holders, region-tailed contexts and intervention from outside. For example, Van Gelder (2010:451) points out that actual tenure security for household settlements is generated by characteristics intrinsic to a settlement, such as the length of time of occupation, the size of the settlement and the level and cohesion of community organization, and by factors extrinsic to a settlement, such as third-party support, the mobilization of media, political acceptance or administrative practices.

¹³ Some authors even argue that legal 'security' obtained by means of title can lead to actual, de facto insecurity (Payne 2002; Bromley 2005).

¹⁴ For example, farmers with sufficient economic or political resources can claim, formalize and enforce land rights, regardless of the original legal tenure situation of the land. Conversely, lack of economic and political resources (wealth and power) may prevent poor farmers from obtaining the necessary support from formal state institutions to enforce their property rights, despite possessing a land title (Van Gelder 2007; Van Gelder 2009).

Does Tenure Security Matter?

2.3.3 Perceived tenure security

The perceived tenure security approach starts from the view that the perceived tenure situation forms the basis upon which the landholder can be expected to take land-related decisions. Perceived tenure security serves therefore as a more direct proxy of tenure security than legal and actual tenure security (Migot-Adholla *et al.* 1991; Jansen and Roquas 1998; Sjaastad and Bromley 2000).

As mentioned above, perceived tenure security corresponds to the sense of security that is derived from a probability estimate of the chance of eviction or other factors that threaten a tenure situation and may cause involuntary relocation. Therefore perceived tenure insecurity implies high likelihoods of reduction in net benefits that will take place in the future, rather than benefit reductions that took place in the past, although the two might be correlated with each other. The eviction threat can come from governmental actors, but can also stem from other households, gangs and others. Perceived tenure security of rural land is a composite concept combining the farmers' own assessments of their tenure situation when asked directly, and their fears (or absence of fear) for future conflicts regarding their property rights (Broegaard 2005:850).

Perceived tenure security is a dynamic concept, and may vary among households within the same location. It depends on who perceives it, how such tenure has been gained, which actors have been involved in securing the tenure for particular households, and what is perceived as secure (de Souza 2001:28-29).

2.3.4 Integrated conceptual framework

Figure 2.1 shows an integrated conceptual framework that can be used for analyzing the impact of the market-oriented land tenure reforms, tenure security and household economic behavior in China.

Path A in the figure presents the direct effect of legal tenure security on household economic behavior. The market-oriented land tenure reforms aim to stabilize land tenure by implementing a series of land laws and regulations (see Section 2.2). Three important measures are the prohibition of land reallocation, the prohibition of land expropriation without acceptable compensation and the issuing of land certificates to farmers. The legal tenure security that they provide are expected to affect household decisions on making investments in their land, renting out of land, and participating in off-farm employment.

Path B shows the effect of actual tenure security on household economic behavior. Actual tenure security held by a land holder can be measured by such proxies as the numbers of land readjustment it experienced in recent years, the duration of holding a plot, and whether it holds a land certificate or not. Both formal and informal enforcement mechanisms determine whether legal assignments of rights

Chapter 2 Land Tenure: Legal, Actual and Perceived Security

and duties are effectively enforced in practice. An important law that assists the formal judicial system in protecting land tenure in China is the Law of the People's Republic of China on the Mediation and Arbitration of Rural Land Contract Disputes, adopted in 2009. Informal enforcement mechanisms includes village self governance rules which are endowed by the Organic Law of the Villagers Committees of the People's Republic of China, adopted in 1998, and amended in 2010 (see details in Section 2.5). Moreover, villagers' preferences on the policy of stabilizing land tenure influence whether legal assignments of rights and duties are enforced effectively by means of village self governance.

Path C represents the effect of perceived tenure security on household economic behavior. Estimation of perceived likelihoods associated with changes in net benefits of a tenure holder is difficult because it consists of cognitive and affect-based elements (Broegaard 2005; Van Gelder 2007). An alternative approach is to use proxies of perceived tenure security, such as household opinions about the likelihood of future land reallocation or land expropriation and about the importance of land certificates in protecting land tenure. These indicators intend to measure the tenure security a household perceives in its village or village group. Information dissemination like mobilization of media and village-level meetings can enhance household understanding of national laws and regulations, and consequently influence their expectation of future land tenure. Household characteristics, like size, age and gender composition or risk preference, may be important intrinsic factors contributing to household perceptions of tenure security.

In conclusion, even though legal, actual and perceived land tenure security may be related to each other, they are not the same. Factors contributing to each of these three types of security are fundamentally different. A household makes its economic decisions, like land-related investments or participation in land transfer markets, based on its own expectations of the future net benefits involved in these decisions. Path C therefore captures the direct effect of land tenure security on land-related investments and other decisions. Path C is consistent with the perceived tenure security approach used in some studies (e.g. Feder *et al.* 1992; Holden and Yohannes 2002; Gebremedhin *et al.* 2003; Benin *et al.* 2005; Van Gelder 2007; Van Gelder 2009). Path A and path B reflect indirect effects of land tenure security on land-related investments and other economic decisions. They are consistent with the legal and actual tenure security approaches used in the literature (Krusekopf 2002; Smith 2004; Holden *et al.* 2007; Kabubo-Mariara *et al.* 2006; Bouquet 2009; Kabubo-Mariara *et al.* 2010; Oostendorp and Zaal 2012). The results of these studies provide accurate estimates of the effect of land tenure security on household decisions in regions where legal and actual tenure security are equal to, or closely related to, perceived tenure security. As we will see below, this is not the case at present in the two case study regions in China where we collected information for this study.

Does Tenure Security Matter?

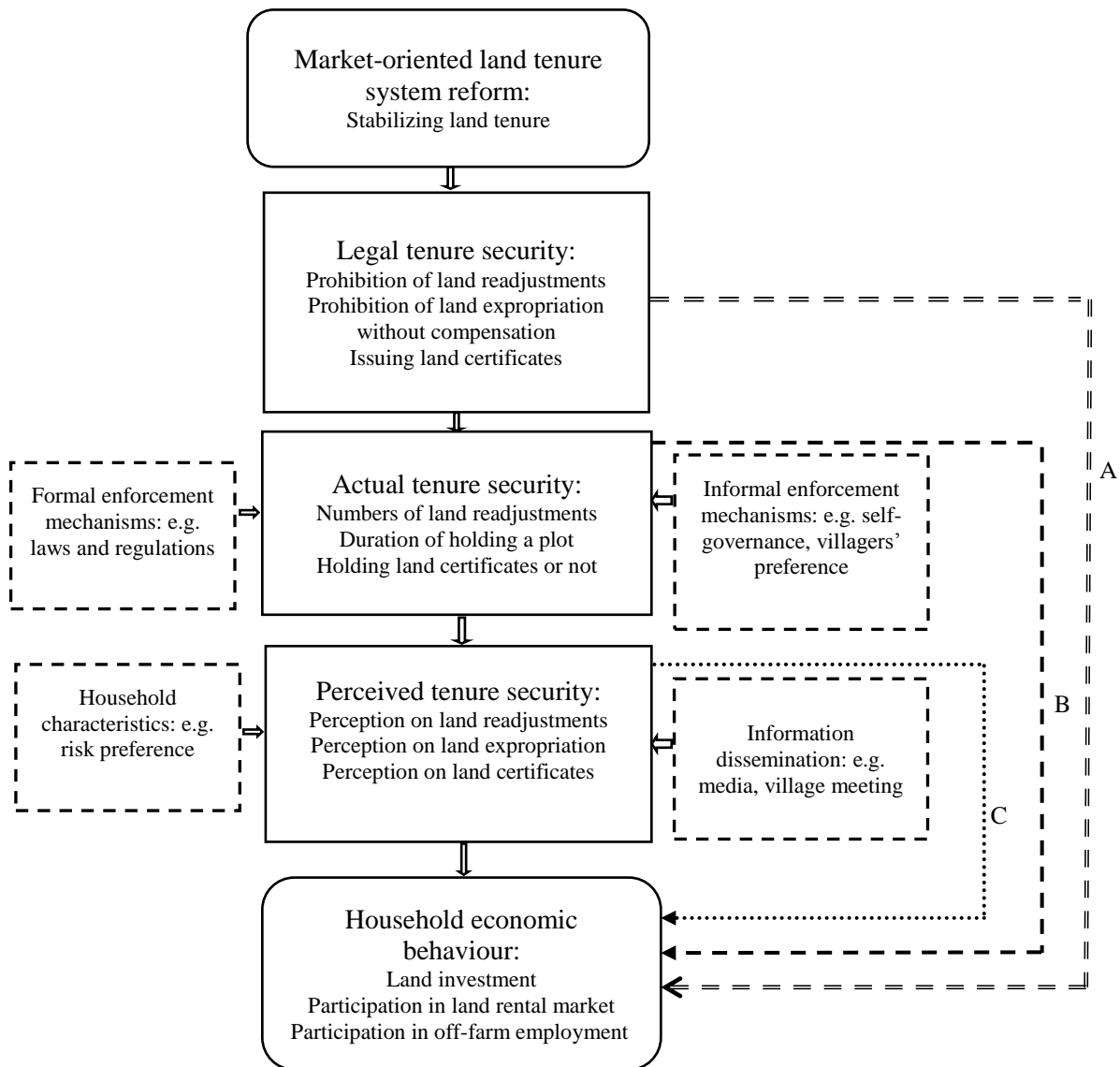


Figure 2.1 Conceptual framework of land tenure reforms, tenure security and household decision making

2.4 Methodology

2.4.1 Data collection

In order to examine differences between legal, actual and perceived tenure security, we examine data collected during two household and village leader surveys in Minle County, Gansu province in northwest China and in Shangrao County and Yingtan County in Jiangxi province in central-south China.

In the Gansu case study, a farm household and village leader survey was held in May of 2010. It covered 315 households and 21 village leaders, living in 21 villages and ten townships. Topics included in the household survey comprise farm production, off-farm employment, expenditures, land and water use in the year 2009 as well as tenure security at the time of the survey. The village leader

Chapter 2 Land Tenure: Legal, Actual and Perceived Security

survey contained questions about village-level population, off-farm employment, land and water use in the year 2009 as well as tenure security. The survey was the follow-up of a similar survey carried out, using a stratified random sampling technique, in May 2008 (see Ma *et al.* 2013a for details on the household and village leader selection procedure). The earlier survey, however, did not contain information on land tenure security.

In the Jiangxi case study, a similar farm household and village leader survey was held in Shangrao County and Yingtian County in August 2011. Included topics were similar to those in the survey held in Minle County in Gansu province, but refer to the year 2010 instead of 2009. The survey covered 526 households and 11 village leaders living in 11 villages and six townships. For 175 of the interviewed households the survey was the follow-up of two similar surveys carried out in three villages, one in Shangrao County and two in Yingtian County, for the years 2000 and 2005 (see Kuiper *et al.* 2001 and Feng 2008 for details on the stratified random sampling technique used for the first survey). The earlier two surveys, however, did not contain information on land tenure security. The other 351 households were interviewed only in 2011. They were randomly selected within eight other villages in Shangrao County.

To obtain a deeper understanding of the causes of observed differences between legal, actual and perceived tenure security, the author held more in-depth interviews with 35 selected household heads and 10 village leaders in Minle County, and 45 selected household heads and 8 village leaders in Shangrao County and Yingtian County. These households and village leaders were selected among those who reported low levels of actual and perceived land tenure security. The interviews were held at the same time and in the same villages as the household and village surveys were carried out, and were based on open-ended questions which aimed to explore causes of low level of actual and perceived land tenure security.

Table 2.1 presents background information on the socio-economic situation in the two case study regions and compares it with the average values for rural China as a whole. We find that household net income per capita in the two study regions is 10-13 per cent lower than the average for rural China. Agriculture plays a relatively important role in the economy of the Gansu case study region. Per capita land resources are relatively large and the migration rate is relatively low in the Gansu case, while land resources are lower and the migration rate is higher than the national average in the Jiangxi case.

Does Tenure Security Matter?

Table 2.1 Socio-economic situations in two case study regions and rural China, 2009-2010

Indicator	315 households in Gansu, 2009 ^a	526 households in Jiangxi, 2010 ^a	Rural China	
			2009 ^b	2010 ^b
Household net income per capita (RMB)	4,500	5,326	5,153	5,919
Share of agricultural income to total income (%)	70	44	47.15	46.29
Share of migrants to all workers (%)	22	46	33	36
Household land area per capita (mu)	4.28	1.58	2.26	2.28

^a Calculated based on the information collected by two household and village leader surveys.

^b Calculated from NBS (2010a,b, 2011a,b, 2012)

2.4.2 Choice of indicators

The household head's responses to questions about land tenure status were used to obtain measures of actual tenure security and perceived tenure security (see Table 2.2). Actual tenure security is measured by three indicators¹⁵. The first two indicators refer to land reallocation: land reallocation experience since 1998, and number of land reallocations. The third indicator measures whether a household possesses a land certificate or not.

Table 2.2 Links between security indicators and questions asked in household surveys

Type of security	Indicator	Survey question
Actual security	Land reallocation experience	Have you experienced land reallocation since 1998?
	Number of land reallocations	How many times have you experienced land reallocations since 1998?
	Possession of land certificates	Do you have a land certificate at the time of survey?
Perceived security	Perception on the policy of stabilizing land tenure	Do you agree with the policy of stabilizing land tenure?
	Expectation on future land reallocations	Do you think that land will be reallocated in your village within 5 years?
	Perception on importance of land certificates	To what extent do you think land certificates are important in protecting your land rights?

Source: author's survey

Perceived tenure security is also measured by three indicators. The first indicator measures farmers' perceptions on the central government's policy of stabilizing farmland tenure. The more farmers agree with the policy of stabilizing land tenure in a village, the easier the policy can be enforced. Wang *et al.*

¹⁵ The duration of holding a certain plot by a household can also serve a good proxy for actual security, however, our surveys did not collect information at plot-level because of a high degree of land fragmentation. It is roughly estimated by village leaders that a household has on average 8 plots in Jiangxi case, and 15 plots in Gansu case.

(2011) use this indicator to measure farmers' attitudes towards land reallocation. The second indicator measures farmers' perceptions on the probability of future land reallocation which is derived from questions regarding the household heads' expectation on whether land will be reallocated in the near future. The third indicator measures farmers' perceptions on the role and importance of land certificates and is derived from the household heads' assessment of the importance of land certificates for protecting land use rights. The second and third indicator both serve as indicators of farmers' subjective probability estimates of the chance of eviction of the land that they obtained from the village leader.

2.5 Results

2.5.1 The status of land tenure security

With respect to legal tenure security, we can observe that the 1998 LAL, 2002 RLCL and 2007 PL were issued and implemented throughout China since their dates of promulgation. These laws significantly improve legal tenure security through the ban on land reallocations, the prohibition of land expropriations without appropriate compensations, and the issuing of land certificates. Hence, it can be assumed that legal tenure security is high and is the same in the two case study regions in Gansu province and Jiangxi province.

The results with respect to actual and perceived tenure security are summarized in Table 2.3. They show that actual tenure security is lower than legal security in both regions. In particular, we find that that actual tenure security is much lower in the Jiangxi case than in the Gansu case. In the Jiangxi case, 70% of the households still experienced at least one land reallocation since 1998, while the average number of land reallocations these households experienced since that year equals 3.4. In the Gansu case, on the other hand, only 6% of the households experienced a land reallocation since 1998, with all these households experiencing only one land reallocation since that year. As much as 67% of the households in the Jiangxi research area stated that they do not have official land certificates, while only 3% of the interviewed households in the Gansu case said they do not have land certificates. The possession of land certificates in the Jiangxi case is much lower than was found by Jin and Deininger (2009) for central China between 2001 and 2004 (81%), while land certificates possession in the Gansu case is much higher than was found in that study for northern China (74%).

With respect to perceived tenure security, our results show that it is still weak in both regions where we did our research. In the Jiangxi case only 32% of the interviewed household heads agree with the central government's policy of stabilizing land tenure, while 53% of the interviewees disagree with the policy. For the Gansu case, the results are slightly more positive: 53% of the interviewees endorse the policy, while 45% of the interviewees disagree with it. The findings for the Jiangxi case are

Does Tenure Security Matter?

comparable with those obtained by Wang *et al.* (2011) for six provinces (Jiangsu, Sichuan, Shaanxi, Jilin, Hebei and Fujian) in 2008. Their study finds that around 30% of the interviewees agree with the policy, while more than 60% of the interviewees do not endorse it.

Table 2.3 Actual and perceived land tenure security in the two case study regions

Indicator	Survey answers	Share of households (%)	
		Gansu case	Jiangxi case
Actual tenure security			
Land reallocation experience	At least one land reallocation since 1998	6	70
	No land reallocation since 1998	94	30
Number of land reallocations	Average number of land reallocations since 1998	1.0 ^a	3.4 ^a
Possession of land certificates	With land certificate	95	30
	Without land certificate	3	67
	No answer	2	3
Perceived tenure security			
Perception on the policy of stabilizing land tenure	Agree with the policy	53	32
	Disagree with the policy	45	53
	No answer	2	15
Expectation on future land reallocations	Expect that land will be reallocated within 5 years	15	57
	Expect that land will not be reallocated within 5 years	38	18
	Do not know	47	25
Perception on importance of land certificates	Important for protecting land rights	80	35
	Not important for protecting land rights	8	61
	Do not know	12	4

Source: Author's calculations.

^a Average number of land reallocations indicates the number of reallocations of households who experienced at least one land reallocation since 1998.

For the other two indicators of perceived land tenure security we also find large discrepancies between the two research areas. Out of the interviewed households in the Gansu case, 38% expect that land reallocations will not take place in the next five years. In the Jiangxi research area, only 18% of the interviewed households have the same expectation. The discrepancy is even larger for the confidence in land certificates. In the Gansu research area, 80 percent of the interviewed households believe that land certificates are important for protecting land rights, while only 35 percent of the interviewed households in the Jiangxi case hold a similar belief.

Chapter 2 Land Tenure: Legal, Actual and Perceived Security

This raises the question why such large regional differences exist in actual and perceived tenure security. In another study based on the Minle County data set, we examine the impact of household characteristics, land investments and other household-level factors on perceived tenure security (Ma *et al.* 2013a). That study concludes that land readjustments are less likely to occur in villages where household investments in land quality improvement are common, because these investments will increase the difficulties of reallocating land. As investments in land quality improvement, like land leveling and investments in small-scale irrigation canals are common in the Gansu case study area but not in the Jiangxi case study area, this finding provides a possible explanation for the observed differences in actual and perceived tenure security between the Gansu case and the Jiangxi case.

In summary, we find that actual tenure security and perceived security differs significantly from legal land tenure security in our two research sites. The market-oriented land tenure reforms that have been implemented since the end of the 1990s provide farmers with high legal tenure security. But actual tenure security is much lower, particularly in the research area in Jiangxi province. Given the large number of land reallocations that are still taking place in the Jiangxi case, and the small share of households possessing land certificates in that region, it may be concluded that the central government's policy of stabilizing land tenure is not enforced effectively. The implementation of the policy has been much more successful in the other research area, Minle County in Gansu Province. Few land reallocations still take place in that area, and almost all households in the region possess a land certificate. Perceived tenure security is also much lower than legal tenure security in both research areas, and seems to be related to actual tenure security. Particularly current expectations about the absence of land reallocations in the near future and the importance attached to land certificates in protecting land rights are much lower in the Jiangxi case study area than in the area in Gansu where we did our field research.

2.5.2 Causes of land tenure insecurity

The evidence presented in Section 2.5.1 raises the question what causes the large discrepancies between legal land tenure security on the one hand and actual and perceived tenure security on the other hand. In this section we will use the results of household survey questions soliciting household opinions, and additional insights obtained during the open-ended interviews with a selected number of household heads and village leaders, to argue that egalitarianism inherent in farmers' thinking, ambiguous formulations of laws and regulations, and village self-governance rules are three important factors that contribute to this discrepancy.

Our case study areas are located in economically less-developed and relatively remote counties. Few land expropriations to facilitate industrialization and urban expansion occurred since 1998 in both regions. Land expropriation for urban and industrial development is therefore not an important factor

Does Tenure Security Matter?

in these regions. Demographic changes in the village, on the other hand, are likely to play an important role. Moreover, land reallocations might take place in a few villages where household land is taken away by village leaders for rural infrastructure construction, like building roads or bridges.

In the remainder of this section we will explore what role internal driving forces and shortcomings in formal and informal governance rules play in contributing to weak actual and perceived security of land tenure. Our analysis focuses on why these factors contribute to inefficient enforcement of laws and regulations defining legal tenure security in practice.

2.5.2.1 Internal driving forces: egalitarianism

Egalitarianism in Chinese society originates from Confucius, one of the greatest ideologists in China's ancient times. Confucius stated that shortage is not a problem, but the inequality in the process of building a harmony society is. Chinese are deeply influenced by Confucianism. Confucianism undoubtedly also influenced the land tenure reforms in China. This is clear in particular from the equalitarian principle that dominated land allocation under the HRS (see Section 2.2.1).

The market-oriented land tenure reforms since 1998 do not eliminate the egalitarianism inherent in farmers' thinking. A large majority of farmers still considers that it is necessary to allocate land, a main asset of farmers, based on equalitarian principles (Wang *et al.* 2011). To maintain these equalitarian principles, land needs to be readjusted periodically in response to demographic changes in a village. The top part of Table 2.4 shows the answers given in our surveys in Gansu and Jiangxi Province to the question why land reallocations still took place since 1998. It clearly demonstrates that demographic changes are the most important driving force of land reallocations.

The other two parts of Table 2.4 show the answers given to the question why households either disagree or agree with the policy of stabilizing land tenure. The results show that 96% of the households that disagree with the policy of stabilizing land tenure in the Jiangxi research area answered that land reallocations based on egalitarian principles are fair. In the Gansu research area, 91% of those who disagree the policy of stabilizing land tenure hold the same opinion. Of the households that agree with the policy of stabilizing land tenure, only 5% in both research areas answered that it is fair that there is no land reallocation. Over seventy percent of the households that agree with the policy answered that stable land tenure can encourage farmers to make more land conservation investments.

The less egalitarian land allocation that results from the policy to stabilize land tenure is a main reason for increasing rural inequality (Xing *et al.* 2006), and may be at the root of conflicts among villagers.

Chapter 2 Land Tenure: Legal, Actual and Perceived Security

In fact, the policy to refrain from reallocations for a period of 30 years can be argued to deprive farmers of the right to an equal share of the village land (Piotrowski 2009).

Table 2.4 Reasons for weak actual and perceived land tenure security in China

Household survey question	Answer	Share of households (%)	
		Gansu case	Jiangxi case
Reasons for land reallocation since 1998	Demographic change	100 ^a	91
	Land consolidation	0 ^a	1
	Land conversion from Farmland to non-farmland	0 ^a	1
	Natural disaster	0 ^a	2
	Others, e.g. rural infrastructure construction	0 ^a	5
Reasons for disagreeing with policy of stabilizing land tenure	Land reallocation is fair	91	96
	Other reasons, e.g. land reallocation facilitates cultivation	9	4
Reasons for agreeing with the policy of stabilizing land tenure	It is better to use plots for a long time, and encourage more land conservation investments	87	70
	It is fair that land is not reallocated	5	5
	It can avoid that village leader benefits from reallocations	5	1
	Others, e.g. It causes lots of work during land reallocation	3	24

Source: Author's calculations based on household surveys

^a Based on village leaders' information (question is missing in household survey held in Minle County)

Inequality in land endowments does not necessarily contribute to income inequality if land scarce households have access to off-farm employment (Kung and Liu 1997). The net benefits derived from agricultural land, however, have increased significantly since 2004 due to rising agricultural product price and government subsidies. Potential conversion from agricultural land to non-agricultural land, and the insurance function of agricultural land, further add to its increased value. Therefore, households who have access to off-farm employment are often not willing to give up their land use rights. The following narrative collected by in-depth interviews with selected households is illustrative in this respect: *“Land is important because it is an insurance and property for my family. Although some households in my family have migrated to urban areas, they are temporary migrants. The migrating households of my family might come back and continue to cultivate land if they can no longer find suitable jobs in the city. Even though they do not need to come back, they can still rent out land to other households and earn land rent. If they are lucky that the government expropriates their land for some purpose, they can get lots of compensation. Therefore in no case will they give up rural land.”*

Does Tenure Security Matter?

Another potential cause of conflict is the weak protection of women's rights associated with marriage. As a result of the ban on reallocations and increasing population pressure on land, married women usually lose their land shares in their maiden villages while land endowments cannot be adjusted for their husbands' households to reflect the additional person in the family. Land reallocations can therefore be seen as a way to secure women's land use rights (Lin and Lixin 2006). In order to protect women's land rights, the LLCRA states that the maiden villages cannot take back the originally contracted land if a married woman cannot get land in the place of her new residence. However, married women often cannot obtain any benefits from their maiden family's land unless the land market would enable them to rent out the land and rent in land in their new residences. In large parts of China, however, the land rental market still functions far from perfectly.

2.5.2.2 Shortcomings in formal governance rules: ambiguous formulations of laws

There exist a number of shortcomings at present in the formal rules that govern tenure security. Firstly, ambiguous formulations of relevant laws lead to potential contradictions. For example, the 1998 LAL, 2002 RLCL and 2007 PL explicitly prohibit land reallocation in order to protect farmers' land rights. However, the Organic Law of the Villagers Committees of the People's Republic of China (OLVC), adopted in 1998 and amended in 2010, stipulates that villagers committees shall administer affairs concerning land contracting through self-governance mechanisms. Moreover, the 2002 RLCL states that partial land reallocations are allowed if they are accepted by at least two-thirds of villagers' representatives (self-governance mechanism) and approved by higher-level (e.g. township) authorities. Although the OLVC points out that self-governance must comply with the existing laws, it does not specify how to avoid potential contradictions between laws and self-governance mechanisms, and how to deal with these contradictions. Ambiguous formulations of laws allow many villages to make decisions about land reallocations that are based more on village self-governance rules than on existing land laws.

Secondly, ambiguous formulations of relevant laws give villages the opportunity to continue readjusting the land. Although the 2002 RLCL and 2007 PL explicitly prohibit land reallocation, their formulations are not unambiguous and transparent. In particular, the two laws state that partial land reallocation can take place in the case of natural disasters which irreversibly damage contracted land and in other conditions. The two laws however do not specify what is included in other conditions for land reallocation. The in-depth interviews with selected village leaders in the Gansu and Jiangxi case study areas confirm that ambiguous formulations of relevant laws allow villages to continue readjusting the land. As a village leader explained "*We know that the RLCL prohibits land reallocation due to demographic changes, but it also specifies some other conditions that allow land reallocation. When more than two thirds of the village representatives hope to readjust the land, we normally do so using these ambiguous other conditions as an excuse.*" Piotrowski (2009) also argues

that the seemingly vague and ambiguous formulations inherent in the land laws and regulations defining legal tenure security are important reasons for the existing weak tenure security.

2.5.2.3 Shortcomings in informal governance rules: self-governance rule

Self-governance, as a major informal governance rule in rural China, plays an important role in explaining weak tenure security. Firstly, self-governance rule allows land readjustment decisions to be made at the village level or village group level. The OLVC allows villagers committees to make decisions whether and in what conditions land can be readjusted in the context of self-governance. In our two research areas, many villagers committees give the decision power concerning land reallocation to village groups and allow village groups to self-govern land reallocation. The following response of a village leader is illustrative of the answers given by many village leaders why the transfer of decision power occurs: *“Sometime it is very hard to make a trade-off between the benefits of households who are willing to readjust land and the benefits of those who want to stabilize land tenure. Villagers committees will have less trouble by giving decision power to (lower-level) village groups.”*

In the context of self-governance rules, whether or not a village group reallocates land mainly depends on farmers' attitudes towards land reallocation. If a majority of villager representatives¹⁶ are willing to readjust the land in a village, land reallocation can easily be organized via self-governance rules despite their legal prohibition. In the in-depth interviews with selected households, one question was *“Land readjustment is not allowed under the central government's policy of stabilizing land tenure. Why do you think land will still be reallocated in the future?”* The following response of a household is illustrative of the answers given by over eighty percent of the interviewed households: *“Conflicts between households that result from the failure to readjust land in the past few years have increased significantly. The growing conflicts result in an unavoidable fact that more people favor readjustment of land. Land reallocation can be undertaken regardless of the contradiction with legal systems if more than two thirds of households think the land must be readjusted in my village.”*

Secondly, self-governance rule is a more important enforcement mechanism than the formal judicial system in the regions where we did our research. The transaction costs involved in judicial procedures to enforce farmers' land rights are large. This makes it nearly impossible for most farmers, particularly poor farmers, to use the legal system to enforce their land rights effectively. In this situation, farmers with disputes concerning land reallocation normally try to seek mediation or arbitration within their own village where self-governance rules are used for mediation or arbitration.

¹⁶ The 2002 RLCL states that acceptance by two-thirds of villagers' representatives is the minimum requirements for land readjustments. However, according to the in-depth interviews with village leaders, the minimum requirements for village self-governance rules differ across villages; they range from 50% to 90% of all villager representatives in our two research areas.

Does Tenure Security Matter?

Few farmers in our two research areas appeal to the judicial procedure to solve disputes concerning land reallocation. In the in-depth interviews with selected households, two questions were: (1) *“If your village readjusts land irrespective of your interest and legal land systems, why do you not use judicial procedures to protect your interest?”* and (2) *“Why do you think land certificates cannot protect your land when land readjustment or land requisition for urban or infrastructure development occurs?”* The following response of a household is illustrative of the answers given by many interviewed households: *“Land readjustment is done according to most farmers’ will; I will hurt the benefits of most farmers, and be condemned by these villagers if I strongly go against land reallocation. Land certificates may be helpful when I appeal to judicial procedures, but I will not do so unless I decide to leave the village forever”*.

2.6 Conclusions

This paper examines the magnitudes of legal security, actual security and perceived security of land tenure, and the causes of currently prevailing land tenure insecurity in China. Two household and village leaders surveys conducted in northwest Gansu province in 2010 and in northeast Jiangxi province in 2011 are used for the study. Our findings show that legal land tenure security is high. The market-oriented land tenure reforms, however, fail to provide farmers with high levels of actual tenure security and perceived tenure security. Especially in the research area in Jiangxi Province, Shangrao County and Yingtan County, both actual and perceived land tenure security was at a low level at the time of the interviews. Our evidence further supports existence of a positive relationship between actual tenure security and perceived tenure security, although perceived tenure security is generally lower than actual tenure security. With respect to the causes of the low levels of actual and perceived tenure security, we use evidence collected during in-depth interviews to argue that the egalitarianism inherent in farmers’ thinking, ambiguous formulations of relevant laws, and prevailing village self-governance rules are important contributing factors.

Our results have important implications for policy-making and future study. With respect to policy, we recommend that policy makers pay more attention to land tenure security perceptions at the household level as these are the basis for economic decisions making by rural households. Market-oriented land tenure reforms do not necessarily improve perceived (and actual) tenure security. Tenure security perceptions may be improved by addressing the egalitarianism inherent in farmers’ thinking, the current formulations of relevant laws, and the existing rural self-governance mechanisms in rural China.

With respect to future study, we recommend that more efforts are made to measure farm household perceptions of land tenure insecurity in rural China. Too much attention is still being paid to legal

Chapter 2 Land Tenure: Legal, Actual and Perceived Security

tenure security, while perceived land tenure may be much more insecure due to a host of factors. Future policy making in this field may also benefit from more rigorous research on the factors responsible for perceived insecurity of rural land tenure. The findings in our study are based on surveys and in-depth interviews of a small number of households and village leaders. More extensive surveys are needed to check the validity of our findings at a larger scale. Research in this field should in particular also address the factors responsible for differences in perceived (and actual) tenure security between different regions. As noted in Section 2.5.1, very large regional differences can be observed in household perceptions with respect to the likelihood of future land reallocations and the importance of land certificates. Differences in household investments in land may be an important explanatory factor, but more research is needed to examine its role and those of other factors.

3. Land Tenure Reforms and Land Conservation Investments in China: Theoretical Considerations¹⁷

Abstract: Land conservation investments can make an important contribution to avoidance and mitigation of land degradation. Lack of tenure security and land transferability may, however, limit the extent to which farmers undertake such investments. Using real option value theory, this paper investigates the expected impact of the market-oriented tenure reforms implemented in China since 1998 on land conservation investment incentives. It postulates that the reforms are more likely to elicit land conservation investments in areas where land markets are developing. This paper further argues that benefits of the land tenure reforms will be underestimated if only the intrinsic but not the time value of changes in the investment incentives is considered. The findings obtained from this research provide a better understanding of the relationship between the land tenure reforms and land conservation investments, and are likely to serve sustainable land management in China and elsewhere.

¹⁷ This chapter has been published as: Ma, X., J. Wesseler, N. Heerink and F. Qu (2013). "Land Tenure Reforms and Land Conservation Investments in China – What Does Real Option Value Theory Tell Us?" *Review of Economics & Finance* 3:19-33.

3.1 Introduction

Poverty, agricultural stagnation and resource degradation are frequently interlinked in a vicious circle in many developing countries (WCED 1987). Investments in land conservation - such as terracing, blocking of soil erosion outlets, and application of organic manure - can play a fundamental role in breaking this vicious circle by mitigating soil erosion, restoring soil fertility and soil organic matter, and controlling dry land salinization (Kabubo-Mariara *et al.* 2006).

Tenure security and land transferability are generally considered to be important preconditions for undertaking land conservation investments (Feder and Feeny 1991; Besley 1995; Banerjee and Ghatak 2004; Deininger and Jin 2006). The underlying theoretical argument claims that secure property rights over land encourage land conservation investments through strengthening claims to the fruits of the investment (assurance effect) (Banerjee and Ghatak 2004), allowing for gains from trade (transferability effect) (Besley 1995; Deininger and Jin 2006) and increasing access to capital (collateralizability effect) (Feder and Feeny 1991).

The existing literature on property right security and land conservation investments neglects two important aspects. First, land conservation investments undertaken by farmers are frequently irreversible. Land conservation investments are linked to specific plots, and it may not be easy to retrieve them or transfer them technically and economically to other plots. More secure property rights provides households with better opportunities to retrieve the costs of investments in land quality by negotiating rental prices or compensations for expropriation that reflect these quality improvements. Second, empirical studies implicitly assume that farmers have no time flexibility in making land investment decisions. More secure land rights, however, may improve the long-term investment environment. As a consequence, rural households can decide to defer land-related investments until the most appropriate moment. Empirical studies of the impact of property right security on land conservation investments focus on immediate benefits and generally fail to take this indirect benefit into account. The neglect of these two aspects may explain, at least partially, why empirical studies have provided mixed results so far (Holden and Yohannes 2002; Jacoby *et al.* 2002; Kassie *et al.* 2012).

The objective of this paper is to analyze the effect of the market-oriented land tenure reforms in China on farmers' land conservation investment decisions. To this end, we use an integrated framework that takes into account irreversibility of land investment costs and indirect benefits obtained from increased time flexibility. We will argue that failure to take these two factors into account may underestimate the economic benefits of land tenure reforms in China, in particular the environmental benefits.

Does Tenure Security Matter?

The approach used in this paper is to identify the main characteristics of the land reforms, link these characteristics to the real option value (ROV) model of investment behavior, and compare the outcomes with those of a net present value (NPV) approach that neglects investment irreversibility and time flexibility aspects.

The paper is organized as follows. Section 3.2 presents background information on the rural social structure and the land tenure system and its reforms in China. Three basic characteristics of land conservation investments in China are discussed in section 3.3. These characteristics are used in section 3.4 to analyze the effect of the market-oriented land tenure reforms on land conservation investments. Section 3.5 summarizes the main findings and discusses their implications.

3.2 Rural social structure and land tenure in China

The prevailing social structure in rural China plays an important role in both the land tenure system and in certain types of land conservation investments. This section will first briefly discuss the background of the current social structure. Next, it will pay attention to the evolution of the system of land tenure in rural China since 1978, which can be divided into two distinct phases. The first phase is the establishment of the HRS, guided by egalitarian principles. The second phase consists of adjustments of the HRS aimed at increasing tenure security and transferability.

3.2.1 Rural social structure

At the beginning of the foundation of the Peoples' Republic of China, China implemented a policy of collectivization which required farmers to surrender land to collectives, and adopt a shareholding cooperative production way. As a consequence, Chinese farmers were deprived of the bundle of control and income rights (Kung 2000). From 1953 to 1957, mutual-aid teams and elementary cooperatives were gradually founded. The collective production organization had been further enhanced since the foundation of the people's communes in 1958. During the period of the people's communes the collective land ownership was established, and land has been fully collectivized. The collective production organization was the major rural social structure in China from 1953 to 1978. The collective production organization in the people's communes included three levels: people's commune, production brigade and production team.

The people's communes were gradually dismantled during the implementation of the HRS that started in 1978. The HRS granted farmers land use rights, with the defunct production teams continuing to be the owners of the collective land. The collective production organization has changed significantly since 1978. The people's communes, production brigades and production teams have been transformed into townships, administrative villages and natural villages, respectively. Many joint decisions about local infrastructure investment and maintenance and land reallocations are taken

through self-governed rules at the administrative village level, and are sometimes delegated to the natural village level. The social cohesion within natural and administrative villages is still relatively strong and affects a range of economic decisions taken at the local level, including land conservation investments.

3.2.2 Land tenure under the HRS

In 1978, the resolution of the Opening and Reform Policy required to dismantle fully collectivized land property rights in order to enhance agricultural productivity. The HRS was firstly introduced as a trial in Xiaogang Village, Fengyang County, Anhui Province in 1979, and then was implemented across the country from 1981 onwards. The HRS allocated collective land resources to individual farm households according to equalitarian principles. The size of the land assigned to households within a village was determined by the household size and/or the number of laborers in a household (Tan 2006). Farmers were given land use rights for a period of 15 years and the right to obtain a portion of the income derived from the land, while land ownership remained with the collective (see Tan *et al.* 2011 for a detailed discussion of rural land property rights in China). The implementation of the HRS improved labor monitoring efficiency and gave farmers greater production incentives, leading to a sharp growth in land productivity (McMillan *et al.* 1989; Lin 1992). The egalitarian principles underlying this system of land allocation, however, had four important, less desirable consequences.

Firstly, to deal with differences in land quality (particularly soil fertility, irrigation and drainage conditions) within a village, land was divided into different classes. Each household in a village received at least one plot of each land class. A high degree of land fragmentation was the result, with households having on average 8.4 plots with a plot size of only 0.07 ha in 1986 (Qu *et al.* 1995; Tan 2006).

Secondly, administrative reallocations of land were used by village officials to address demographic changes within a village. Either full-scale or partial land reallocations have been implemented. Under full-scale reallocations all farmland in the village is given back to the collective and, after subtracting proportional shares of land needed for other purposes, redistributed proportionally among village households. Under partial reallocations only the land of those households who experienced demographic changes (birth, death, marriage, migration) was reallocated among these households while leaving the rest of the land unaffected (Deininger and Jin 2009; Wang *et al.* 2011). The practice of frequent reallocations in response to changes in household sizes or composition, with households typically not being compensated for investments in the land that they have made, is generally believed to introduce tenure insecurity (see e.g. Lohmar 2003; Wang *et al.* 2011).

Does Tenure Security Matter?

Thirdly, the HRS regulations stipulated that land can only be allocated to households residing within a village. Consequently, the land use rights granted to a farm household may be dispossessed by its village when that household moves out of a village. Farmers therefore face the risk of losing land use rights when they leave a village for off-farm work.

Finally, transfers of land use rights possessed by farmers are not allowed under the HRS. This regulation was intended to avoid growing land inequality, but reduced the scope for further efficiency gains in agricultural production. Subsequent reforms in the land tenure system aimed to address in particular these major shortcomings in the system.

3.2.3 Reforms of the land tenure system

The first steps towards reforming the land tenure system can be traced back to the early 1990s. The Land Administration Law (LAL) of 1986, which formally introduced the basis of the HRS, formally granted land rights to farmers. Farmers' land rights are supposed to be secure and extended. In practice, however, farmers' rights were frequently challenged and land transfers mainly took place through administrative reallocations (Vendryes 2010). The No. 11 Central Document of the Central Committee, the Communist Party of China (CCCPC), issued in 1993, specified that farmers' land rights will be extended by 30 years after the 15-years period has ended. And the No. 16 Central Document of the CCCPC published in 1997 strictly limited village land reallocations or takings. Although these regulations remained declarations of principles and lacked actual implementation procedures and were not binding on any of the parties, they provided important guidelines for the series of land laws that followed (Chen and Davis 1998).

The 1998 revision of the LAL stipulates that the duration of land use rights will be extended by another 30 years, that farmers' land use rights are protected by law, that land certificates will be issued to protect farmers' land use rights, that land transfer rights are offered to farmers, and that acceptance by two-thirds of villagers' representatives and approval of higher-level governments is needed for land reallocation within villages. The Rural Land Contract Law (RLCL) of 2002 confirms that farmland tenure security must be maintained for at least 30 years after the nationwide reallocation that started in 1998. It further states that full-scale land reallocations within villages are completely prohibited and that partial land reallocations are only allowed in case of a natural disaster, land expropriation or other special circumstances, in which case they depend on acceptance by two-thirds of villagers' representatives and approval by higher-level (e.g. township) authorities. In addition, it specifies that the collective cannot take (back) land from individual users without providing compensation. An important novel element of the RLCL is the specification of land transfer rights, including the rights of subcontracting (*zhuan bao*), leasing (*chu zu*), exchanging (*hu huan*), transferring (*zhuan rang*) and transferring land through "other means". The RLCL, however, does not provide clear rules for the

Chapter 3 Land Tenure Reforms and Land Conservation Investments: Theoretical considerations

inheritance of land use rights. Yet, the RLCL can be seen as important milestone marking a significant increase in transferability and in property rights security (see also Deininger and Jin 2009).

The Property Law (PL), adopted in 2007, further increased land tenure security in rural (and urban) areas. It implicitly grants farmers with perpetual rights, as it states that farmers should retain and inherit their rights according to relevant rules when the 30 years period has passed. Moreover, the PL for the first time defines farmers' land use rights as usufructuary. Usufruct rights allow a better protection of farmers' interests (Ho 2005). Further legal support of farmers' interests is provided by the Mediation and Arbitration of Rural Land Contract Disputes Law, adopted in 2009, which sets out principles related to the use of mediation or arbitration to settle land disputes.

In 2008 the third Plenary Session of the 17th CCCPC reconfirmed that the rural land tenure system is characterized by a two-tier management system consisting of collective ownership and farmers' permanent usufructuary rights. It approved a document stipulating that markets for the lease of contracted farmland and transfer of farmland use rights must be set up and improved to allow farmers to sub-contract, lease, exchange and swap their land use rights, or join share-holding entities with their farmland. Participation by farmers in such transfers of land use rights must be voluntarily, with adequate payment and in accordance with the law.

It should be noted that the land tenure reforms do not provide farmers with rights to use their land as collateral. The 1995 Guarantee Law prohibits the mortgaging of use rights to arable land. The underlying reason for denying rural households this right is the fear that mortgaging land use rights may drive farmers into landlessness.

In summary, land use rights could not be transferred freely and tenure security was impaired by frequent land reallocations and ambiguous land rights definition after the establishment of the HRS. Subsequent land tenure reforms significantly increased land tenure security and transferability. This was realized by: (1) extending farmers' land rights with a period of 30 years in the 1998 LAL and the 2002 RLCL, and giving them a permanent status in the 2007 PL and the 2008 document; (2) restricting land reallocations in the 1998 LAL, and prohibiting full-scale land reallocations and narrowing the scope of partial land reallocations in the 2002 RLCL; (3) mandatory issuing of land certificates to farmers in the 1998 LAL; (4) defining land use rights as usufruct rights and specifying farmers' compensation for losing land use rights in the 2002 RLCL, and (5) specifying land transfer rights in the 1998 LAL, and identifying the modes of land transfers in the 2002 RLCL and the 2008 document.

3.3 Characteristics of land conservation investments in China

The improvements in land tenure security and transferability that result from the recent legal reforms in China are expected to encourage longer term investments in the quality of land and hence its productivity. Benefits of productivity enhancements that have an effect also in the future are more likely to be captured by the investor. Examples of land quality improving investments made by farmers include the use of organic manure, well digging, land leveling, surface irrigation, drainage, terracing, and others. Contrary to variable inputs such as seeds, chemical fertilizers, pesticides, and herbicides, these investments contribute more than one season to output and can improve soil quality and agricultural production in the long term. Important characteristics of long-term on-farm land-related investments are the irreversibility of cost, uncertainty of benefits, and flexibility of investment. We discuss each of them in turn.

Cost irreversibility: Land conservation investments are linked to specific plots. It is not easy to retrieve them or transfer them technically and economically to other plots because of immobility of land. Despite the fact that farmers can retrieve some parts of the benefits by transferring plots with land conservation investments to others via land rental markets, it is often hard to calculate the pure incremental benefits from land conservation investments accurately and, as a result, difficult to get a price agreement. In the case of land rental markets failures, which are common in rural China, this problem is even more serious. Hence there may be important irreversible costs linked with long-term land conservation investments.

Uncertainty of benefits: There may be several sources of uncertainty in reaping the benefits of land conservation investments. One important source is tenure insecurity. Farmers lose (part of) the benefits of investments that they make in a plot, when the use right of the plot in question is taken from them without adequate compensation for the investment. This may happen, for example, when land is reallocated within a village to correct for demographic changes or when land is taken away from farm households moving out of a village for off-farm employment. Other sources of uncertainty include natural disasters, which can seriously damage a crop and depress the benefits of land-related investments, volatility of output and output and input prices, uncertainty in market relationships and the policy environment.

Investment flexibility: Rural land in China is assigned to the households living within a village on the basis of equality. Households that are registered in a village always have access to some of its land, unless a household decides to change its registration and leave the village. Every household has a right to make investments in its land; others cannot deprive the investment opportunity attached to the land.

In this situation, rural households can decide to defer land-related investments until the most appropriate moment. In other words, land conservation investments are flexible over time.

In the next section, these characteristics of land conservation investments are used to analyze how the recent land tenure reforms in China affect investment incentives in land conservation investments of rural households. Although the focus is on household investment decisions, many aspects are equally relevant for so-called self-governed investments that are jointly made by households belonging to the same natural or administrative village.

3.4 Land tenure reforms and land conservation investment incentives: a real option value analysis

3.4.1 Real option value theory and land conservation investments

The ROV model is a suitable tool for analyzing the optimal rule of irreversible investments under uncertainty when investors have a flexibility of making decisions (Dixit and Pindyck 1994; Wong 2007). Empirical studies in an agricultural context, either based on field data - such as Hill (2010) and Hinrichs *et al.* (2008) - or on an experimental approach - such as Maart-Noelck and Musshoff (2013) - have provided convincing evidence of the existence of a ROV. These studies favour the explanatory power of the ROV over the NPV in understanding investment behavior of farmers.

Given the characteristics of land conservation investments discussed in the previous section, the real option model is a suitable tool for examining farm-level land conservation investment decisions. Two seminal models in this field analyze the value of the option to invest and the optimal rule for exercising that option as well (McDonald and Siegel 1986; Dixit and Pindyck 1994). The key principle of real option value (ROV) theory is that, given the presence of uncertainty and irreversibility of benefits and costs, investors value the flexibility to decide about making an investment (Wesseler 2009). The method used for deriving the critical value (threshold) for making an investment is to risk-adjust the future pay-offs of an investment so that cash flows are discounted at a 'risk-free' rate.

3.4.2 Effect of land tenure reforms on land conservation investments

Improved tenure security and alienability allow an investor to sell or rent his investment in the event that profitable outside opportunities arise (Besley 1995). It also permits a cultivator to overcome the problem of long time horizons, since he does not need to wait through the whole gestation period of an investment in order to reap the full benefit from it (Deininger and Jin 2006). Another potential effect of land tenure reforms is the benefits from increased access to capital through the use of land as collateral which is expected to stimulate land conservation investments (e.g. Besley 1995).

Does Tenure Security Matter?

The recent land tenure reforms in China are expected to reduce the uncertainty of benefits of land conservation investments. As discussed in section 3.2, the reforms aim at reducing the frequency of land reallocations, providing farmers with formal land tenure certificates and granting perpetual land use rights. Hence, farmers are less likely to lose a plot in which they made an investment. In the case of China, however, use of land as collateral remains prohibited. The so-called collateralizability effect of land tenure reforms is therefore limited.

Farmers who migrate out of their village will generally be compensated for investments that they made in the land. Two categories of migrants need to be distinguished in this respect. Migrants who register in a city will receive a reasonable compensation for their land investments according to relevant recent laws. More secure tenure therefore reduces the threat that not all investment benefits can be reaped for this group. Migrants who maintain their registration in the village, on the other hand, run the risk of losing their land when they do not cultivate it. When land transfers are prohibited, these migrants normally lose all the benefits of their investments. The recent land reforms in China, however, intend to increase land tenure transferability. By renting out their land to other households, migrant households have better opportunities to retrieve the benefits of their investments in land quality by negotiating a rental price that reflects these quality improvements.

The impact of uncertainty of project benefits on a project's net present value can be analyzed with the standard Capital Asset Pricing Model (CAPM). It specifies the present value of an investment project (X) as equation (3.1):

$$X = \frac{E[\tilde{X}] - \lambda \text{Cov}(\tilde{X}, \tilde{r})}{1 + r_f} \quad (3.1)$$

Where $E[\tilde{X}]$ is the expected return of the investment opportunity; λ the market price of risk; \tilde{r} the uncertain return of alternative investment opportunities, the market portfolio; $\text{Cov}(\tilde{X}, \tilde{r})$ the covariance of the uncertain returns of the investment opportunity with the uncertain returns of alternative investment opportunities; and r_f the risk-free rate of return. Equation (3.1) implies that an increase in the uncertainty of the project benefits decreases the present value of the project (X) (e.g. Sarkar 2000).

The effect of tenure (in) security on land conservation investments has been analyzed based on the traditional NPV principle in the prevailing literature (see e.g. Jacoby *et al.* 2002; Abdulai *et al.* 2011), we call this the present value effect (PVE). Following the canonical real option models by Dixit and

Pindyck (1994)¹⁸ and the link between the CAPM and the real option model by Wong (2007), we can get the optimal investment rule when farmers have the option to postpone investments:

$$F(X_0) = \max_{t^*} E\{[X(t^*) - I]e^{-(r_f + \lambda\rho\sigma)t^*}\} \quad (3.2)$$

Solving Equation (3.2) according to the standard real option pricing approach provides the investment trigger X^* :

$$X^* = \frac{b}{b-1}I, \text{ with} \quad (3.3)$$

$$b = \frac{1}{2} - \frac{\alpha - \lambda\rho\sigma}{\sigma^2} + \sqrt{\frac{1}{2} - \frac{\alpha - \lambda\rho\sigma}{\sigma^2} + \frac{2r_f}{\sigma^2}} \quad (3.4)$$

Equation (3.3) and (3.4) give the threshold of a land conservation project, X^* , which depend on the irreversible cost (I), the market price of risk (λ), the risk-free rate of return (r_f), the correlation coefficient between the return of the project and the return on the opportunity cost – the market portfolio (ρ), the drift or growth rate (α), and the volatility (uncertainty) of the project benefits (σ). The relationship between σ and X^* can be either positive or negative (Weaver and Wesseler 2004; Wong 2007) as a change in uncertainty affects the value of the project X as well as the real option value of the project $F(X)$. This implies that a reduction in the uncertainty of project benefits, caused for example by improved tenure security, may decrease or increase the threshold of the land investment project depending on the combination of the effect on the value of the project and on the real option value. We hereby call the overall effect on the real option value the option value effect (OVE). Whether farmers undertake a land conservation investment project immediately after the land reforms depends on whether or not as a result the present value of the project (X) is larger than the (new) threshold (X^*).

Figure 3.1 shows that the overall investment incentives of China's market-oriented land tenure reforms hence depend on the combination of PVE and OVE. The upper part of the figure shows the impact of the market-oriented tenure reforms on tenure security and land transferability, as discussed in Section 3.2.2. Improved tenure security and land transferability are both expected to reduce the uncertainty in investment project benefits, as argued in Section 3.4.2. In its turn, a reduction in the uncertainty of investment project benefits affects the present value of a project (Equation (3.1)) as well as the option value of the project (Equations (3.3) and (3.4)). Both the PVE and the OVE raise the overall land conservation investment incentives (bottom of Figure 3.1).

¹⁸ More complex situations have been discussed in the literature on real option values, including investment and disinvestments (Dixit 1994), the effects of different stochastic processes (Mbah *et al.* 2010), and numerical approaches (Trigeorgis 1998). This paper focuses on the generic model as these model modifications do not change our basic argument.

Does Tenure Security Matter?

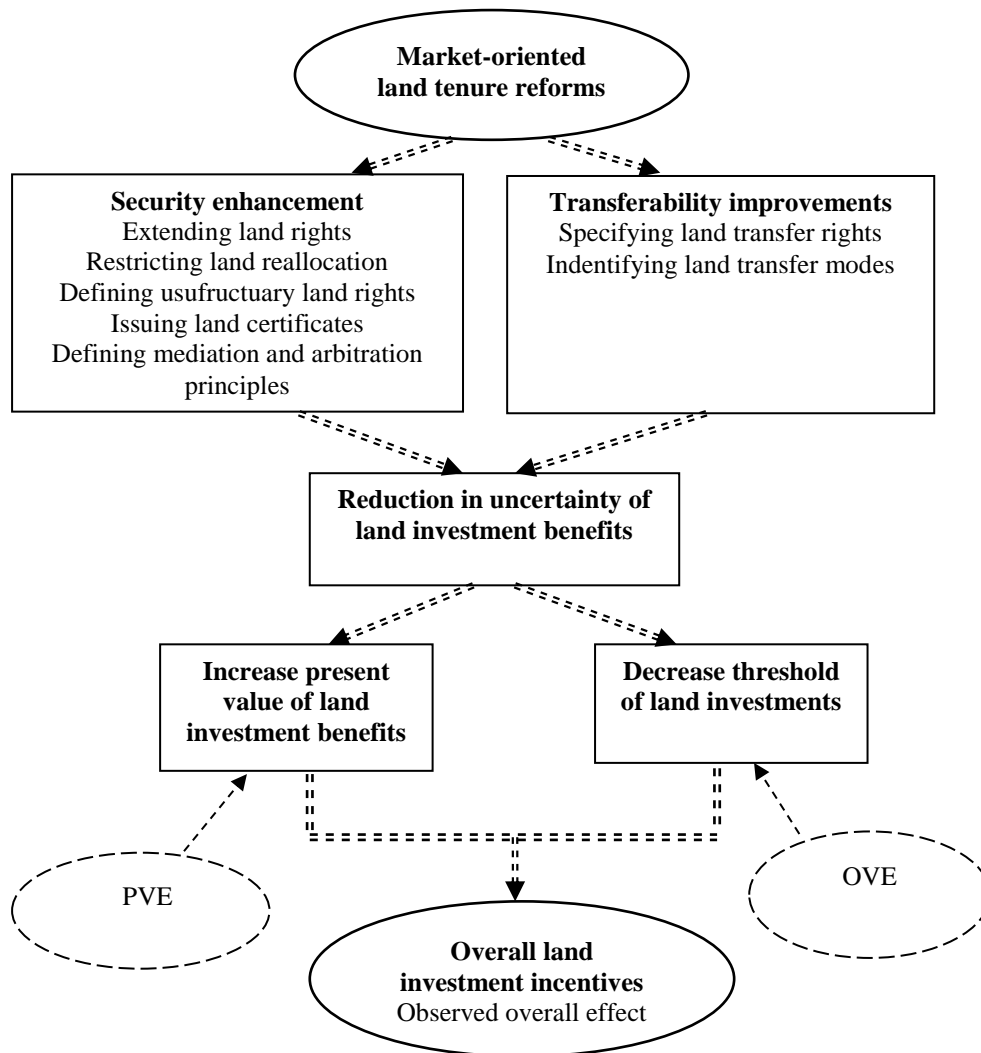


Figure 3.1 Impact of land tenure reforms on land conservation investments: a framework

3.4.3 Land tenure reforms and the timing of land conservation investments

The PVE and OVE of increased tenure security may affect the timing of undertaking land conservation investments. This section analyzes the optimal timing of land investments under different institutional settings, i.e. before and after the land tenure reforms and with / without functioning land markets.

As discussed above, land tenure was more insecure and land was formally not transferable before the land tenure reforms started. As a result, the uncertainty in reaping the benefits of land investment projects was relatively high (see Figure 3.2). In Figure 3.2 the horizontal measures the present value of the project (X), while the vertical axis measures the ROV ($F(X)$) and the net present value of the project ($X-I$), where I denotes the cost of the project. The line $X - I$ intersects the horizontal axis at a 45° angle. Point I at the horizontal axis gives the threshold of undertaking the project in NPV analysis.

Chapter 3 Land Tenure Reforms and Land Conservation Investments: Theoretical considerations

The tangency point of the ROV curve $F(X)$ with the line $X - I$ gives the critical value X^* of the project in ROV analysis. Figure 3.2 shows that the present value of the project (X^a) is much smaller than the threshold of undertaking the project (X^*), which implies that a rational farmer will not undertake the investment. Even when we ignore the real option value of undertaking the project, and employ the traditional NPV approach, the investment is unlikely to take place because the present value of the project (X^a) is smaller than the investment cost (I). This explains why the literature based on the conventional NPV approach also points out weak and insecure land tenure discourages farmers' land conservation investments (Jacoby *et al.* 2002; Deininger and Jin 2006). Applying the real option approach we obtain the real option value, shown in the graph as $F(X^a)$. In this case, the time value of the option is positive but small. The intrinsic value of the option, however, is zero as the option is "out of the money".

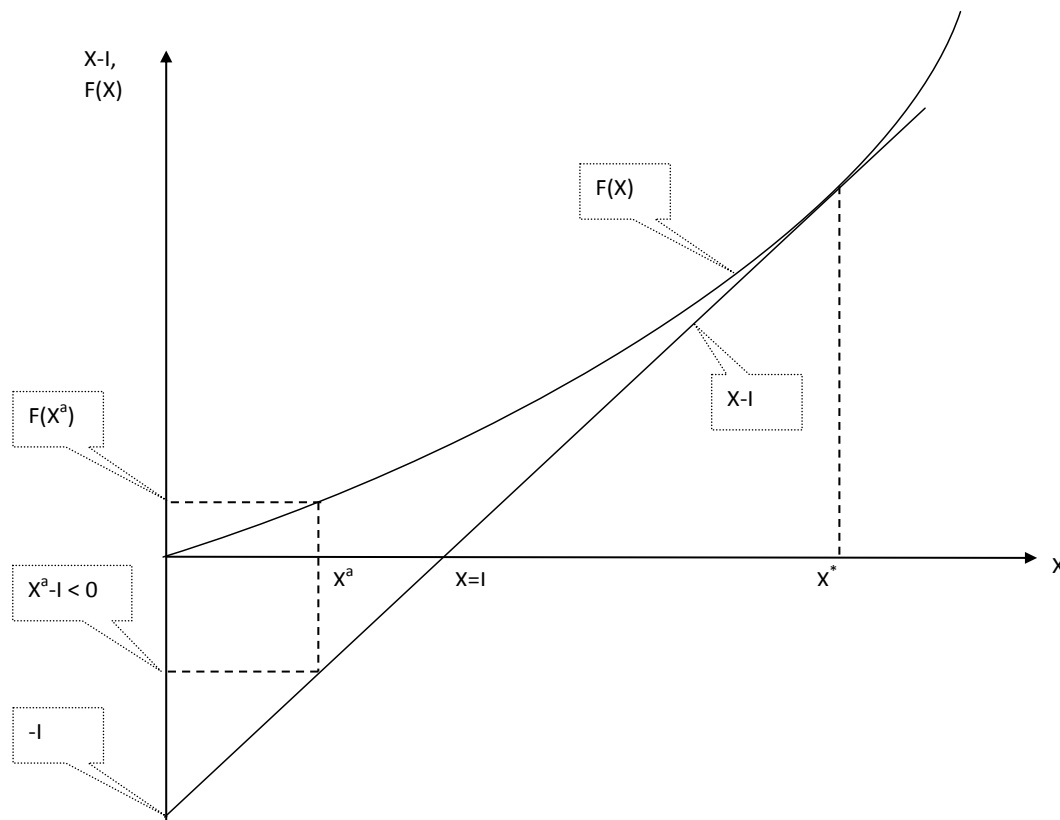


Figure 3.2 The value of land conservation investment under high uncertainty in ROV and NPV analysis

As argued above, China's recent land tenure reforms significantly improve land tenure security and transferability, and thereby decrease the uncertainty of the benefits of investments in land. It is likely, however, that the magnitude of the reduction in uncertainty of benefits differs between different regions for at least two reasons. In the first place, the flexibility and ambiguity that is inherent to the land laws and land use regulations allow for a flexible interpretation and adaptation of the land laws by local actors (Piotrowski 2009). For example, recent land laws restrict the use of land reallocations

Does Tenure Security Matter?

by village leaders, but land reallocations still do occur and their frequency shows large regional differences (Wang *et al.* 2011). Secondly, even when the interpretation and implementation of land laws and land use regulations is the same, the degree of uncertainty in the benefits that can be derived from land investments may differ if there exist differences in the presence of well-functioning land markets. In villages where land markets are absent, as still seems to be the case in large parts of rural China (Brandt *et al.* 2004), farmers are less certain that they can reap the full benefits of an investment.

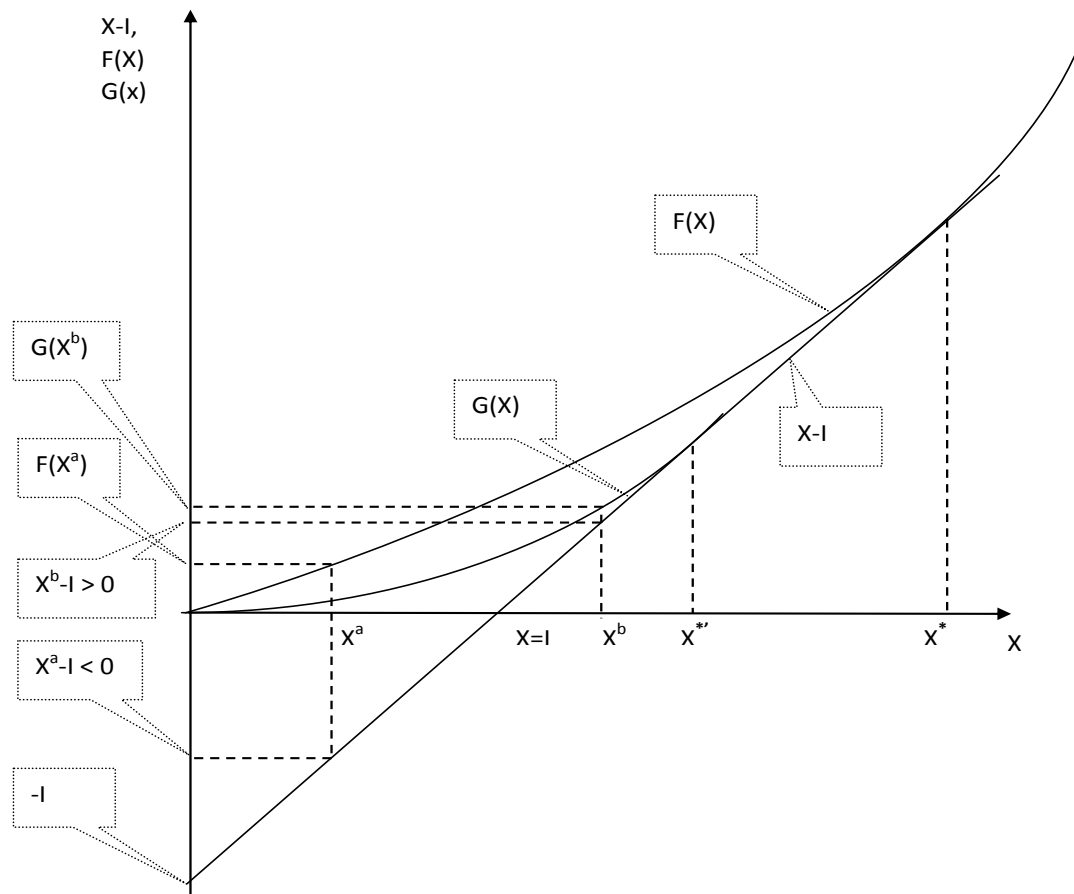


Figure 3.3 Changes in the real option value of land conservation investments induced by lower uncertainty in ROV and NPV analysis

Figure 3.3 illustrates the impact of a reduction in uncertainty of project benefits. As a result of the lower degree of uncertainty, the reasonable assumption has been made the present value of a land conservation investment increases from X^a to X^b . This is the PVE specified in Equation (3.1). But the curve of the real option value function of the project simultaneously shifts downwards from $F(X)$ to $G(X)$, and thereby decreases the threshold of undertaking the project from X^* to X^{**} . This is the OVE specified in Equations (3.3) and (3.4). If the traditional NPV approach is used, a profit maximizing farmer will undertake the project immediately because $X^b - I > 0$. However, in the example in Figure 3.3 the value of X^b is smaller than the value of the ROV threshold X^* . In other words, a profit maximizing farmer is expected to require a higher value for immediate investment X because he has the option to postpone the investment until some uncertainty has been eliminated.

It should also be noticed that the improvements in land tenure security and transferability provide an indirect economic benefit to investment projects that are not undertaken immediately, because the ROV has increased from $F(X^a)$ to $G(X^b)$. This increase can be considered as an economic benefit of the land tenure reforms. In general $G(X^b) > F(X^a)$, and hence the ROV increases, even though the real option value function $F(X)$ moves downwards to $G(X)$.¹⁹

The situation depicted in Figure 3.3 would change considerably if the reduction in uncertainty increases the value of the project such that $X^b > X^*$. In that case the option to invest in land conservation is expected to be exercised immediately. In that case the PVE is sufficiently large to induce investment. This situation is more likely to occur in areas where well-functioning land transfer markets exist as they allow farmers who transfer their land to recapture a larger share of benefits of their land investments.

3.5 Conclusion

The available literature on tenure security and land investments, in China and other parts of the world, focuses on the changes in net present value generated by improved security. This paper argues that land investments in China are characterized by cost irreversibility, uncertainty of benefits, and investment flexibility, and that changes in the real option value should therefore also be taken into account.

Using real option value theory, this paper shows that the market-oriented land tenure reforms which aim at improving land tenure security and land transferability in China have both a present value effect (PVE) and an option value effect (OVE) on land conservation investments. The PVE represents the conventional impact of tenure (in)security on the present value of a land investment project. The OVE represents the change in the real option value of a land investment project. The OVE of improved tenure security and land transferability is to decrease the threshold of undertaking the investment project. If the OVE is ignored, we may underestimate the impact of market-oriented land tenure reforms on land value, and also incorrectly predict the likelihood of farmers' undertaking investments in their land. In fact, by improving tenure security and land transferability, China's market-oriented land tenure reforms improve the long-term investment environment of land and eventually increase land value and farmers' welfare, whether or not these land-related investments are immediately observable. Therefore, further implementation of the market-oriented land tenure reforms in China is expected to enhance farmers' incentives for undertaking land conservation investments. Besides land-related laws and regulations, supplementary measures may be taken to improve household perceptions

¹⁹ A reduction in uncertainty will reduce the downward movement of the underlying stochastic process either in the form of changes in the probability distribution or in the form of reduced losses in case of bad outcomes, with a larger real option value $G(X^b) > F(X^a)$ as the overall effect (Shreve 2004).

Does Tenure Security Matter?

of tenure security, such as provision of information about the importance of land certificates for pursuing rights in land conflicts.

In addition, provided that the market-oriented land tenure reforms are implemented in a satisfactory way, the presence of well-functioning land transfer markets will be a crucial factor influencing the likelihood of making land conservation investments. A number of factors, such as the household registration system, insufficient off-farm employment opportunities, and lower level of trust among households, currently prohibit the development of land transfer markets in some parts of China and other developing countries (Zhang *et al.* 2004; Holden and Ghebru 2005; Feng 2006; Whalley and Zhang 2007). The absence of well-functioning land markets reduces the possibilities to retrieve the benefits of an investment in land quality, and thereby decreases the positive impact of the land tenure reforms on land conservation investments. Market-oriented land tenure reforms therefore need to be accompanied by measures to remove existing barriers in the rural land transfer market in order to fully realize their potential impact on land conservation investments. Measures that may be considered in this respect include provision of sufficient and stable off-farm employment jobs, reduction in discrimination on urban and rural residents associated with the household registration system, and enhancement of trust among households in China.

This analysis has two important implications for future research. Firstly, it shows that market-oriented land tenure reforms provide economic benefits to farm households either by stimulating investments in the quality of their land (visible direct benefit) or by improving the long-term investment environment of their land (invisible indirect benefit in the form of real option value). We suggest that future research in this field collects panel data at the household level that allows to estimate the invisible indirect benefit of policy reforms using real option model approaches (see e.g. Carey and Zilberman 2002; Rahim *et al.* 2007; Wesseler *et al.* 2007; Towe *et al.* 2008; Wesseler 2009). Secondly, this analysis shows that the presence of well-functioning land markets is crucial for realizing the full potential impact of market-oriented land tenure reforms on investment incentives. Future research in this field may therefore take prevailing land market conditions into account when analyzing changes in investment incentives caused by land tenure reforms, and test whether reform-induced changes in investment incentives differ significantly between areas with well-functioning land markets and areas with thin or absent land markets.

4. Land Tenure Security and Land Investments in Northwest China²⁰

Abstract: Since 1998, the Chinese government has implemented a number of land tenure reforms which improved significantly legal tenure security of rural land. Farmers' perception on legal land tenure situation however is still insecure across areas. This article examines the relationship between perceived land tenure security and land quality improvement investments. Detailed household-level data from Minle County, Gansu Province in northwest China are used to estimate the factors affecting land leveling investments, irrigation canal investments and perceived land tenure security. The results show that perceived land tenure security significantly affects self-governed investments but does not affect individual investments in land quality improvements. In particular it is found that households that consider land certificates as important for protecting land rights invest significantly more in irrigation canals construction and maintenance. The results further provide evidence that individual investments in land quality improvement contribute to higher perceived land tenure security. The latter finding provides an explanation for the phenomenon that land readjustments still take place in some parts of China, but not in others.

²⁰ This chapter has been published as: Ma, X., N. Heerink, E.C. van Ierland, M. van den Berg, X. Shi (2013). "Land tenure security and land investments in Northwest China." *China Agricultural Economic Review* 5(2): 281-307.

4.1 Introduction

Investment in land quality improvement, especially long-term investment aiming at improving agricultural infrastructure (such as canal maintenance, terracing and land leveling), plays an important role in promoting sustainable agricultural and rural development. Available studies claim that secure property rights over land encourage investments through strengthening claims to the fruits of the investment (assurance effect) (Banerjee and Ghatak 2004), allowing for gains from trade (transferability effect) (Besley 1995; Deininger and Jin 2006) and increasing access to capital (collateralizability effect) (Feder and Feeny 1991).

An issue that has received increasing attention in empirical studies on Africa is the potential endogeneity of informal (customary) land rights (Besley 1995; Brasselle *et al.* 2002; Abdulai *et al.* 2011). In many traditional tenure systems property rights can be confirmed indirectly by households' investments that range from marking boundaries to planting trees and building houses or sheds. The primary purpose of these investments is to establish implicit property rights to land and increase existing levels of tenure security (Deininger and Jin 2003). Econometric support is provided in an empirical study for Burkina Faso that controls for potential endogeneity (Brasselle *et al.* 2002). These empirical results cast doubt on the existence of a systematic influence of land tenure security on investment.

Available empirical studies on China examine the impact on land investments of the assurance and transferability effects of land tenure, because relevant laws make it impossible to use land as collateral for obtaining loans. The focus of these studies is mainly on land tenure insecurity caused by land readjustments within villages²¹. The types of investments examined in these studies tend to be relatively short-term land-related investment such as fertilizers, green manure and organic manure (Yao 1995; Li *et al.* 2000; Jacoby *et al.* 2002; Feng *et al.* 2010). The obtained results indicate that a higher expropriation risk as a result of land readjustments has a significant but small negative effect on the application of organic fertilizers and green manure. Surprisingly little research has been carried out for China, however, on the impact of tenure insecurity caused by land readjustments on medium- to long-term investments in land quality²².

The existing literature on land tenure security and land investments in China generally does not address potential endogeneity of land tenure security. The underlying argument is that land tenure arrangements are not indigenous as in Africa, but evolve within the national formal legal framework (Deininger and Jin 2003). In particular, land readjustments are usually decided at the village level and

²¹ For a more detailed discussion of land allocation and land readjustments in China, see e.g. Tan (2006) and Wang *et al.* (2011).

²² One exception is the study by Wen (1995) that provides a descriptive analysis of the effect of land tenure on long-term investments in terraced fields and tubewells in China.

are independent from household land management and investment decisions (Liu *et al.* 1998; Brandt *et al.* 2004).

To our knowledge, Jacoby *et al.* (2002) is the only study on land tenure security and land investments in China that controls for potential endogeneity of tenure security. Their study argues that expropriation risk may depend on individual household actions (e.g. farming effort) that are unobserved, but may be correlated with soil quality investments. This may be the case, for example, when village leaders use land reallocations as a "carrot and stick" to enforce village policies or if expropriation risk is affected by household efforts to lobby village leaders. Using village dummy variables as instruments for exogenous expropriation risk, the study finds that higher expropriation risk significantly reduces application of organic fertilizer.

Several recent studies (e.g. Migot-Adholla *et al.* 1991; Jansen and Roquas 1998; Sjaastad and Bromley 2000) stress that household perceptions of tenure security may be more important for investment decisions than legal arrangements and their implementation. It is the perceived tenure situation that forms the basis upon which the landholder can be expected to take decisions and to act, whatever the legal situation of a piece of land.

Legal land tenure security has been enhanced by the market-oriented land tenure reforms initiated by the Chinese government since 1998. But farmers' perceptions of land tenure may not be as secure as dictated by the legal tenure reforms. In particular, farmers' perceptions of the likelihood of future land readjustments may depend on unobserved household and farm characteristics, including land quality improvement investments. Farm households that have undertaken land investments are more likely to oppose land readjustments, unless they are fully compensated for their investments (which is usually not the case). Investment in land quality improvements thus may affect household perceptions on future land readjustments. In other words, it is necessary to take potential endogeneity of perceived land tenure in China into account in estimating the effect of land tenure security on land quality investments. The existing literature has examined the relationship between perceived tenure security and housing improvement in South American countries such as Argentina and Brazil (de Souza 1998; de Souza 2001; Van Gelder 2007; Van Gelder 2009). To our knowledge, however, no studies so far have examined the relationship between perceived tenure security and investment in land quality improvement, in China or elsewhere.

Land quality investments in China can be categorized into three different types. The first type consists of investments made by governments, such as large scale land consolidation programs and investments in irrigation improvement-schemes. These investments are usually either funded by national projects and/or village or water users association (WUA) budgets, and are undertaken at the village- or WUA-

Does Tenure Security Matter?

level. The second type consists of investments organized by a self-governed system by which farmers make decisions within collective-choice arenas. This self-governed system identifies the investors and the beneficiaries of the investments as well as the size of the investments that each investor should make. Irrigation canal maintenance and improvement by households can be seen as such a self-governed investment. Depending on the number of investors, decisions whether or not and how much to invest can be taken by a group of farmers, the village group, the village committee or the WUA. Whoever initiates the investment decision, the final agreement on the investment decision is obtained through mutual agreement. Although these investment decisions may be affected by the village committee or WUA ²³, the self-governed aspect is crucial. In government investments at the village or WUA level, the costs of investments are (partly) paid from national public projects, and every household is obliged to contribute labor or money (or both). The third type of land quality investments consists of individual investments, such as terracing, planting green manure and land leveling. These investments are based on private decisions made by households. Although self-governed investments and individual investments are both fully funded by households, the factors driving them may be different due to differences in decision-making rules. The literature on tenure security and land investments has so far concentrated on individual investments. To our knowledge no studies have examined whether or not and to what extent land tenure security affects self-governed investments in land quality improvements in China.

The objective of this paper is to examine the effect of perceived land tenure security on farmers' decisions to invest in long-term land quality improving measures in China, taking into account the potential endogeneity of tenure security. To this end, a case study is made of Minle County, Gansu Province in northwest China, where we collected survey data on legal as well as perceived land tenure security, land investments and other relevant data for our analysis. Since 1998, the Chinese government has implemented a number of market-oriented land tenure reforms which aim at introducing market mechanisms and providing households with more secure land rights. Despite the improved legal tenure security, households may still perceive their land tenure as insecure and perhaps even improve their tenure security by investing in the quality of their land.

Perceived land tenure security is measured in our study through households' perceptions on the likelihood of future land readjustment and household opinions on the importance of land certificates for protecting land use rights. The investments that we include in our analysis are land leveling (an individual investment decision), aiming at flattening the land to save irrigation water, and irrigation canal maintenance and improvement (a self-governed investment decision), aimed at securing reliable water supply to the land. Short-term investments, such as planting green manure or applying organic

²³ In most modern political economies it is rare to find a resource system that is governed entirely by participants without rules made by local, regional, national, and international authorities affecting key decisions (Ostrom 1998).

manure, are not included in the analysis. Green manure is hardly used by households in our research area, while organic manure application is mainly determined by a household's herd size, rather than land tenure security, due to the absence of a functioning organic manure market.

Household-level data on land quality investments, perceived tenure security and other factors that may affect household investment decisions are used to estimate the impact of land tenure security on investment in land leveling and canal maintenance. The data were collected in a survey held in 2008 and 2010 among 259 households living in 21 villages in Minle County, Gansu province, Northwest China. We use Two-Stage Conditional Maximum Likelihood and Instrumental Variables Least Squares, respectively, to examine the effects of land tenure security on the probability and on the intensity of investment. Two Instrumental Variables Probit methods are used to examine the robustness of our results. In addition, we use Bivariate Probit regression to test the potential interdependence between individual and self-governed investment decisions.

The paper contributes to the available literature on tenure security and land investments by examining the impact of perceived land tenure security on rural household land investments and by considering the potential endogeneity of perceived tenure security. It also contributes to the literature on tenure security and land investments in China by focusing on medium- to long-term investments and by including self-governed investments in the analysis. The insights obtained from our case study are likely to be relevant for other parts of China, and even other regions in the world, where significant differences exist between legal and perceived tenure security and where land investments focus on relatively long-term quality improvements.

The rest of the paper is organized as follows. Section 4.2 provides a brief introduction into land tenure security in China. Section 4.3 describes the research area and the dataset used for estimating the models. Section 4.4 and Section 4.5 discuss model specification and the estimation methods that are used, respectively. Model estimation results are presented and discussed in Section 4.6, while Section 4.7 summarizes the main findings and discusses two major policy implications.

4.2 Land tenure security in China

Following a number of recent studies on tenure security, this section makes a distinction between legal tenure security (*de jure* tenure security) and perceived tenure security (*de facto* tenure security). Studies stressing the importance of legal tenure security are partly rooted in the property rights paradigm, i.e. private property rights can protect against infringement and in case of violation allow for the invocation of state authority (Demsetz 1967). Perceived tenure security can be defined as the sense of security that is derived from a probability estimate of the chance of eviction or other factors that threaten a tenure situation and may cause involuntary relocation (Van Gelder 2007). Perceived

Does Tenure Security Matter?

tenure security is clearly related to legal tenure security, but the two are not identical. The extent to which both are related may vary from situation to situation and is ultimately an empirical question (Van Gelder 2009).

4.2.1 Legal tenure security in China

In 1979 the household responsibility system (HRS) was initially implemented in Xiaogang Village, Fengyang County, Anhui Province. It allocated collective land resources to individual farm households in accordance with equalitarian principles. The implementation of the HRS improved labor monitoring efficiency and gave farmers greater production incentives, leading to a sharp growth in land productivity (McMillan *et al.* 1989; Lin 1992). The equalitarian principles used in the HRS, however, led to much land fragmentation. The land within a village was divided into different land quality classes, and each household received use rights to a piece of land within each class with land size being based on household size and/or number of laborers in the household (Qu *et al.* 1995; Tan *et al.* 2006). Partial or full land reallocations were frequently used by village leaders to adjust for changes over time in household and labor force sizes in a village (Deininger and Jin 2009; Wang *et al.* 2011).

Since 1998, the Chinese government has issued four major land laws aimed at introducing market mechanisms and providing households with more secure land rights. The 1998 Land Management Law stipulates that the duration of land use rights will be extended by another 30 years, that farmers' land use rights are protected by law, that land certificates will be issued to protect farmers' land use rights, that land transfer rights are offered to farmers, and that acceptance by two-thirds of villagers' representatives and approval of higher-level governments is needed for land reallocations within villages.

The Rural Land Contract Law (RLCL) of 2002 confirms that farmland tenure security must be maintained for at least 30 years after the nationwide reallocation that started in 1998. It further states that full-scale land reallocations within villages are completely prohibited and that partial land reallocations are only allowed in case of a natural disaster, land expropriation or other special circumstances, in which case they depend on acceptance by two-thirds of villagers' representatives and approval by higher-level (e.g. township) authorities. In addition, it specifies that the collective cannot take back land from individual users without providing compensation. The RLCL marks a clear increase in the security and transferability of land tenure from the state (Deininger and Jin 2009; Wang *et al.* 2011)

The third law is the Property Law (PL), adopted in 2007, which further increased land tenure security in rural (and urban) areas. It implicitly grants farmers with perpetual rights, as it states that farmers

should retain and inherit their rights according to relevant rules when the 30 years period has passed. Moreover, the PL for the first time defines farmers' land use rights as usufructuary. Usufruct rights allow a better protection of farmers' interests (Qu *et al.* 2011). Further legal support of farmers' interests also comes from the Mediation and Arbitration of Rural Land Contract Disputes Law, adopted in 2009, which sets out principles related to the use of mediation or arbitration to settle land disputes.

4.2.2 Perceived tenure security in China

Although the legal tenure security has increased significantly since 1998, actual tenure security and household perceptions of land tenure security stay behind in many parts of China. Results from an almost nationally representative rural survey collected in 119 villages located in 6 provinces across China in 2008 show that the average frequency of (full-scale and partial) land reallocations within villages has declined from 2.6 before 1998 to 1.0 during the period 1998 – 2008 (Wang *et al.* 2011). Hence, despite the policy reforms that started in 1998, land reallocations are still a frequently observed phenomenon in present-day rural China. The same survey finds that as much as 60 percent of the responding farmers do not endorse the central government's attempt to stabilize farmland tenure. A survey covering 526 households in 11 villages three different counties in Jiangxi Province, carried out by the first author of this paper in 2011²⁴, found that 53% of the respondents do not agree with the central government policy of stabilizing land tenure, that only 18% of the respondents expect that land readjustments²⁵ will not occur in the future, and that only 35% of the respondents believe that land certificates are important for protecting individual land rights.

Results from the survey in Minle County, Gansu Province that we use for this study (see Section 4.3 for an introduction into the survey) show that interviewed households experienced on average 0.83 land readjustments since 1979. Almost one half (45%) of the respondents does not endorse the central government's policy of stabilizing land tenure. All interviewed village leaders in the 21 villages that we surveyed state that they have issued land certificates to all households in their villages, and 95% of the interviewed households state that they indeed possess land certificates. However, only 38% of the respondents expect that no land readjustments will occur in the future. And only 80% of the respondents believe that a land certificate is an important document for protecting individual land rights.

²⁴ The survey was carried out within the framework of the SURE project (<http://sure.emasia.org/>), funded by the Programme Strategic Scientific Alliances of the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Ministry of Science and Technology, P.R. China.

²⁵ The terms reallocation, readjustment and redistribution have similar meanings throughout this paper.

4.3 The research site and data

4.3.1 Research site

To meet the objective of our study, we use household and village survey data that we collected in Minle County, one of six counties in Zhangye City located in Gansu Province in the northwest of China. In 2002, the government of China introduced a pilot project to reduce water overuse, aiming for a “Water-saving society in Zhangye city”. Measures taken within the pilot project include government investments in the irrigation infrastructure and the introduction of water-saving irrigation technologies (Zhang 2007). Investments in irrigation canals are also made by farmers’ groups at different levels. Large scale investment decisions, such as maintenance of second level canals that affect a large number of households, are normally made at water users association (WUA) level. Small scale investment decisions, such as maintenance and improvement of third or lower level canals that normally concern a small number of households, are usually made at the water use group (WUG) level, i.e. the group of households having plots alongside the same canal.

Another important land improvement investment in the region, apart from canal maintenance and improvement, is the leveling of land by farmers to increase water use efficiency. Land leveling is an important way to save water in irrigated agriculture (Wang *et al.* 2002).

4.3.2 Data description

Two farm household and village surveys were held in Minle County in May 2008 and in May 2010. The collected information refers to the calendar years 2007 and 2009, respectively. The survey covered 21 villages and 317 households in May 2008, and 315 households living in the same 21 villages in May 2010; 265 households were interviewed in both surveys.

In May 2008, a stratified random sampling technique was used to select 10 percent of the villages within each of the ten townships that make up Minle County. In each selected village, the village leader was interviewed and 15 households were randomly chosen to be interviewed (see Castro *et al.* (2010) for more information).

The survey was repeated in the same 21 villages in May 2010. Out of the 317 households that were interviewed two years earlier, 265 households could be interviewed again. Out of these 265 households, 6 households had missing data on one or more variables used in the empirical analysis. Taking out those households, we obtained a data set with information from 259 households for both years.

Unfortunately we cannot exploit the panel nature of the data for our analysis, because questions about subjective perceptions of land tenure were asked only in the May 2010 survey. But it does make it possible to include two-years lagged values of investment variables in our empirical model. Hence, we use a cross-section analysis based on the sample of 259 households that were interviewed in both years in our empirical analysis.

4.4 Model specification

4.4.1 Basic model

Our objective is to examine the relationship between perceived land tenure security and land quality improvement investments. The general system of equations can be specified as

$$S_i = a_0 + a_1L_i + a_2C_i + \sum a_{3j}X_{ji} + u_{1i} \quad (4.1)$$

$$L_i = b_0 + b_1S_i + \sum b_{2j}X_{ji} + u_{2i} \quad (4.2)$$

$$C_i = c_0 + c_1S_i + \sum c_{2j}X_{ji} + u_{3i} \quad (4.3)$$

S_i denotes the perceived land tenure security of household i ; L_i is the investment in land leveling made by household i ; C_i the investment made in canal improvement and maintenance by household i ; X_{ji} is the value of control variable j for household i ; and u_{1i} , u_{2i} and u_{3i} are residuals in the perceived tenure equation, land leveling equation and canal investment equation, respectively. We expect that there is no correlation between u_{1i} and u_{2i} and between u_{1i} and u_{3i} . But there may be correlation between u_{2i} and u_{3i} , because two types of investments may be interdependent. The latter issue will be tested below.

4.4.2 Definition of variables

Table 4.1 contains the definitions and descriptive statistics of the variables used in the first-stage and second-stage regressions. We categorize the variables used into six groups.

(1) Investment

The investment variables include the probability of investment and the size of investment in 2009 as well as the size of investment in 2007. Both land leveling and canal investment require labor input and financial input (for hiring labor, machinery or buying materials). We sum up the financial costs and labor costs, valued by applying the average labor wage, to obtain the total investment costs of each household. In order to remove the effect of changes in prices between the two years, we use the consumer price index (CPI) to express investment costs in 2007 in terms of prices of 2009.

Gebremedhin *et al.* (2003) find that public conservation campaigns on private plots reduce adoption of both private stone terraces and soil bunds in Ethiopia. In our research area, there are two types of public projects that may affect private land quality improvements, namely large-scale land

Does Tenure Security Matter?

consolidation programs and public maintenance and improvement of first and second level irrigation canals. Large-scale land consolidation programs were not undertaken in the year 2009 in all twenty-one villages that we surveyed, and only three villages were involved in public canal improvement and maintenance. Public investment in canal improvement and maintenance takes place in first and second level canals, while self-governed investments in canal improvement and maintenance focus on third and lower level canals. We therefore do not expect that public canal investment suppresses self-governed canal investment²⁶.

Table 4.1 Variable definitions and descriptive statistics

Variable	Definition	Mean	S.D.
Investment			
Leveling dummy	= 1 if household invested in land leveling in 2009, = 0 otherwise	0.37	0.48
Canal dummy	= 1 if households invested in irrigation canals in 2009, = 0 otherwise	0.31	0.46
Leveling costs	Land leveling costs in 2009; includes financial and labor cost (RMB)	832	2541
Canal costs	Canal investment costs in 2009; includes financial and labor cost (RMB)	256	637
Leveling costs 2007	Land leveling cost in 2007; includes financial and labor cost (RMB)	483	1390
Canal costs 2007	Canal investment cost in 2007; includes financial and labor cost (RMB)	158	546
Land tenure			
Perception on land readjustments	=1 if no redistribution is expected within five years, = 0 otherwise	0.38	0.49
Perception on land certificates	=1 if land certificate is believed to be important for protecting individual land rights, = 0 otherwise	0.80	0.41
Village characteristics			
Distance to town	Distance from household homestead to the nearest town (km)	4.81	4.33
Land inequality	Share of households with less than half of the average land area to all households in the village (%)	19	14
Land rental market	Average land area that is rented by the other 14 respondents within the same village (mu)	1.35	1.29
Village water use rights	Total water use rights area owned by the village (mu)	2805	1785
Village leader's familiarity with the RLCL	= 1 if village leader is familiar with the RLCL, =0 otherwise	0.13	0.34
Household characteristics			
Hage	Age of the household head (years)	46.7	10.4
Heducation	Years of formal education of the household head (years)	7.42	3.49
Off-farm employment in	= 1 if household head was employed off-farm in the past five years, = 0 otherwise	0.56	0.50

²⁶ We also introduced a binary variable measuring village-level public canal investment in our empirical analysis. Consistent with our expectations, this variable does not significantly affect self-governed canal investment, nor land leveling.

past				
Participation in WUA	= 1 if household participates in WUA, = 0 otherwise		0.43	0.50
Party member or leader	= 1 if household head is a party member or village leader, =0 otherwise		0.25	0.43
Wealth	Value of agricultural devices, livestock, electronic instruments, house, furniture and transportation vehicle (RMB)	59332		60067
Opinion about policy	= 1 if respondent agrees with policy of no redistribution within 30 years, = 0 otherwise		0.51	0.50
Number of readjustments	Total number of land readjustments that a household experienced since 1979		0.83	0.91
Risk attitude	Answer to statement about technology adoption, 1= disagree, 2=no opinion, 3= agree.		1.85	0.98
Land characteristics				
Contracted land per head	Contracted (=allocated) land area per head (mu)		4.28	3.72
Cultivated land per laborer	Cultivated land area for all crops per labor force member (mu)		8.50	7.30
Household water use rights	Total water use rights area allocated to a household (mu)		13.9	7.91
Number of plots	Number of land plots allocated to a household		14.3	8.39
Land fertility	Respondent's subjective evaluation on land fertility, ranging from 1 (=poor) to 3 (=good)		2.51	0.54
Land slope	Respondent's subjective evaluation of land slope, ranging from 1 (= plain) to 2 (= sloping)		1.07	0.21
Rented land share	Share of rented-in land area to total cropland area (%)		4	13
Regional characteristics				
Tongziba	= 1 if respondent resides in Tongziba irrigation district, = 0 otherwise		0.29	0.45
Hongshuihe	= 1 if respondent resides in Hongshuihe irrigation district, = 0 otherwise		0.34	0.47
Haichaoba	= 1 if respondent resides in Haichaoba irrigation district, = 0 otherwise		0.10	0.31
Daduma	=1 if respondent resides in Daduma irrigation district, = 0 otherwise		0.13	0.34

Source: Own survey

(2) Perceived land tenure security

Following the concept of perceived tenure security proposed by Broegaard (2005), we use two variables to measure perceived land tenure security. The first variable represents farmers' perception on the probability of future land readjustments. In rural China, land readjustment is considered a key factor influencing the risk of losing land use rights (Li *et al.* 2000; Brandt *et al.* 2002; Jacoby *et al.* 2002; Lohmar *et al.* 2003; Deininger *et al.* 2004). The dummy variable farmers' perception on land readjustments equals one if the respondent expects no land redistribution within 5 years, and zero

Does Tenure Security Matter?

otherwise. The second variable measures farmers' perception on the role and importance of land certificates, and thereby represents farmers' attitude towards legal land titles (land registration). We define the dummy variable farmers' perception on land certificates as equal to one if the respondent believes that a land certificate is important for protecting individual land rights, and equal to zero otherwise.

(3) Village characteristics

The village characteristics in our analysis include distance to town, land inequality, land rental market, village water use rights and the village leader's familiarity with the RLCL. Distance to town is used as a proxy for market access, while land inequality is used to represent the existing pressure for land readjustments. The land rental market can serve as an important alternative for land reallocation (Deininger and Jin 2002). We use the average land area that is rented in by the other 14 respondents within the same village to represent the presence of a land rental market in the village. Irrigation water is allocated according to the size of the water user rights land that a village possesses. We therefore use village water use rights as an indicator of the available amount of water at the village level. Village leaders who are familiar with the RLCL are less likely to readjust land and more likely to respect land certificates as proofs of formal land titles. A dummy variable measuring the village leader's familiarity with the RLCL is therefore included in our analysis.

(4) Household characteristics

We use age of the household head and years of education of the household head as proxies for the experience and education level of the household. A dummy variable that equals one if the household head was involved in off-farm employment in the past five years is used to reflect the opportunity costs of investing in agriculture. Household off-farm activity may be endogenous, i.e. correlated with unobserved household characteristics such as entrepreneurial drive that may also affect investment decisions. We therefore use the head's past participation in off-farm employment instead of off-farm employment in 2009 in our empirical analysis. Dummy variables representing whether the household participates in the WUA or not, and whether the household head is a party member or village leader or not, are used as indicators of the household's access to public information. Household wealth is used to control for heterogeneity in economic and social power among households (Li *et al.* 2000; Smith 2004; Abdulai *et al.* 2011). It is measured by the value of durables possessed by a household, including agricultural devices, livestock, electronic instruments, houses, furniture and transportation vehicles. We include the respondent's opinion about the policy of no-redistribution within 30 years as this may affect the household's perception of tenure security. For the same reason we include in our analysis the number of land readjustments that the household has experienced in the past. Finally, risk

attitude is measured by asking the respondent whether he or she agrees the statement “I have never been the first one to adopt new technology in my village, because I think that has a high risk.”²⁷

(5) Land characteristics

The land characteristics that we use in our model include contracted land per head, cultivated land per laborer, household water use rights, number of plots, land fertility, land slope and rented land share. Contracted land per head measures the ratio of the land that is allocated to size of the household. Cultivated land per laborer measures the ratio of the cultivated land (which may differ from the contracted land due to the renting of land) to the number of labor force members in a household. The number of plots allocated to a household is used as a measure land fragmentation, which may affect household perception on land readjustments. Land fertility and land slope are used as indicators of land quality; they are measured by asking the respondent about the fertility on a scale from 1 (poor) to 3 (good) and the slope (1 = flat, 2 = sloping) of plot(s) planted with a particular crop and then calculating the weighted average using planting area as weights. Finally, the share of rented-in land to the total cultivated land area is included in our analysis to examine whether renting in of land affects investment decisions (Li *et al.* 1998; Li *et al.* 2000; Jacoby *et al.* 2002; Feng *et al.* 2010).

(6) Regional characteristics

Four dummy variables are introduced to control for unobserved factors that may differ between the five irrigation districts in which the villages in our sample are located.

4.5 Estimation methods

Our main interest is to estimate the effect of perceived land tenure security on investments. But, as discussed above, investments may also enhance perceived land tenure security. In order to test the potential reverse causality between perceived land tenure security and investments, we first specify investment equations that aim to test whether perceived land tenure security affects land leveling and canal investments, and then specify a perceived land tenure security equation that aims to test whether investments enhance farmers’ perceived land tenure security.

4.5.1 Investment equations

4.5.1.1 Probability of investment

A properly specified two-stage instrumental variable approach will produce consistent estimates of the parameters in Equation (4.2) and Equation (4.3). The first-stage equation specifies perceived land tenure security as a function of exogenous variables. The predicted values from the first-stage equation

²⁷ We also calculated a risk index through a titration experiment. This risk index does not significantly affect investment and perceived land tenure security in our data set. For reasons of simplicity we exclude it from the results that we present in this paper.

Does Tenure Security Matter?

rather than the actual ones are then used in the second stage estimation. However, when the dependent variable is discrete, as is the case with the leveling dummy and canal dummy in the present study, the usual two-stage approach will not be able to address the endogeneity problem. In such cases, the Two-Stage Conditional Maximum Likelihood (2SCML) proposed by Rivers and Vuong (1988), Brasselle *et al.* (2002) and Wooldridge (2002) may be used. Rather than using the predicted values of the endogenous variable obtained through the first-stage regression, the 2SCML approach introduces the residuals obtained from the first-stage equation, and the endogenous variable itself, into the second-stage equation. We use the 2SCML approach to estimate the following system of equations

$$S_i = a_0 + \sum a_{1j}X_{ji} + u_{1i} \quad (4.4)$$

$$P_i^L = b_0 + b_1S_i + b_2 \widehat{u}_{1i} + \sum b_{3j}X_{ji} + u_{2i} \quad (4.5)$$

$$P_i^C = c_0 + c_1S_i + c_2 \widehat{u}_{1i} + \sum c_{3j}X_{ji} + u_{3i} \quad (4.6)$$

P_i^L and P_i^C denote probability of land leveling and canal investment made by household i , respectively. \widehat{u}_{1i} is the residual term from Equation (4.4). The 2SCML technique requires to use a linear probability model for the first stage estimation (Equation (4.4)), and then introduce the residual (\widehat{u}_{1i}) and the endogenous variable (S_i) into the second-stage estimation (Equation (4.5) and (4.6)). An important feature of this estimation method is that the usual Probit t-statistics for coefficients b_2 and c_2 are valid tests of the null hypotheses that the perceived land tenure security variables are exogenous in the investment equations (Wooldridge 2002; Abdulai *et al.* 2011).

One issue that should be taken into account in estimating this model is the potential interdependence of the two investment decisions (Abdulai *et al.* 2011). Empirical estimates of the impact of tenure security may be biased if the interdependence between land leveling and canal maintenance and improvement decisions is neglected. There may be two reasons to expect that the two investments are interdependent. On the one hand, a household investing labor and/or money in canal maintenance and improvement will have less labor and money available for land leveling (the ‘loss of labor and income effect’). On the other hand, households making canal investments are also more likely to level land, because the two types of investments may complement each other in achieving water savings (the ‘complementarity effect’). The net outcome of these effects is unclear.

In order to test the potential interdependence, we estimated a Biprobit model of joint decisions to undertake land leveling and canal investments. The result, however, does not provide statistically significant evidence of interdependence between land leveling and canal investment²⁸. Hence, either

²⁸ Doing a Wald test of $\rho=0$, we find $\text{Ch2}(1) = 0.03$, $\text{Prob} > \chi^2 = 0.87$. Hence, the null hypothesis that there is no interdependence between the two investment decisions is not rejected.

the loss of labor or income effect tends to counterbalance each other, or the two effects are both negligible.

4.5.1.2 Size of investment

To examine the impact of tenure security on the size of the investments, an IVTobit model may be used. It assumes that the endogenous regressor is continuous. In our case, however, the perceived tenure security variables are discrete. Instead of IVTobit we therefore employ instrumental variable-least squares (IVLS), with a probit model in the first-stage equation (Equation (4.4)). The predicted values from Equation (4.4), \widehat{S}_i are introduced into the second-stage equations for investment size, Equation (4.7) and Equation (4.8) (Brasselle *et al.* 2002; Feng 2006). This gives the following model:

$$S_i = a_0 + \sum a_{1j}X_{ji} + u_{1i} \quad (4.4)$$

$$I_i^L = b_0 + b_1\widehat{S}_i + \sum b_{2j}X_{ji} + u_{2i} \quad (4.7)$$

$$I_i^C = c_0 + c_1\widehat{S}_i + \sum c_{2j}X_{ji} + u_{2i} \quad (4.8)$$

I_i^L and I_i^C denote the sizes of the land leveling and canal investment made by household i , respectively.

4.5.2 Perceived land tenure security equation

In the equation explaining perceived land tenure, the dependent variable is discrete. Hence, we use the 2SCML approach again to estimate it. This gives the following system of equations:

$$L_i = b_0 + \sum b_{1j}X_{ji} + u_{2i} \quad (4.9)$$

$$C_i = c_0 + \sum c_{1j}X_{ji} + u_{3i} \quad (4.10)$$

$$S_i = a_0 + a_1L_i + a_2 C_i + a_3 \widehat{u}_{2i} + a_4 \widehat{u}_{3i} + \sum a_{5j}X_{ji} + u_{1i} \quad (4.11)$$

Our investment data is censored data. We therefore use a linear model to estimate Equation (4.9) and Equation (4.10), and obtain the residual terms, \widehat{u}_{2i} and \widehat{u}_{3i} , respectively. In the second stage, we introduce these residuals and the two endogenous variables themselves, L_i and C_i , into Equation (4.11).

It should be noted that one of the explanatory variables in this model, the share of rented-in land area to total cropland area, may be endogenous. Participation in the land rental market may depend on unobserved household characteristics and farm characteristics that also affect investment decisions. We follow the same approach (2SCML) to deal with this issue in estimation of probability of investment. More precisely, we specify an additional first-stage linear regression equation that explains household participation in the land rental market from a vector of exogenous variables. The

Does Tenure Security Matter?

residuals obtained, together with the land rental market participation variable, are then introduced into the second-stage equations Equation (4.5) and Equation (4.6). We also apply the instrumental variable-least squares (IVLS) to deal with this issue in estimation of size of investment, where the predicted value from first-stage regression equation are introduced into the second-stage equation of Equation (4.7) and Equation (4.8) .

4.5.3 Identification strategy

In order to identify the investment equations, we include four instrumental variables in Equation (4.4) and not in Equation (4.5), Equation (4.6), Equation (4.7) and Equation (4.8). These are: Number of readjustments, land inequality, village leader's familiarity with the RLCL, and opinion about policy. Households that experienced relatively many land readjustments in the past are more likely to expect land readjustments, because villages with a history of land readjustments are more likely to readjust land again in the future (Deininger and Jin 2006). In these villages the protection provided by land certificates is also weakened. On the other hand, past land readjustments are not likely to affect investment decisions directly. Land inequality within a village may affect household perceptions on future land readjustments, because unbalanced land allocation is a major driving force of land readjustments. There is no reason, however, to expect that land inequality directly affects land investment decisions. While a household's farm size is clearly a direct determinant of investment, the distribution of land among its neighbors is not. The RLCL of 2002 stipulates explicitly that land readjustments are prohibited, and that land certificates can protect land rights. We expect that farmers living in villages where village leaders are familiar with the contents of the RLCL have higher perceived land tenure security. But again there is no reason to expect that village leaders' familiarity with the law will directly affect household investment decisions. Finally, households who agree with the policy of no land redistribution within 30 years are less likely to expect that land readjustments will take place and may attach more weight to having land certificates for protecting land rights. There are no reasonable grounds, however, to expect that (dis)agreement with the policy would directly affect a household's land improvement investments.

To ensure identification of the land tenure security equation (Equation (4.11)), we introduce three instrumental variables into the investment equations (Equation (4.9) and Equation (4.10)), and exclude them from the perceived land tenure security equation (Equation (4.11)). These three variables are: Distance to town, land slope, and village water use rights. The distance of a household's homestead to the nearest town is expected to play a role in land conservation investment decisions, because agricultural production activities are relatively more important in more remote villages, while the access to agricultural output and input markets may be less due to a relatively poor infrastructure. The slope of the land is an important factor influencing irrigation water efficiency, and therefore is likely to play a role in land leveling and canal investment decisions which intend to increasing water use

efficiency. The size of the village water use rights is an important factor determining the access to irrigation water of its residents. When access to water is limited, investments in land leveling and canal investment make less sense.

Although these three variables are likely to play a role in land investments, there are no clear a priori grounds to expect that they might affect household perceptions of land tenure security. The main driving forces of (partial or full) land readjustments in our research area are changes in family sizes. Urban expansion or infrastructure improvement is not a major issue. Nor does off-farm employment play much of a role. Due to the rapidly increasing agricultural subsidies and the insurance function of land, households engaged in off-farm employment are reluctant to give up their land use rights and prefer renting out their land over leaving the land uncultivated and thereby running the danger of land being reallocated to others. As farmers in the region are aware that demographic changes are the main driving forces of land reallocations, it is not expected that distance to town, land slope or village water use rights will affect farmers' perceptions on the likelihood of land reallocations in the near future and the importance of land certificates for protecting their land use rights.

4.6 Estimation results

4.6.1 Land investments

In this section we present the regression results for the probability of making investments and the size of investments. In the first subsection we will discuss the results for land leveling, while the results for canal investments will be discussed in the second sub-section.

4.6.1.1 Land leveling

Table 4.2 reports the regression results for the probability and size of land leveling obtained by using a Probit model and Tobit model, respectively. The residuals derived from the first-stage perceived land tenure security equations are not statistically significant in the Probit model. The hypothesis that the coefficients of the perceived land tenure security variables are the same if we would not control for endogeneity is therefore not rejected.

The two variables measuring household perceptions of tenure security do not significantly affect the probability of land leveling nor the size of land leveling investments. Hence, we find for our research area that farm household investments in land leveling are not dependent on subjective perceptions of land tenure security. This finding is in strong contrast with the conclusion, reached by Jacoby *et al.* (2002), that expropriation risk negatively affects the application of organic fertilizer to the land. It is, however, consistent with similar conclusions obtained for Ethiopia (Shiferaw and Holden 1998; Holden and Yohannes 2002; Hagos and Holden 2006), where land-related policies and regulations are very similar to those in China and land redistributions are also a frequent phenomenon.

Does Tenure Security Matter?

Table 4.2 Instrumental variable estimates of determinants of land leveling

Variable	Probability of land leveling		Cost of land leveling	
	Probit model, 2SCML ^a		Tobit model, IVLS ^b	
	Coefficient	Z-value	Coefficient	Z-value
Perceived land tenure variables				
Perception on land readjustments	0.81	0.84	1.41	0.71
Perception on land certificates	-1.01	-0.82	-1.05	-0.66
Residual from perception on land readjustments	-1.37	-1.41		
Residual from perception on land certificates	0.96	0.76		
Other independent variables				
ln(Leveling cost 2007)	0.05*	1.62	0.22	1.20
ln(Canal cost 2007)	0.05	1.29	0.26	1.18
ln(Distance to town)	0.52***	2.85	3.03***	3.17
ln(Hage)	-0.35	-0.48	-2.85	-0.79
Heducation	0.00	-0.02	-0.02	-0.11
Past off-farm employment	-0.09	-0.38	-0.99	-0.79
ln(Wealth)	-0.18	-1.41	-0.80	-1.17
Risk attitude	-0.46***	-4.10	-2.20***	-3.46
Cultivated land per laborer	0.23	1.32	0.53	0.58
ln(Household water use rights)	0.51***	2.38	2.84***	2.50
Land slope	1.19***	2.44	4.70**	2.15
Rented land share	0.00	-0.04	0.01	0.48
Residual from rented land share	-0.01	-0.19		
Observations	259		259	
Log-likelihood	-129.41		-395.55	
VIF	8.63 ^c in 2SCML model, 2.18 in IVLS model			
F-statistic for instruments in first stage estimations (P-value)	4.56 (0.00) for perception on land readjustments 5.13 (0.00) for perception on land certificates			
F-statistic for overidentification (P-value)	0.17 (0.68)			
χ^2 - statistic for joint sig. of residuals (P-value)	Probit model: 2.7 (0.56)			

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a With the 2SCML technique, Perception on land readjustments and Perception on land certificates are binary variables, Rented land share is a censored variable, the residuals from the first-stage equations are introduced.

^b With the IVLS method, Perception on land readjustments, Perception on land certificates and Rented land share are continuous variables constructed with the predicted values extracted from the first-stage equation.

^c The relatively large VIF (8.63) results from the introduction of the residuals derived from the first-stage equations (perception on land readjustments, perception on land certificates and rented land share). They must be included in the 2SCML technique in order to address endogeneity of land tenure security.

Other noteworthy findings that we obtained for the land leveling investment equations are that distance to town, size of the water use rights and slope of the land positively affect land leveling investments. These findings are consistent with the priori expectations discussed in the previous section. We furthermore find that risk averse farmers are less likely to invest in land leveling, which is consistent with the available literature on investment behavior. We also find that households that invested more in land leveling in 2007 were significantly more likely to invest in land leveling in 2009 (at a 10-percent testing level), but that the size of the investment is not affected.

The other explanatory variables that we included in our analysis do not have a statistically significant impact on the probability of land leveling nor on the costs of land leveling. These include human capital indicators (age and education of household head), the head's past involvement in off-farm employment as well as the wealth of the household. Nor do we find that participation in the land rental market significantly affects land leveling decisions. The latter finding again contradicts previous studies for short-term land investments in China, which found that fewer investments are made in rented-in land (Li *et al.* 1998; Li *et al.* 2000; Jacoby *et al.* 2002; Feng *et al.* 2010), but is consistent with similar results found for Ethiopia (Holden and Yohannes 2002; Hagos and Holden 2006).

4.6.1.2 Canal investment

Table 4.3 reports the regression results for the probability and size of canal investments obtained by using a Probit model and Tobit model, respectively. The residuals derived from the first-stage perceived land tenure security equations are significant at a 5% statistical level. The hypothesis that the coefficients of the perceived land tenure security variables would be the same if we do not control for potential endogeneity is therefore rejected.

The most notable finding for the purpose of our research is that households that consider land certificates as being important for protecting land use rights are significantly more likely to invest in canal improvement and maintenance and also invest significantly larger amounts in irrigation canals. This finding indicates that measures that would improve household perceptions of the importance of land certificates will stimulate more self-governed investments. A possible explanation for this finding is that farmers have more problems in realizing the enhanced value of the land that results from self-governed investment than that from individual investment. Because self-governed investments involve several different households, free-riding is a potential problem. Moreover, individual investments are tied to specific plots, while self-governed investments are not. The enhanced land value that results from individual investments can be monetized through land rental transactions, but the enhanced land value that results from self-governed investment is much harder to be monetized.

Does Tenure Security Matter?

Table 4.3 Instrumental variable estimates of determinants of canal investment

Variable	Probability of canal investment		Cost of canal investment	
	Probit model, 2SCML ^a		Tobit model, IVLS ^b	
	Coefficient	Z-value	Coefficient	Z-value
Perceived land tenure variables				
Perception on land readjustments	-1.77	-1.71	-3.59	-1.70
Perception on land certificates	3.70***	2.63	5.21***	2.85
Residual from perception on land readjustments	2.14**	2.04		
Residual from perception on land certificates	-3.04**	-2.14		
Other independent variables				
ln(Leveling cost 2007)	0.02	0.48	0.08	0.43
ln(Canal cost 2007)	0.00	-0.13	-0.03	-0.14
ln(Distance to town)	0.57***	3.46	3.42***	3.81
ln(Hage)	2.51***	3.29	15.15***	3.75
Heducation	0.06*	1.68	0.25	1.30
Past off-farm employment	0.66***	2.69	4.11***	3.00
ln(Wealth)	0.26**	1.92	1.00	1.40
Risk attitude	-0.20*	-1.80	-1.27*	-1.83
Cultivated land per laborer	-0.06	-0.37	-0.05	-0.06
ln(Household water use rights)	0.09	0.47	1.16	1.02
Land slope	0.66	1.22	3.54	1.14
Rented land share	-0.15***	-4.36	-0.13***	-4.72
Residual from rented land share	0.13***	3.97		
Observations	259		259	
Log-likelihood	-131.70		-348.16	
VIF	8.63 ^c in 2SCML model, 2.18 in IVLS model			
F-statistic for instruments in first stage estimations (P-value)	4.56 (0.00) for perception on land readjustments 5.13 (0.00) for perception on land certificates			
F-statistic for overidentification (P-value)	1.48 (0.22)			
χ^2 - statistic for joint sig. of residuals (P-value)	Probit model: 19.01 (0.00)			

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a With the 2SCML technique, Perceived land readjustment and Perceived land certificate are binary variables, Renting land is a censored variable, the residuals from the first-stage equations are introduced.

^b With the IVLS method, Perceived land readjustment, Perceived land certificate and Rented land share are continuous variables constructed with the predicted values extracted from the first-stage equation.

^c The relatively large VIF (8.63) results from the introduction of the residuals from the first-stage equations (perception on land readjustments, perception on land certificates and rented land share). They must be included in the 2SCML technique in order to address endogeneity of land tenure security.

As for the control variables, we find that distance to town again has a positive impact, but the slope of the land and the size of the water use rights land do not significantly affect irrigation canal

investments. For the slope of the land this is not surprising, because this factor is expected to be more important for land leveling than for canal improvement and maintenance. But the finding that access to irrigation water, as measured by the size of the water use rights land, does not play a significant role in canal investment decisions is unexpected. Perhaps the fact that we do not control for the current state of the canals plays a role here.

As before we find that risk averse farmers are less likely to make investments. But we also find that human capital, as measured by the household head's age and (particularly) education, and a household's wealth have a significant positive impact on irrigation canal investments made by a household. We further find that past experience in off-farm employment of the household head is positively related to canal investment. A possible explanation is that past off-farm activities brought in additional income that is not fully captured by family wealth, and is used for investing in canals. Participation in the land rental market is found to have a significant negative effect on canal investment. In other words, households that rent-in additional plots of land are less likely to invest in the canals that bring irrigation water to those plots. A possible explanation is that the benefits that result from canal investment are spread over a longer period than the benefits of land leveling. Households that rent additional land for a certain period may therefore reap only a small part of the benefits of investing in canal improvement and maintenance.

4.6.2 Perceived land tenure security

Table 4.4 presents the regression results for the two perceived land tenure security variables, obtained by using a Probit model. The coefficients of the residuals derived from the first-stage land investment equations are jointly significantly different from zero in both equations. We therefore reject the hypothesis that the coefficients of the investment variables would be the same if we do not control for potential endogeneity.

The estimated coefficients of land leveling costs are significant (at a 5% level) and positive in the equation explaining a household's perception of land readjustments and also in the equation explaining its perception on the importance of land certificates. This finding supports the hypothesis that individual household investments enhance perceived land tenure security, and is consistent with similar findings in studies that focused on Africa (Besley 1995; Brasselle *et al.* 2002). The estimated coefficients for the costs of investments in irrigation canals, however, are not significantly different from zero. Hence, self-governed investments do not seem to affect household land tenure security perceptions.

Does Tenure Security Matter?

Table 4.4 Instrumental variable estimates of determinants of perceived tenure security

Variable	Perception on land readjustments		Perception on land certificates	
	Probit model, 2SCML ^a		Probit model, 2SCML ^a	
	Coefficient	Z-value	Coefficient	Z-value
Investment variables				
ln(Leveling cost)	0.27**	2.24	0.23**	1.90
ln(Canal cost)	-0.10	-0.82	-0.12	-0.93
Residual from leveling cost	-0.36***	-2.80	-0.24**	-1.96
Residual from canal cost	0.16	1.32	0.22*	1.63
ln(Leveling cost 2007)	-0.07*	-1.73	-0.03	-0.81
ln(Canal cost 2007)	0.00	-0.06	0.06	1.38
Other independent variables				
Land inequality	0.00	-0.12	-0.02**	-2.32
Land rental market	-0.03	-0.33	-0.07	-0.80
ln(Hage)	0.11	0.25	-1.19**	-2.15
Heducation	0.03	1.08	-0.04	-1.42
Party member or leader	0.02	0.10	0.32	1.35
ln(Wealth)	0.15*	1.83	-0.11	-1.21
Opinion about policy	0.48***	2.72	0.36*	1.72
Number of readjustments	0.23**	2.23	0.19	1.35
Risk attitude	0.25**	2.17	-0.03	-0.24
Contracted land per head	0.03	1.49	-0.03	-1.39
ln(Number of plots)	-0.19	-0.96	-0.20	-0.93
Observations	259		259	
Log-likelihood	-148.09		-107.63	
VIF		5.16 ^b in 2SCML model, 2.40 in IVP model		
F-statistic for instruments in first stage estimations (P-value)		Land leveling equation: 9.65 (0.00) Canal investment equation: 7.73 (0.00)		
F-statistic for overidentification (P-value)		0.03 (0.86) for perception on land readjustments 0.01 (0.90) for perception on land certificates		
χ^2 - statistic for joint sig. of residuals (P-value)		7.95 (0.02) for perception on land readjustments 5.72 (0.05) for perception on land certificates		

Notes: **,*, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a With the 2SCML technique, Leveling cost and Canal cost are actual values, and the residuals from the first-stage estimation are introduced.

^b The relatively large VIF (5.16) results from the introduction of the residuals from the first-stage land leveling equation and canal investment equation. This is inevitable since they must be included in the 2SCML technique.

We further find that a household's perception of the likelihood of no land reallocations taking place in the coming five years is positively affected by the number of past land readjustments and by the household's opinion about the policy of no land readjustments. The former finding contradicts the

hypothesis that past land readjustments increase the probability of future land readjustments (Deininger and Jin 2006). A possible explanation is that past land readjustments contributed to a more equal land distribution in the village, and thereby reduces the need for further readjustments in the near future. The land inequality variable that we use in our analysis, the share of households in the village with less than half of the average land area, may in fact not adequately capture existing land inequality. This would also explain why the estimated coefficient for the land inequality variable does not differ significantly from zero in the land reallocation perception equation.

With respect to household perceptions of the importance of land certificates for protecting land use rights, we find that a household's opinion on the no-reallocation policy has a significant positive impact (at a 10% testing level) on such perceptions, as expected. In this case, the degree of land inequality has a significant negative impact on perceived land tenure security. This suggests that when there is a large share of households in a village with relatively small holdings, households in that village are more afraid that land certificates cannot protect their rights even though they do not expect land reallocations will take place in the near future.

Among the control variables, we find that the age of the household head has a significant negative impact on household perceptions of land certificates. In other words, households with younger heads are more likely to rely on land certificates to protect individual land rights, while older households may rely more on local informal decisions rules. The village-level land rental market does not impact significantly on perceived land tenure security. A possible explanation is that the land rental market is underdeveloped and characterized by a high degree of segmentation in our research area, as in many other parts of rural China, caused by the fact that rental transactions are limited to a close circle of relatives and friends. A household's wealth is found to have a positive impact (at a 10% testing level) on a household's expectation that there will be no land reallocation in the near future. This finding is consistent with that of Holden and Yohannes's (2002) for Ethiopia. And we find that risk-taking households tend to be more convinced that no land readjustments will take place in the near future.

4.6.3 Robustness checks

A crucial assumption in the 2SCML approach is that the residuals of the second-stage equation follow a normal distribution conditionally to the endogenous explanatory variable, with a conditional expected value that depends linearly on the residuals of the first-stage equation (Brasselle *et al.* 2002). In order to examine the robustness of the regression results for investment probability equations obtained by using the 2SCML technique, we use a similar modified Instrumental Variables Probit (IVP) method suggested by (Brasselle *et al.* 2002). In this method the standard errors obtained by using conventional methods are replaced by bootstrap estimates of standard errors. The bootstrap method generates multiple samples by resampling from the current sample. The bootstrap estimate of

Does Tenure Security Matter?

the standard error can be used to solve the problem of biased standard error estimates obtained by using conventional methods (Cameron and Trivedi 2010). More specifically, in the first stage we estimate a Probit model for Equation (4.4) and obtain the predicted values, \widehat{S}_i . In the second stage, we randomly draw 150 sub-samples and introduce the predicted values (instead of the residuals) from the first-stage estimation into Equation (4.5) and Equation (4.6) and estimate Equation (4.5) and Equation (4.6) on the basis of these sub-samples.

In order to examine the robustness of the regression results for investment costs obtained by using the IVLS technique, we extend the 2SCML procedure into Tobit models with an endogenous explanatory variable. We run an OLS regression for Equation (4.4) to obtain the residuals of the first stage, and then introduce the residuals (\widehat{u}_{1i}) and the endogenous variable (S_i) into the second-stage estimations (Equation (4.7) and Equation (4.8)). The 2SCML procedure also allows us to test the null hypotheses that land tenure variables are exogenous.

The results for the determinants of land leveling and canal investments are reported in Table A4.1 and Table A4.2 in the Appendix, respectively. The conclusions that can be drawn for the variables that are our main interest from applying the modified IVP for estimating the investment probability equations are the same as those that we obtained from using the 2SCML technique. Likewise similar conclusions can be drawn from using the IVLS method instead of the 2SCML technique for estimating the investments cost equations. This indicates that the strong assumption of conditional normality of residuals does not influence (bias) the results from the 2SCML technique. Hence, we may conclude that the results reported in Table 4.2 and Table 4.3 are robust to the choice of the estimation technique.

To examine the robustness of the regression results that we obtained for perceived land tenure security, we estimated the model by means of standard IVP instead of the 2SCML. We treat investment data as continuous, and use the predicted values from the first-stage equation for the second stage estimation. The results obtained by using the IVP method are reported in Table A4.3 in the Appendix. Again, the conclusions that can be drawn are the same as those that we obtained by using the 2SCML technique.

4.7 Conclusions

In this paper, we employ variations between households in land tenure security perceptions to examine the relationship between tenure security and household land quality improvement investments in Northwest China. Our analysis distinguishes between land leveling as an individual investment decision and investment in canal maintenance and improvement as a self-governed investment decision. The econometric approach that we applied takes into account potential reverse causality between land tenure security and land investment.

Using household-level data collected among 259 households in Minle County, Gansu Province for the year 2009, and lagged values of some explanatory variables based on data from an earlier survey, we find that perceived land tenure security significantly affects self-governed investments but does not affect individual investments in land quality improvements. Households who consider land certificates as important for protecting land rights are found to invest significantly more in irrigation canals improvement and maintenance as compared to those who attach lower importance to land certificates. Our results further provide evidence that individual investments in land quality improvement contribute to higher perceived land tenure security.

Besides reverse causality, endogeneity may also be caused by omitted variables, such as efficiency, entrepreneurship and other unmeasured household characteristics that are correlated with both the dependent variables and the regressors. The results obtained in our study are valid to the extent that the impact of such omitted variables is negligible. Further robustness test, based on panel data sets, are needed to examine to what extent our results are still valid if fixed effects are controlled.

The policy implications of our findings are twofold. Firstly, perceived land tenure security is an important complement of formal institutions in promoting land investments. Supplementary measures aimed at improving household perceptions of tenure security, such as disseminating information about the importance of land certificates for pursuing rights in land conflicts, may play an important role in stimulating households to undertake self-governed land investments. Secondly, we find that tenure security-enhancing investment plays an important role in protecting farmers' individual land rights. Since 1998 the Chinese government has issued a series of laws and regulations aimed at introducing market incentives and providing households with more secure land rights. Land readjustments, however, still occur in some regions but not in others. Our findings provide a possible explanation for this observed heterogeneity. Land readjustments are less likely to occur in villages where household individual land quality improvement investments are common, because these investments will increase the difficulties of readjusting land.

Does Tenure Security Matter?

Table A4.1 Instrumental variable estimates of determinants of land leveling

Variable	Probability of land leveling		Cost of land leveling	
	Probit model, modified IVP ^a		Tobit model, 2SCML ^b	
	Coefficient	Z-value	Coefficient	Z-value
Perceived land tenure variables				
Perception on land readjustments	0.27	0.64	3.49	0.66
Perception on land certificates	-0.23	-0.74	-4.04	-0.63
Residual from perception on land readjustments			-6.45	-1.23
Residual from perception on land certificates			3.79	0.58
Other independent variables				
ln(Leveling cost 2007)	0.05	1.39	0.21	1.23
ln(Canal cost 2007)	0.05	1.26	0.25	1.25
ln(Distance to town)	0.52***	2.36	2.99***	3.06
ln(Hage)	-0.41	-0.47	-2.39	-0.64
Heducation	0.00	-0.09	0.00	0.01
Past off-farm employment	-0.15	-0.48	-0.70	-0.58
Ln(Wealth)	-0.16	-1.12	-0.79	-1.15
Risk attitude	-0.42***	-3.20	-2.30***	-3.83
Cultivated land per laborer	0.09	0.41	1.26	1.33
ln(Household water use rights)	0.53**	2.02	2.63**	2.29
Land slope	1.06**	2.02	5.37***	2.44
Rented land share	0.00	0.35	0.00	0.02
Residual from rented land share			-0.04	-0.23
Observations	259		259	
Log-likelihood	-133.49		-391.56	
VIF	8.63 ^c in 2SCML model, 2.18 in IVP model			
F-statistic for instruments in first stage estimations	4.56 (0.00) for perception on land readjustments			
(P-value)	5.13 (0.00) for perception on land certificates			
F-statistic for overidentification (P-value)	0.46 (0.50)			
χ^2 - statistic for joint sig. of residuals (P-value)	Tobit model: 0.55 (0.64)			

Notes: *,**, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a In the IVP method, Perception on land readjustments, Perception on land certificates and Rented land share are continuous variables obtained as predicted values from the first-stage equation. The standard errors are estimated by means of bootstrapping procedure.

^b With the 2SCML technique, Perception on land readjustments and Perception on land certificates are binary variables and Rented land share is a censored variable for which the residuals from the first-stage equations are introduced into the second stage estimation.

^c The relatively large VIF (8.63) results from the introduction of the residuals derived from the first-stage equations (perception on land readjustments, perception on land certificates and rented land share). They must be included in the 2SCML technique in order to address endogeneity of land tenure security.

Table A4.2 Instrumental variable estimates of determinants of canal investment

Variable	Probability of canal investment		Cost of canal investment	
	Probit model, modified IVP ^a		Tobit model, 2SCML ^b	
	Coefficient	Z-value	Coefficient	Z-value
Perceived land tenure variables				
Perception on land readjustments	-0.64*	-1.74	-9.65	-1.64
Perception on land certificates	0.94***	2.75	20.11***	2.58
Residual from perception on land readjustments			11.87**	1.98
Residual from perception on land certificates			-16.11**	-2.05
Other independent variables				
ln(Leveling cost 2007)	0.01	0.39	0.08	0.42
ln(Canal cost 2007)	-0.02	-0.43	0.03	0.13
ln(Distance to town)	0.58***	3.16	3.16***	3.66
ln(Hage)	2.52***	3.33	14.49***	3.48
Heducation	0.04	1.28	0.31*	1.66
Past off-farm employment	0.68***	2.74	3.74***	2.85
ln(Wealth)	0.17	1.19	1.54**	2.02
Risk attitude	-0.20*	-1.73	-1.26**	-1.94
Cultivated land per laborer	-0.03	-0.19	-0.26	-0.29
ln(Household water use rights)	0.18	0.79	0.56	0.52
Land slope	0.48	0.54	4.43	1.43
Rented land share	-0.02***	-3.96	-0.85***	-4.81
Residual from rented land share			0.76***	4.26
Observations	259		259	
Log-likelihood	-136.76		-342.15	
VIF	8.63 ^c in 2SCML model, 2.18 in IVP model			
F-statistic for instruments in first stage estimations	4.56 (0.00) for perception on land readjustments			
(P-value)	5.13 (0.00) for perception on land certificates			
F-statistic for overidentification (P-value)	0.46 (0.50)			
χ^2 - statistic for joint sig. of residuals (P-value)	Tobit model: 7.60 (0.00)			

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a With the modified IVP method, Perception on land readjustments, Perception on land certificates and Rented land share are continuous variables obtained as predicted values from the first-stage equation. The standard errors are estimated by means of bootstrapping procedure.

^b With the 2SCML technique, Perception on land readjustments and Perception on land certificates are binary variables and Rented land share is a censored variable for which the residuals from the first-stage equations are introduced into the second-stage estimation.

^c The relatively large VIF (8.63) results from the introduction of the residuals derived from the first-stage equations (perception on land readjustments, perception on land certificates and rented land share). They must be included in the 2SCML technique in order to address endogeneity of land tenure security.

Does Tenure Security Matter?

Table A4.3 Instrumental variable estimates of determinants of perceived tenure security

Variable	Perception on land readjustments		Perception on land certificates	
	Probit model, IVP ^a		Probit model, IVP ^a	
	Coefficient	Z-value	Coefficient	Z-value
Investment variables				
ln(Leveling cost)	0.26**	2.18	0.22*	1.88
ln(Canal cost)	-0.09	-0.71	-0.12	-0.98
ln(Leveling cost 2007)	-0.06*	-1.81	-0.03	-0.77
ln(Canal cost 2007)	0.00	-0.07	0.06	1.39
Other independent variables				
Land inequality	0.00	-0.33	-0.02***	-2.44
Land rental market	-0.04	-0.39	-0.08	-0.89
ln(Hage)	0.12	0.29	-1.10**	-2.03
Heducation	0.03	1.00	-0.04	-1.35
Party member or leader	0.02	0.10	0.37	1.59
ln(Wealth)	0.15*	1.80	-0.11	-1.29
Opinion about policy	0.48***	2.73	0.35*	1.72
Number of readjustments	0.19*	1.85	0.17	1.22
Risk attitude	0.24**	2.14	-0.04	-0.37
Contracted land per head	0.03	1.25	-0.04	-1.55
ln(Number of plots)	-0.17	-0.85	-0.17	-0.83
Observations	259		259	
Log-likelihood	-154.06		-110.76	
VIF	2.30			
F-statistic for instruments in first stage estimations (P-value)	Land leveling equation: 9.65 (0.00) Canal investment equation: 7.73 (0.00)			
F-statistic for overidentification (P-value)	0.03 (0.85) for perception on land readjustments 0.01 (0.90) for perception on land certificates			

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a With the IVP method, Leveling cost and Canal cost are predicted values from the first-stage estimation.

5. Land Tenure Security and Land Rental Markets in Northwest China²⁹

Abstract: Since 1998, the Chinese government has implemented a number of land tenure reforms which are meant to improve formal tenure security and transferability of rural land. The impact of these reforms on the development of the land rental market may, however, be limited by persistent household perceptions of land tenure insecurity and lack of trust in potential transaction partners. Insights into the impact of household perceptions of land tenure security and trust on land rental decisions may contribute to policies that enhance productivity and equity in rural societies. This article examines the impact of perceived land tenure security and trust on the leasing of land, using detailed household-level data collected in Minle County in northwest China. We contribute to the literature on the determinants of land rental market development by (1) examining the role of tenure security as perceived by rural households instead of formal tenure security as specified in land laws and land titling, and (2) differentiating trust into trust towards kinship, trust towards known people and trust towards strangers. We find that the importance attached to land certificates in protecting land rights positively affects the probability of leasing land, the quantity of land that is leased, and the probability that a formal contract is used in the rental transaction. Expectations about the absence of land redistributions in the near future positively affect the likelihood that informal rental contracts are used, but have no significant effects on the probability of land renting and its quantity. Trust towards known people positively affects probability and intensity of land renting and the use of informal contracts, while trust towards kinship does not significantly affect any of the land rental variables in our sample.

²⁹ This chapter is based on a paper submitted to *Land Economics* in November 2013, as Ma, X., N. Heerink, E.C. van Ierland, X. Shi. "Perceived tenure security, trust and land rental markets in China".

5.1 Introduction

Well-functioning land rental markets can play an important role in enhancing productivity as well as equity in rural societies. A typical feature of agrarian economies is the tenacious persistence of credit and labor market imperfections. When credit requires land as a collateral and if it is tied to the amount of land owned, redistribution of land to more productive landholders via the land sale market is prevented (Deininger and Feder 2001). High costs of supervision frequently prohibit the hiring of labor up to the quantity that would equalize the marginal product across households (Binswanger *et al.* 1995). In cases of highly segmented credit markets and thin agricultural labor markets, the land rental market therefore plays an important role in enhancing overall productivity via transferring land to more productive producers (Deininger 2003).

In the process of rural structural transformation that China and many other developing countries experience, laborers leave the agricultural sector and become engaged in off-farm employment. China's agricultural employment share is estimated to have dropped from more than 70% in 1978 to less than 50% by 2000, and is expected to continue to drop in the future (Jin and Deininger 2009). Well-functioning land rental markets could allow households with higher agricultural ability who do not join the off-farm labor force to gain access to additional land, and thereby increase their operational farm size and income. The land rental market therefore has a considerable potential to enhance equity by permitting participation in the nonfarm economy for those with lower agricultural ability (Deininger and Jin 2005).

Despite the potential of the land rental market to enhance productivity and equity, it often develops less than expected. In many developing countries, it is characterized by a high degree of segmentation caused by the fact that rental transactions are limited to a close circle of relatives where social sanctions can be applied to ensure that land is returned at the end of the rental period. A survey held in China's nine agriculturally most important provinces, for example, showed that only 13% of rural households rented in land and 10% rented out land during the period 2002-2004 (Jin and Deininger 2009). Most rental transactions were based on informal, oral contracts instead of written, formal contracts. Sixty percent of the participating households reported to have a contract, but less than 10% of the contracts were in writing. Around 40% of participating households rent in land from a relative. The limited use of land rental transactions clearly reduces the potential of the land rental market to enhance productivity and equity. Moreover, the informal nature of rental contracts may reduce tenants' incentives for making productivity-enhancing land investments (Deininger 2003).

What factors can explain the underdeveloped land transfer markets in China? The existing international literature stresses the role of land rental transaction costs in causing low levels of land

market participation and contributing to land market segmentation (Holden and Yohannes 2002; Deininger and Jin 2005; Holden *et al.* 2007; Jin and Deininger 2009). Transaction costs in land rental markets consist in particular of costs involved in acquiring information on potential partners and costs of negotiating and enforcing contracts, including the risk of land loss. Two major factors contributing to high transaction costs in many developing countries, such as Vietnam, Ethiopia, China, are insecurity of land rights arising from existing laws and regulations (Deininger and Jin 2005; Holden *et al.* 2007; 2009) and lack of trust among partners (Holden and Ghebru 2005).

Since 1998, the Chinese government has implemented a number of land tenure reforms that are meant to improve tenure security and stimulate transferability of rural land. Relevant laws include the Land Administration Law of 1998, the Rural Land Contract Law of 2002, the Property Law of 2007, and the Mediation and Arbitration of Rural Land Contract Disputes Law of 2009. Although these reforms have contributed to improved formal tenure security, it is not clear to what extent they contribute to land rental market development. What matters for land renting decisions is the tenure security as perceived by households. The perceived tenure situation forms the basis upon which the landholder can be expected to take decisions, whatever the legal situation of a piece of land (Jansen and Roquas 1998; Sjaastad and Bromley 2000; Broegaard 2005). Perceived tenure security may differ from formal tenure security as it depends on the way land laws and land titling are being implemented, and on how information about these laws is being distributed among stakeholders. Some studies have examined the relationship between perceived tenure security and housing improvement in South American countries, such as Argentina and Brazil (de Souza 1998; de Souza 2001; Van Gelder 2007; Van Gelder 2009), and the relationship between perceived tenure security and land investments and inputs in China and Ethiopia (Holden and Yohannes 2002; Jacoby *et al.* 2002). According to our knowledge, however, no study has examined the relationship between perceived tenure security and participation in the rural land rental market.

Trust is increasingly recognized as an important factor in farmers' behavior regarding resource use and economic performance (Parks and Hulbert 1995; de Vos and Mol 2010). Only a few studies, however, examine the effect of trust on farmers' participation in land rental markets. Holden and Ghebru (2005) point out that higher trust inherent in kin relationships helps to reduce transaction costs in land rental markets. However, they do not differentiate between different types of trust (e.g. trust towards kinship, trust towards known people and trust towards strangers) that may affect participation in land rental markets.

The main objective of this paper is to examine the impact of two major factors affecting transaction costs, i.e. (i) perceived tenure security and (ii) trust, on farm household decisions to rent in land in China. We focus our analysis on the demand side of the land rental market for two reasons. Firstly,

Does Tenure Security Matter?

while a relatively large body of literature has examined the relationship between insecure land rights and supply of land (Macours *et al.* 2004; Holden *et al.* 2007, 2009), little research has been done so far to examine the effect of insecure land rights on the demand for land³⁰. Secondly, the supply side is usually under-enumerated in rural household surveys, including the survey that we use for this study, because households who are not found at home at the time of the survey time are not interviewed. As a result, households that migrated elsewhere and rented out their land to other households – a common phenomenon in rural China – could not be included in our sample.

This paper contributes to the literature on the effect of land tenure security on land rental market development by examining the role of tenure security as perceived by rural households instead of formal tenure security as specified in land laws and land titling. It also contributes to the literature on how trust affects land rental market development by differentiating the role of trust into trust towards kinship, trust towards known people and trust towards strangers.

The theoretical model that we use in this study divides a potential tenant's decisions to participate in the land rental market into three stages: participation decision, contract choice, and intensity of participation. Each stage-decision is affected by transaction costs. In the empirical analysis, we use Probit models to estimate determinants of household participation in the land rental market and contract choice, and Tobit models to examine the factors affecting participation intensity. A cross-section data set, containing data for 259 households on land market participation, perceived tenure security, trust and other relevant factors, is used to estimate these models. The data were collected in 21 villages in Minle County, Gansu province, northwest China and covers the years 2007 and 2009.

The paper is organized as follows. Section 5.2 reviews the relevant literature on factors affecting land rental market development and discusses in more detail what this study contributes to the literature. Section 5.3 presents the model that we use for the empirical analysis and the strategy that we apply for estimating the models. Section 5.4 discusses data collection and presents the definitions and descriptive statistics of the variables used in the analysis. Section 5.5 reports the estimation results. The paper ends with concluding remarks in section 5.6.

5.2 Factors affecting land rental market development

Failure to provide enough off-farm labor opportunities is argued to be a factor explaining low levels of participation in land markets and land market segmentation (Kung 2002; Feng 2006). Massive rural-urban labor migration in China since the start of the economic liberalization and opening up policy has relaxed the constraints of off-farm labor markets on land rental market development.

³⁰ A few studies that examined the effect of land rights on both supply-side and demand-side activities in Vietnam and Ethiopia found that secure formal land rights can increase the volume of demand-side activities (Deininger and Jin 2003; Holden *et al.* 2007).

Transaction costs play an important role in land rental market development. High transaction costs in land rental markets originate in particular from insecure land rights and low level of trust among landlords and tenants. Insecure land rights from formal laws and regulations may be an important factor. In Vietnam the provision of secure and long-term land rights increased the volume of rental transactions benefiting poor but productive households (Deininger and Jin 2003). In the Dominican Republic insecure property rights not only reduce the level of activity in the rental market, but also induce market segmentation, because rentals are restricted to pre-existing social networks (Macours and Swinnen 2002; Macours *et al.* 2004). In Nicaragua insecure tenure is found to reduce participation on the supply side of the land rental market (Deininger *et al.* 2003). In Ethiopia land certification is found to increase the level of participation in the land rental market (Holden *et al.* 2007), and to increase contract length (Bezabih and Holden 2006). In China migrating households may be seen by the village leader as a signal and a good reason to take land away from the migrating households. Moreover, tenants may not return the land upon expiry of the contract. Land use regulations that allow village leaders to confiscate land that has not been utilized for one season are found to have a very significant and negative impact on the propensity to supply and demand land for renting; possession of land certificates, on the other hand, has no significant impact on rental market participation at either side (Jin and Deininger 2009).

Concerning the role of trust among landlords and tenants, Holden and Ghebru (2005) point out that inherent trust in kin relations helps to reduce transaction costs in land rental markets as the costs of acquiring information and negotiating and enforcing contracts tend to be much lower. Access by tenants to land rental markets is therefore less constrained in communities with a relatively high share of contracts consisting of kinship contracts.

Although the literature provides useful insights into factors explaining the level of land rental market development, two main issues have received insufficient attention so far. Firstly, the existing literature mainly focuses on the impact of formal land rights derived from land laws and land titling. But what matters for household decision making is the perception of households on their land rights. In the case of China, where rural land is formally owned by the village collective and allocated over longer periods by the village leader to households residing within the village, farmers' perceptions on the probability of future land readjustments is likely to play an important role. Because village leaders have the possibility of taking back land that has been rented out and reallocating its use right to other households within the village during such readjustments³¹, the perceived probability of future land readjustments is likely to affect land renting out decisions of farm households. The risk comes from

³¹ For a more detailed discussion of rural land allocation and land readjustments in China (see e.g. Tan *et al.* 2006; Wang *et al.* 2011).

Does Tenure Security Matter?

the fact that formal laws and land titling related to land rights are not enforced effectively, because the seemingly vague and ambiguous formulations inherent in these laws and regulations allow local actors for a flexible interpretation and adaptations of the land laws and regulations to local conditions and changing situations (Piotrowski 2009).

Since 1998 four main laws have been issued which significantly increased formal land tenure security and transferability. These laws intend to (1) grant farmers with perpetual and usufructuary rights; (2) issue land certificates to farmers; (3) significantly limit the scope of administrative land readjustments; (4) prohibit that village leaders take rented out land back unless the landlords in question move to a city and register as an urban citizen. In this situation, the difference in formal land rights across households may be small and perceived land rights may be more important than formal land rights in explaining the differences in land rental market development. For example, most villages in China have issued land certificates to farmers up to date. According to a survey held in the nine agriculturally most important provinces, more than 80% of households possessed land certificates in 2004 (Jin and Deininger 2009). Possession of a land certificate therefore might not explain the large regional differences in participation in land rental markets. But farmers' perception on the role and importance of land certificates surely might. Households that possess a certificate and think that land certificates are important to protect their land rights are more likely to participate in land rental markets than those who possess a certificate but think that land certificates cannot protect their land rights.

Secondly, presence of trust is essential for cooperation within a group and thereby affect resource use and economic performance (Parks and Hulbert 1995; de Vos and Mol 2010). However, different types of trust may have different effects on individual behavior and economic performance. Fukuyama (1995) divides trust into two components: general (non-kinship or generalized) trust and kinship trust. Kinship trust refers to the trust among friends and family, and non-kinship trust refers to the trust toward the community more broadly defined. Generally speaking, high kinship trust may only make that people with kinship relations (a relatively small group) work easily together; while high general trust may make that people from the entire society cooperate easily (Tu *et al.* 2011).

Different types of trust might have different effects on land rental market development. High level of kinship trust helps to reduce the transaction costs only of land rental transactions that occur among kinship members. The existence of relatively high levels of kinship trust and low levels of non-kinship trust may be an important explanatory factor of land rental market segmentation; landlords tend to worry less about losing land when their land is rented out to their kinship members (family relatives). In China, these land rentals based on kinship often tend to be relatively short-term and based on oral contracts. Such contracts cannot ensure that land rental markets lead to optimum outcomes, because they increase tenants' disincentives for making long-term land quality improvement investments

(Deininger 2003). High levels of non-kinship trust can reduce the transaction costs for those transactions that occur among non-kinship members and can thereby stimulate land rental transactions and reduce market segmentation. An important feature of land rental markets in rural China is that almost all land rental transactions occur among villagers. The partner of a tenant or landlord is usually the neighbor or another familiar person within the same village. We therefore expect that trust towards neighbors and familiar people and trust towards strangers have different impacts on participation in the land rental market. Hence, in this study we distinguish between three types of trust, namely (1) trust in parents, children and brothers/sisters (kinship trust), (2) trust towards neighbors and familiar people, and (3) trust towards strangers.

5.3 Model choice and estimation strategy

5.3.1 Model choice

The standard model used in the literature specifies the impact of different transaction costs on the rented land area (Holden and Ghebru 2005). Other studies divide land leasing behaviour into two stages in order to examine the effect of transaction costs on contract choice (Macours *et al.* 2004; Bezabih and Holden 2006). In the first stage the landlord chooses whether to rent out the land or not; in the second stage, given the decision to lease out land, the landlord decides to which tenant he offers the contract (Macours *et al.* 2004) or chooses the duration of the contract (Bezabih and Holden 2006). Transaction costs arising from insecure land rights, low trust and other factors can have different impacts on each stage in these models.

Building on these two-stage models, we propose an integrated three-stage decision model of a potential tenant's decision to participate in the land rental market (see Appendix 5.1).³² In the first stage, a tenant chooses whether or not to rent in land based on the household's agricultural ability, the size of its land endowment, the off-farm opportunities available, and the transaction costs associated with land rental market participation. In the second stage, the tenant decides to which landlord he offers the contract, whether the contract will be written or oral and what the duration of the contract will be, based on the transaction costs associated with alternative contract choices. Contract-specific choices may be highly related to each other. If a tenant offers the contract to a kinship member, an oral contract with a short duration or an open-ended duration is more likely. We therefore focus our analysis in this stage on the choice between formal and informal contracts. In the third stage, the tenant decides the area of land to be rented in, based on the size of its land endowment, the off-farm opportunities available, the available land supply in the village, and the variable transaction costs.

³² A landlord's behaviour can be analysed by a similar three-stage decision model. As discussed previously, the focus of our research is on the demand-side of the land market.

Does Tenure Security Matter?

Based on the assumption that high levels of tenure security and trust can reduce transaction costs for both potential tenant and landlord to participate in land rental market, we can derive two, intuitively appealing, hypotheses for the main variables of our interest: (1) high perceived security of land rights is expected to increase the probability and intensity of participation in the land rental market and the probability of choosing an informal contract, (2) high level of trust is expected to increase the probability and intensity of participation in the land rental market and the probability of choosing an informal contract. These two hypotheses will be tested empirically below.

5.3.2 Estimation strategy

The regression equations are based on the theoretical model specified in Appendix 5.1. When estimating the three-stage econometric model, two issues need to be addressed. Firstly, the participation and contract choice decisions can be estimated jointly using a nested Logit model. It allows the alternatives within a nest to have mutually correlated error terms. However, our data set does not include alternative-specific variables that can be used for estimating a nested Logit model. For example, we have information on the contract type that has been chosen by a household, but not on the type that has not been chosen. We therefore estimate two standard Probit models.³³

Secondly, there may be a selection bias because unobserved characteristics that influence the probability to rent in land could also influence the decision on the quantity of land that is rented (Teklu and Lemi 2004; Holden and Ghebru 2005). Neglecting this selectivity effect is likely to give biased estimates. We used the Heckman selection model to test for possible selection bias, and did not find evidence of a significant selection bias in our data set³⁴. We therefore estimate a Tobit model for the determinants of the intensity of participation decision.

5.4 Data Set

5.4.1 Data collection

This study uses data from two farm household surveys that were held in Minle County, Gansu Province in northwest China in May 2008 and May 2010. The surveys were held to obtain more insights into the sustainability of land and water use of households living in the area, and were carried out by staff and students from Gansu Academy of Social Sciences in Lanzhou, Gansu Agricultural University in Lanzhou, and Nanjing Agricultural University. Collected information refers to the years 2007 and 2009, respectively. The surveys were carried out among household heads and village leaders.³⁵ They cover 317 households in 21 villages in the May 2008 survey, and 315 households in the same 21 villages in the May 2010 survey. In each of the ten townships in Minle County, 10% of

³³ We estimated Probit models instead of standard Logit models, because Probit models do not exhibit the restrictive property of the Independence of Irrelevant Alternatives (IIA).

³⁴ LR test of independent equations has a χ^2 statistic of 2.10 (P-value=0.15). We thus cannot reject the null hypothesis.

³⁵ In addition, leaders of water users associations were interviewed.

the villages were selected randomly for the survey in May 2008. Within each selected village, 15 households were randomly chosen to be interviewed.³⁶ If possible, the same households were also interviewed in May 2010. In 50 cases the same household could not be found, and was replaced by another, randomly selected, household in the same village.

Although 265 households were interviewed in both years, we cannot exploit the panel nature for our analysis. The reasons are that questions about subjective perceptions of land tenure were asked only in the May 2010 survey, and that we need to introduce lagged values of some variables (trust) to avoid endogeneity problems. We therefore perform a cross-section analysis that is based on the sample of 259 households that were interviewed in both years³⁷.

5.4.2 Definitions and descriptive statistics of variables

Table 5.1 presents the definitions of the variables used in the regression analysis and their descriptive statistics as well as the signs of the expected effects.

(1) Participation in land rental market

The three dependent variables in our analysis consist of a land renting in dummy, a contract choice (informal or formal contract) dummy and the area of land that is leased. In our research area, the land rental market is developing. The household surveys show that 15% of the households rented in land, with an average rented-in land area of 10.25 mu in 2009. Almost 40% of the rental contracts in 2009 were written ones. In their survey held in north and northeast China during 2002-2004, Jin and Deininger (2009) found that 11% of the households rented in land, with 18% of the contracts in writing. Hence, the share of renting households was slightly higher and the share of written contracts was much higher in our 2009 survey.

(2) Perceived land tenure security

Perceived land tenure security is measured by household expectations on future land readjustments and perceptions on the importance of land certificates. Expectation on future land redistribution takes the value 1 if a household does not expect a land redistribution within 5 years, and 0 if the household expects a redistribution to occur within 5 years, or does not have an idea. Perception on the importance of land certificates reflects a household's assessment of the significance of land certificates for protecting land rights. It is defined on a scale from 1 (= not important) to 5 (= very important). A potential endogeneity problem arises from the fact that a household's participation in the land rental market may increase the risk of expropriation. To deal with this problem, we use the perceived village-level land tenure security as an approximation. It is defined as the average tenure security perception

³⁶ In the first two villages, 16 instead of 15 households were interviewed.

³⁷ We left out six households who did not engage in agricultural production in 2009.

Does Tenure Security Matter?

of the other respondents within the same village. In our sample only 38% of the households do not expect a land redistribution within 5 years. The average value of the land certificate perception variable equals 4.14, which shows that most of the sampled households consider certificates to be important for protecting land rights.

Table 5.1 Definition of variables and descriptive statistics

Variable	Definition	Mean	S.D.	Exp. signs ^c	
				P, I	C
Participation in land market variables					
Renting in dummy	1= household rented in land, 0= otherwise	0.15	0.36		
Informal contract dummy	Contract type of renting household: 1= informal (oral) contract; 0= formal contract	0.61 ^a	0.50		
Rented land	Total area of land rented in by renting household (mu)	10.25 ^a	11.57		
Land tenure security variables					
Village perception on land readjustments	Average perception on land readjustments in the village based of the other sampled households that live in the same village as the surveyed household	0.38	0.16	+	+
Village perception on land certificates	Average perception on importance of land certificates in the village based of the other sampled households that live in the same village as the surveyed household	4.14	0.36	+	+
Trust variables					
Household trust towards kinship	Trust towards kinship, calculated by comprehensive questions about trust, in 2007	0.96	0.06	+	+
Household trust towards known people	Trust towards known people, calculated by comprehensive questions about trust, in 2007	0.79	0.11	+	+
Household trust towards strangers	Trust towards strangers, calculated by comprehensive questions about trust, in 2007	0.44	0.20	+	+
Other independent variables					
Lagged rented land area	Total area of land rented in by renting household in 2007 (mu)	6.51 ^a	6.50	+	
Distance to town	Average distance from household homes to the nearest town (km)	4.81	4.33	+	
Education of household head	Years of formal education of the household head (years)	7.42	3.49	-	-
Wealth	Value of agricultural devices, livestock, electronic instruments, house, furniture and transportation vehicle (RMB)	59332	60067	+	+/-
Risk aversion	Opinion about risk aversion statement, 1= disagree, 2=no opinion, 3= agree	1.85	0.98	-	+/-
Contracted land –	Ratio of contracted (= allocated) land area to laborers ^b	7.33	5.48	-	

labor ratio	in household (mu)			
Age of household head	Age of the household head (years)	46.69	10.43	+/_
Leader or party member	1= household head is a party member or village leader, 0= otherwise	0.25	0.43	_
Tongziba dummy	1= farmer resides in Tongziba irrigation district; 0= otherwise	0.29	0.45	+/_
Hongshuihe dummy	1= farmer resides in Hongshuihe irrigation district; 0= otherwise	0.34	0.47	+/_
Haichaoba dummy	1= farmer resides in Haichaoba irrigation district; 0=otherwise	0.10	0.31	+/_
Daduma dummy	1= farmer resides in Daduma irrigation district; 0=otherwise	0.13	0.34	+/_

Source: Household survey.

^a The mean is calculated based on the sub-sample of households that rent in land, instead of the full sample. ^bNumber of laborers is standardized using the household' subjective evaluation (one person can be either a full laborer, half laborer or non-labor). ^c P and I indicate the probability of participation in land rental market and intensity of participation, respectively, and C indicates contract choice.

(3) Trust

One widely used method to measure trust is based on the World Values Survey (WVS). The standard question about trust is specified as “Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people?” (Knack and Keefer 1997:1256). However this binary choice question is relatively simple, and it does not fully capture the essence of trust, in particular kinship trust. More comprehensive methods to measure the level of trust include trust games (Berg *et al.* 1995; Bouma *et al.* 2008) and comprehensive questions about trust rather than only using the WVS trust question (Leonard *et al.* 2010; Tu *et al.* 2011).

Our research uses comprehensive questions about trust. Apart from the standard WVS trust question, respondents were also asked to indicate their trust level to twelve different groups (parents, brothers/sisters, children, other relatives, local officials, classmates/peers, religious staff, neighbors, familiar (known) people, staff in domestic companies, staff in foreign companies, strangers), using a scale from 0 (totally distrust) to 1 (fully trust). Since many farmers do not know any staff in foreign companies and religious staff, they did not indicate their trust level towards these two groups. In order to avoid the influence of these missing values, we exclude these two questions and use the other ten questions in our analysis. We performed factor analysis using the standard method of principal-component factors to check whether our ten trust questions are consistent with three common types of trust. Based on rotated factor loadings (pattern matrix), we use the factors of trust to parents, brothers/sisters and children to measure kinship trust, the trust towards classmates/peers, neighbors

Does Tenure Security Matter?

and familiar (known) people to measure trust towards known people, and trust towards staff in domestic companies and strangers to measure trust towards strangers. The observed average levels of trust in our sample equal 0.96 for kinship trust, 0.79 for trust towards known people, and only 0.44 for trust towards strangers (see Table 5.1).

Trust may be an endogenous variable in models explaining participation in the land market. By participating in land markets people may learn about the intentions and behavior of others and as a result build up trust (or distrust)³⁸. In order to avoid potential endogeneity, we use household-level trust in 2007 instead of 2009 as a lagged control variable in our analysis.

(4) Other independent variables

The other independent variables used in the models explaining the probability and intensity of participation in the land rental market include lagged rented land area, a village characteristic, household characteristics and land characteristics. The area of rented-in land in 2007 is included in the model as an indicator of past land renting experience. We expect that past land renting experience positively affects participation in the land rental market, because households with past land renting experience have lower transaction costs. For example, if a household rented a piece of land in the past, the costs of renewing this contract will generally be lower than the costs of establishing a new contract, while the cost of obtaining information is also expected to be lower.

The village characteristic that we use in our analysis is distance of the village to the nearest town. It serves as an indicator of access to markets and availability of local off-farm employment opportunities. We expect that distance to town impacts positively on the probability and intensity of participation in the land rental market for two reasons. The first reason is that agricultural production activities play a more important role in relatively remote villages, and thus potential tenants have larger incentives to participate in the land rental market. The second reason is that households in villages located close to a town have more opportunities to obtain local off-farm employment (and hence may not migrate). These households may keep part-time jobs in agriculture, and therefore not supply their land at the village rental market.

Education of the household head is expected to have a negative effect on participation in the land rental market, because more educated households are more likely to participate in off-farm employment and therefore less likely to rent in additional land. Household wealth is used as an indicator of the economic and social power of a household within the village. It is expected to have a positive effect on the decision to rent in land. The household head's risk aversion is assessed by asking his opinion about the statement "I have never been the first to adopt new technology in my village,

³⁸ Similar arguments can be found in Fischer (2008) and Tu and Bulte (2010).

because I think that has a high risk”, using a scale with values 1 (= disagree), 2 (=no opinion) and 3 (= agree). We expect that risk averse households are less likely to participate in the land rental market because it involves more risk than using contracted land for growing crops. The contracted land (i.e. the land allocated to the household by the village leader) area per laborer is introduced as a measure of a household’s land endowment. It is expected to have a negative impact on the probability that a household rents additional land and on the quantity of land rented in. Finally, four dummy variables are introduced in the rental market probability and intensity equations for four of the five irrigation districts to which the households in our sample belong. These dummies are meant to control for major unobserved differences between irrigation districts in factors such as irrigation infrastructure and water availability which may affect land renting decisions.

In the model explaining (formal / informal) contract choice we include household characteristics as control variables (see also Bezabih and Holden (2006)³⁹). The age of the household head may have a positive impact on the use of informal contracts in land renting, because older household heads will usually have more social contacts and may be less familiar with the formal legal system than younger ones. Education of the household head is expected to have a negative effect on the use of informal contracts. Because more educated households will be more familiar with national laws and regulations, they tend to prefer formal contracts. We use village leader or party membership of the household head as a measure of access to political power (formal power). We expect that it negatively affects informal contract choice, because households with access to political power have a better understanding of how to enforce a formal contract based on legal judicial systems, and thus have less enforcement costs of formal contracts. Wealth can increase a household’s power of enforcement for both informal and formal contracts. Hence, its impact on contract choice is indeterminate. The impact of risk aversion on formal / informal contract choice is unclear. It depends on which contract type is considered to be more secure by the household in question.

5.5 Estimation results

5.5.1 Probability of participation

Table 5.2 reports the regression results for the probability of participation in the land rental market. The estimated coefficient of perceptions on the importance of land certificates has a positive sign and is statistically significant. This finding suggests that higher perceived tenure security from land certificates stimulates more households to rent in land. When it is perceived that land certificates cannot protect land rights, a landlord runs the risk of not getting back rented land, while a tenant runs the risk of losing rented land before the rental contract has expired. Hence, less land will be rented in.

³⁹ Bezabih and Holden (2006) used both landlord’s and tenant’s social economic characteristics to examine contract matching in the contract duration equation. We do not have information on landlord’s characteristics in our survey data.

Does Tenure Security Matter?

This conclusion is consistent with existing research findings that insecure property rights cause a low level of land rental market development (Macours *et al.* 2004; Bezabih and Holden 2006; Holden *et al.* 2007; Jin and Deininger 2009).

Table 5.2 Regression results for participation decision

Variable	Probability of participation in land market	
	Coefficient	Z-value
Land tenure variables		
Village perception on land readjustments	-0.60	-0.65
Village perception on land certificates	1.01**	2.33
Trust variables		
Trust towards kinship	0.47	0.19
Trust towards known people	0.96	0.80
Trust towards strangers	-0.81	-1.28
Other independent variables		
Lagged rented land area	1.56***	3.44
Distance to town	0.07**	2.03
Education of household head	-0.07**	-2.10
ln(Wealth)	0.14	1.27
Risk aversion	-0.38***	-3.20
Contracted land – labor ratio	-0.05	-1.42
Number of obs.	259	
(Pseudo) R ²	0.33	
% correct prediction	89.2	
Mean VIF	1.66	

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

Our results also show that perceptions on future land readjustments do not have a significant effect on land rental market participation. Hence, tenure security derived from land certificates provide farmers with stronger incentives to participate in the land rental market than perceptions about the likelihood of future land readjustments. A possible reason is that land certificates can prevent land expropriation taking place without a reasonable compensation. Land expropriation can be done by either the village leader, who can take land away in the next round of land readjustment, the local government, who can requisite land for urban or infrastructure development, and by a tenant, who may not return the land upon expiry of the contract. Expectations about land readjustments in the future, on the other hand, only refer to potential expropriation by the village leader.

We do not find evidence that trust significantly affects participation in the land rental market. None of the three trust variables that we distinguish has a statistically significant impact on the probability that

a household rents in land. The very high degree of trust towards kinship and its limited variation among households (see Table 5.1) may explain why kinship trust does not significantly affect land renting decisions of the households in our sample. Land rental transactions in our research area, like in most parts of China, normally take place among villagers only. This explains why trust towards strangers does not affect land rental market participation decisions. A possible reason for the insignificant coefficient of trust towards known people is the use of past land renting experience as a control variable in the regression equation. Trust is likely to affect transaction costs in land rental transactions, but trust tends to be relatively stable over time. Hence, if trust towards known people affects land rental transaction costs in the year 2009 in our research area, it was likely to do so already in 2007. Perceptions about land tenure, on the other hand, may vary much more over time, given also the recent land tenure reforms that took place in China. In order to check this argument we ran an additional regression without ‘lagged rented land area’ as a control variable. The results (see Table A5.1 in Appendix 5.2) show that trust towards known people has a significant positive effect (at a 10-percent testing level) on the rental market participation decision, while the estimated coefficients of trust towards kinship and trust towards strangers are still not significantly different from zero.

With respect to the other explanatory variables, we find that past land renting experience has a positive effect on the probability of participation. This is consistent with Holden and Ghebru’s (2005) finding for Ethiopia. Transaction costs are likely to be lower for households with past land renting experiences. Distance to town is found to have a positive effect on the probability of participation. This finding supports the hypothesis that land rental markets are more developed in remote villages. As expected, the level of education of the household head is found to have a negative effect on rental market participation. It suggests that households with more educated heads are more likely to be engaged on off-farm employment and therefore less likely to rent in land. Our results further indicate that risk-averse households are less likely to participate in the land rental market, as expected. Finally, economic and social power (as measured by the household’s wealth) and a household’s land endowment do not have a significant effect on rental market participation decisions in our sample.

5.5.2 Formal / informal contract choice

Regression results for the choice between formal (written) and informal (oral) contracts are reported in Table 5.3. Positive values of the estimated coefficients mean that households are more likely to choose an informal contract.

Consistent with our theoretical expectations, perceptions on land readjustment have a positive effect on the probability of choosing an informal contract. In villages where a relatively large share of the households do not expect a land readjustment in the near future, informal contracts are preferred for rental transactions because informal contracts are less costly than formal contracts. In addition, we

Does Tenure Security Matter?

find that households living in villages where land certificates are considered relatively important for protecting land rights chose significantly more written contracts instead of informal contracts in their land rental transactions. Land certificates function as legal documents in the formal juridical system, and can reduce the landlords' enforcement costs of formal contracts.

Table 5.3 Regression results for contract choice

Variable	Probability of choosing informal contract	
	Coefficient	Z-value
Land tenure variables		
Village perception on land readjustments	3.89*	1.82
Village perception on land certificates	-2.63**	-2.24
Trust variables		
Trust towards kinship	-0.59	-0.14
Trust towards known people	6.30**	2.35
Trust towards strangers	3.02**	2.14
Other independent variables		
Age of household head	-0.02	-0.80
Education of household head	-0.13*	-1.60
Leader or party member	-1.13*	-1.79
ln(Wealth)	-0.34	-1.15
Risk aversion	0.59**	1.99
Number of obs.	40	
(Pseudo) R ²	0.45	
% correct prediction	85.0	
Mean VIF	1.51	

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

With respect to trust, we find that both trust towards known people and trust towards strangers have positive effects on the probability of choosing informal contracts. This finding is consistent with our a priori expectations that households with higher non-kinship trust are more inclined to use informal contracts in land transaction, because informal contracts are less costly.

With respect to household characteristics, significant negative effects are found, as expected, for education of the household head and for households with heads being a village leader or party member. These findings support our hypotheses that households that are more familiar with national laws and regulations and households with more access to political power are more likely to choose a formal instead of an informal contract. We also find that risk-averse households are significantly more likely to choose an informal contract. This finding suggests that informal contracts are considered to be more secure than formal ones. A possible explanation is that risk-averse households are more likely

to rent in land from their family members or relatives, and therefore use informal contracts. Unfortunately there is no information about households renting out land in our dataset that may be used to test this premise.

5.5.3 Area of rented land

Our regression results for the area of land that is rented in are summarized in Table 5.4. The results for the two land tenure security perception variables are consistent with those for the rental market participation equation. We find that perceptions about the importance of land certificates for protecting land rights positively affect both the land rental market participation and intensity decision. Perceptions about the likelihood of land readjustments in the near future, on the other hand, do not play a statistically significant role in the participation decision nor in the intensity decision.

Table 5.4 Regression results for rented land area

Variable	Area of rented land	
	Coefficient	Z-value
Land tenure variables		
Village perception on land readjustments	-12.22	-0.83
Village perception on land certificates	18.44**	2.12
Trust variables		
Trust towards kinship	-13.24	-0.35
Trust towards known people	30.82*	1.70
Trust towards strangers	-7.60	-0.97
Other independent variables		
Lagged rented land area	1.99***	3.79
Distance to town	0.72*	1.62
Education of household head	-0.45	-1.13
ln(Wealth)	1.66	0.97
Risk aversion	-3.65**	-2.01
Contracted land – labor ratio	-0.36	-0.71
Number of obs.	259	
Log-likelihood	-226.7	
Mean VIF	1.66	

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

Regarding the trust variables, we find that only trust towards known people has a statistically significant impact (at a 10-percent testing level) on the rented land area. This result indicates that larger amounts of land are rented in when trust among known people is higher. We also ran the same regression without ‘lagged rented land area’, as we did for the rental market participation decision. The results (see Table A5.2 in Appendix 5.2) show that the coefficient of trust towards known people

Does Tenure Security Matter?

increases around 30 percent (and becomes significant at a 5 percent testing level) while the estimated coefficients of trust towards kinship and trust towards strangers remain still not significantly different from zero. This finding supports the argument that trust towards known people affects land renting decisions and tends to be relatively stable over time.

As expected, past land renting experience has a positive effect on the rented land area. This result shows again that transaction costs may be lower for households with past land renting experiences. Distance to town is found to positively affect rented land area. This finding again confirms that land rental markets tend to be more developed in relatively remote villages. The results for household characteristics indicate that risk-averse households are more likely to rent in less land, as expected. Contrary to what was found in the rental market participation equation, education of the head does not significantly affect the quantity of land that is rented in. Finally, neither family wealth nor land endowment is found to have a statistically significant impact on the rented land area. Both variables also do not significantly affect the rental market participation decision in our research area (see table 5.2).

5.6 Conclusions

The development of land rental markets may play an important role in enhancing productivity as well as equity among rural households, particularly when there are major imperfections in rural credit and labor markets. This study intends to improve our understanding of factors that play a role in land rental market development in rural China by examining the role of land tenure security and the degree of trust among households within a village. It contributes to the available literature by focusing on the perceived security of land rights, instead of its legal arrangements, and by using a three-stage approach for analyzing household decisions to rent in land. The three stages in decision making that we distinguish are the decision to participate in the rental market, the choice between a formal and an informal contract, and the decision about the size of the rented land area.

Using data collected in a household and village survey that was held in Minle County, Gansu Province, we find that greater perceived land tenure security can significantly increase both the probability and intensity of participation in the land market. The fact that perceptions on the importance of land certificates have a statistically significant impact on both the probability and intensity of participation suggests that well-functioning land certificates play a crucial role in the development of land rental markets. We further find that perceptions about absence of land readjustments in the near future and about the importance of land certificates for protecting land rights play opposite roles in the choice between formal and informal land rental contracts. The former is positively related to the use of informal contracts and the latter to the use of formal contracts.

With respect to trust, we find evidence that trust towards known people positively affects participation in land rental markets, the quantity of land that is rented in and the use of informal contracts. Trust towards kinship, on the other hand, does not significantly affect any of the land rental variables. The latter finding may be explained from the fact that kinship trust is very high and shows only limited variation for the households in our sample.

An important implication of our findings is that perceived land tenure security and trust are important complements of formal institutions in the development of land rental markets. The recent land tenure policy reforms are expected to have a stronger impact on the development of land rental markets, and thereby on productivity and equity in rural China, if additional measures would be taken that will further enhance the believe among rural households that land certificates do protect their land rights. For example, future amendments of the Land Administration Law, the Rural Land Contract Law and the Property Law may stipulate explicitly the important role of land certificates in protecting land rights, and the Mediation and Arbitration of Rural Land Contract Disputes Law may stress explicitly the importance of land certificates in mediation and arbitration of rural land conflicts. At the same time, the rural legislative system may reduce the costs borne by farm households in protecting their land rights via formal legal means, such as official meditation and arbitration and going to the court. Promoting trust among known people, especially within the same village, can also contribute significantly to the development of rural land rental markets. Measures that may be taken in this respect may focus on the enlargement of farmers' social network, such as provision of more collaboration opportunities among villagers or introducing participatory or community-based development projects in which farmers are involved in project design and project management.

Although our study is limited to a relatively small region in northwest China, the issues discussed are likely to be of relevance to other parts of rural China and a wider range of developing countries (e.g., Ethiopia, Vietnam) with similar tenure systems that aim to provide farmers with secure and long-term formal land rights. Formal land rights may become more secure through appropriate land laws and regulations, but persistent perceptions of land tenure insecurity and lack of trust among potential partners may limit the development of land rental markets. The focus on formal land rights in ongoing research on land rental markets may therefore need a re-orientation, and include also informal institutions like tenure security perceptions and trust.

A major limitation of our study is the use of a cross-section data base for the empirical analysis. Unmeasured household characteristics (like production capacity or efficiency) may affect both the dependent and the independent variables in the analysis, and thereby lead to biased results. Since household characteristics tend to be relatively stable over time, panel data analysis may be used in future research in this field to reduce the potential bias caused by such omitted variables.

Does Tenure Security Matter?

Appendix 5.1: Integrated three-stage decision model

Building on the two-stage models (see Section 5.3.1), we develop an integrated three-stage decision model of a potential tenant's decision to participate in the land rental market. In the first stage, a tenant chooses whether or not to rent in land based on the household's agricultural ability, the size of its land endowment, the off-farm opportunities available, and the transaction costs associated with market participation. In the second stage, the tenant decides whether the contract will be written or oral based on the transaction costs associated with alternative contact choices. In the third stage, the tenant decides the area of land to be rented in, based on the size of its land endowment, the off-farm opportunities available, the available land supply in the village, and the variable transaction costs.

We assume that the tenant maximizes expected income (Y) from production on his own land (\bar{A}^T) and rented in land (R^T) and from off-farm activity. The tenant has a fixed endowment of non-land resources (\bar{N}^T). The non-land resources may be used in farm production or for generating off-farm income. Households thus can allocate their non-land resources between farming on own or rented in land and off-farm employment at an exogenously given wage (w). We assume that N^w non-land resources are used in off-farm employment, and the household can earn off-farm income (wN^w). The rent (r) depends on village-level land endowment (\bar{A}^V), village-level non-land resources endowment (\bar{N}^V), and village-level off-farm employment opportunities (OF^V). Production risk may be one main risk for agricultural production, but following similar assumptions by Deininger and Jin (2003, 2005, 2007), we ignore this type of production risk for the moment. Furthermore, we assume that rental contracts are not influenced by credit market imperfections, or credit market imperfections can be overcome through appropriately structured rental contracts. Land and non-land resources are complements in agricultural production, and we make the standard assumptions for the production function q : the first-order derivatives of q , i.e. $q_A, q_R, q_N > 0$, the second-order derivatives of q , i.e. $q_{AA}, q_{RR}, q_{NN} < 0$, $q_{AN}, q_{RN}, q_{NA}, q_{NR} > 0$.

The maximization problem of the tenant can therefore be described as:

$$\max_{N^w, R^T} Y = pq(\bar{A}^T + R^T, \bar{N}^T - N^w; Z^T) + wN^w - S^1(r + TC^M)R^T - S^2TC^C R^T - S^3TC^I R^T \quad (5.1)$$

$$\text{s.t. } r = g(\bar{A}^V, \bar{N}^V, OF^V) \quad (5.2)$$

$$TC^M = c^M(LR^T, TR^T, OF^V, R_{lag}^T, Z^T) \quad (5.3)$$

$$TC^C = c^C(C^T, LR^T, TR^T, Z^T) \quad (5.4)$$

$$TC^I = c^I(LR^T, TR^T, OF^V, R_{lag}^T, Z^T) \quad (5.5)$$

The symbol S^1 is an indicator for renting in in the first stage (1 for renting in any small quantity of land⁴⁰, and 0 for not renting in land), S^2 an indicator for contract choice in the second stage (1 for choosing one (formal or informal) contract, and 0 otherwise), and S^3 an indicator for intensity of participation in the third stage (1 for renting in more than one unit of land, and 0 otherwise). TC^M , TC^C , TC^I denote the matching-specific cost per unit of land, contract-specific cost per unit of land and intensity-specific transaction cost per unit of land, respectively. c^M , c^C and c^I denote the matching-specific, contract-specific and intensity-specific transaction cost functions, respectively. The symbol g denotes the unit rent function, p and Z^T denote the price of the agricultural product and tenant's characteristics. LR^T denotes the (in)security of perceived land rights, TR^T is the level of trust, R_{lag}^T the past trading experience, C^T the type of contract.

(1) Participation decision condition

In the first-stage only matching-specific transaction costs are taken into account, namely, we have $S^1=1$, $S^2=S^3=0$. By solving the first order conditions (FOC) of the maximization problem, we get the condition of the participation decision⁴¹:

$$pq_{R^T}(\bar{A}^T + R^T, \bar{N}^T - N^w; Z^T) \geq g(\bar{A}^V, \bar{N}^V, OF^V) + c^M(LR^T, TR^T, OF^V, R_{lag}^T, Z^T) \quad (5.6)$$

Condition 1. *A tenant is expected to participate in the land rental market if the value of the agricultural product that he obtains from cultivating R^T of rented land is greater or equal to the sum of the land rent and matching-specific transaction costs of that quantity. The latter sum can be called the 'threshold' for participation.*

(2) Contract choice conditions

In the second stage, a household participating in the land rental market has to decide which type of contract provides higher expectation income, taking into account contract-specific transaction costs. We thus have $S^1=S^2=1$, $S^3=0$. The condition for a household to choose a contract is:

$$pq_{R^T}(\bar{A}^T + R^T, \bar{N}^T - N^w; Z^T) \geq g(\bar{A}^V, \bar{N}^V, OF^V) + c^M(LR^T, TR^T, OF^V, R_{lag}^T, Z^T) + c^C(C^T, LR^T, TR^T, Z^T) \quad (5.7)$$

and the household will choose an informal contract if:

⁴⁰ We assume that a tenant participates in the land rental market in the first stage by renting in any small quantity of land. The tenant then chooses the optimal area of land to be rented in the third stage.

⁴¹ The first order conditions (FOCs) also include $pq_{N^w}(\bar{A}^T + R^T, \bar{N}^T - N^w; Z^T) = w$, indicating that the marginal off-farm income equates to the wage of engaging in off-farm employment.

Does Tenure Security Matter?

$$c^C(C^I, LR^T, TR^T, Z^T) \leq c^C(C^F, LR^T, TR^T, Z^T) \quad (5.8)$$

or the household will choose a formal contract if:

$$c^C(C^I, LR^T, TR^T, Z^T) \geq c^C(C^F, LR^T, TR^T, Z^T) \quad (5.9)$$

Where C^I and C^F denote informal contract and formal contract, respectively.

Condition 2. *Selecting a contract leads to contract-specific transaction costs, which further enlarge the value of the threshold. Furthermore, the tenant is assumed to prefer the contract type which has the lowest contract-specific transaction costs.*

(3) Intensity decision condition

In the third stage, the tenant chooses the optimal area of land to be rented, taking into account intensity-specific transaction costs. We thus have $S^1=S^2=S^3=1$. The relevant condition is:

$$pq_{RT}(\bar{A}^T + R^T, \bar{N}^T - N^w; Z^T) > g(\bar{A}^V, \bar{N}^V, OF^V) + c^M(LR^T, TR^T, OF^V, R_{lag}^T, Z^T) + c^C(C^T, LR^T, TR^T, Z^T) + c^I(LR^T, TR^T, OF^V, R_{lag}^T, Z^T) \quad (5.10)$$

Condition 3. *A tenant will bear extra intensity-specific transaction costs when he wants to rent in more, and intensity-specific transaction costs per unit land are expected to increase with the size of land transacted.*

The conditions of each decision in the three-stage decision structure can be summarized in the following decision-tree (Figure 5.1).

Based on the above mentioned three conditions, the econometric equations for three stage decisions can be specified as follows:

(1) The land rental market participation decision is specified as:

$$P^R = \beta_0 + \beta_1 LR^T + \beta_2 TR^T + \beta_3 R_{lag}^T + \beta_4 \bar{A}^V + \beta_5 \bar{N}^V + \beta_6 OF^V + \beta_7 \bar{A}^T + \beta_8 \bar{N}^T + \beta_9 Z^T + \varepsilon^R \quad (5.11)$$

P^R is a dummy variable that equals one if a tenant participates in the land rental market, and zero otherwise, while ε^R is the residual with standard properties. The explanatory variables are based on Equation (5.6).

(2) The choice between a formal and an informal contract is specified as:

$$P^C = \alpha_0 + \alpha_1 LR^V + \alpha_2 LR^T + \alpha_3 TR^T + \alpha_4 Z^T + \varepsilon^C \quad (5.12)$$

P^C is a dummy variable that equals one if a tenant chooses an informal contract, and zero otherwise, while ε^C is the residual. The explanatory variables are based on Equation (5.8).

(4) The intensity of participation decision is specified as:

$$R^I = \gamma_0 + \gamma_1 LR^T + \gamma_2 TR^T + \gamma_3 R_{lag}^T + \gamma_4 \bar{A}^V + \gamma_5 \bar{N}^V + \gamma_6 OF^V + \gamma_7 \bar{A}^T + \gamma_8 \bar{N}^T + \gamma_9 Z^T + \varepsilon^I \quad (5.13)$$

R^I denotes the size of the rented land, while ε^I is the residual. The explanatory variables are based on Equation (5.10).

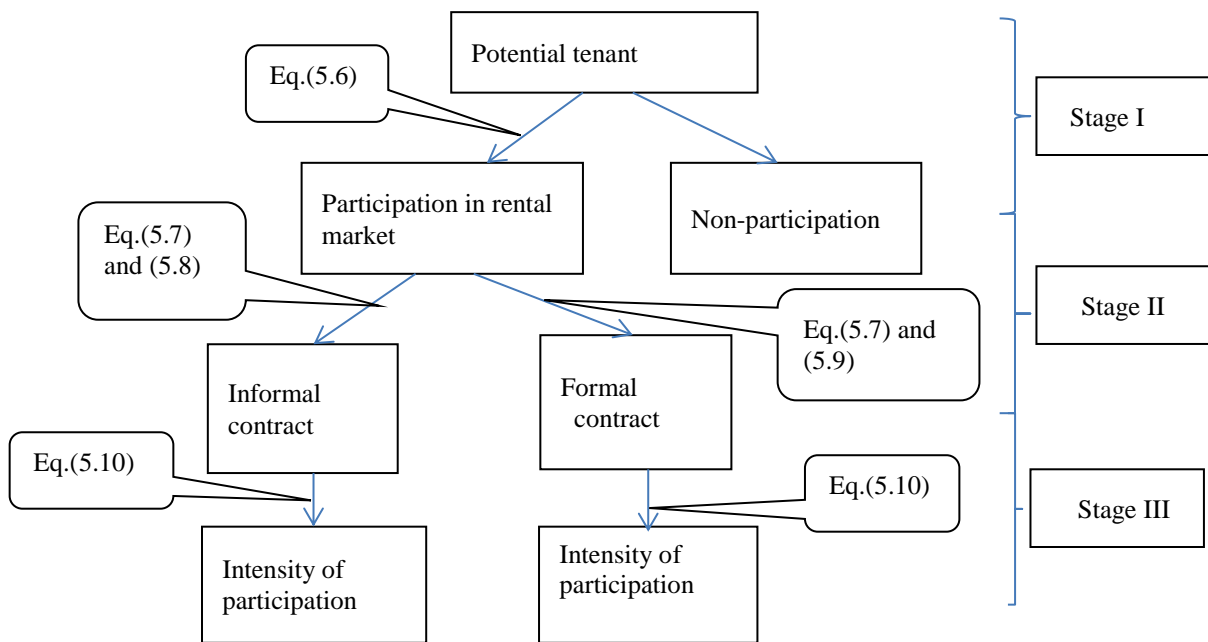


Figure 5.1 Structure of potential tenant’s decision to participate in land rental market

Does Tenure Security Matter?

Appendix 5.2 Regression results without lagged rented land area variable

Table A5.1 Regression results for participation decision, lagged rented area excluded

Variable	Probability of participation in land market	
	Coefficient	Z-value
Land tenure variables		
Village perception on land readjustments	-0.33	-0.39
Village perception on land certificates	0.68*	1.79
Trust variables		
Trust towards kinship	0.72	0.35
Trust towards known people	1.78*	1.70
Trust towards strangers	-0.51	-0.97
Other independent variables		
Distance to town	0.05*	1.70
Education of household head	-0.03	-1.28
ln(Wealth)	0.00	-0.02
Risk aversion	-0.19*	-1.81
Contracted land – labor ratio	-0.03	-1.13
Number of obs.	259	
% correct prediction	84.94	

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

Table A5.2 Regression results for rented land area, lagged rented area excluded

Variable	Area of rented land	
	Coefficient	Z-value
Land tenure variables		
Village perception on land readjustments	-17.73	-1.03
Village perception on land certificates	15.98*	1.77
Trust variables		
Trust towards kinship	-0.47	-0.01
Trust towards known people	40.53**	2.06
Trust towards strangers	-7.77	-0.86
Other independent variables		
Distance to town	0.98*	1.91
Education of household head	-0.39	-0.88
ln(Wealth)	1.64	0.80
Risk aversion	-4.12**	-2.02
Contracted land – labor ratio	-0.15	-0.34
Number of obs.	259	
Log-likelihood	-237.20	

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

6. Land Tenure Security and Rural-Urban Migration in Northwest China⁴²

Abstract: Existing obstacles to rural-urban migration in China negatively affect economic development and sustainable natural resource management. Besides discrimination against rural migrants associated with the household registration system, rural land tenure insecurity may constrain rural-urban migration. This article examines the impact of household-level land tenure security perceptions on rural-urban migration decisions, using data collected in Minle County in northwest China. The results indicate that a greater importance attached to land certificates in protecting land rights significantly increases rural-urban migration. Households that expect that no land reallocation will occur in the near future, on the other hand, show less rural-urban migration in villages where the land rental market has not developed. The effect of land reallocation expectations is insignificant in villages where a land rental market exists. We also find tentative evidence of interaction effects between the two tenure security variables, namely that perceptions on the importance of land certificates have a weaker effect on migration in villages with a lower expected probability of land reallocations.

⁴² This chapter is based on a paper submitted to *Papers in Regional Science* in September 2013, as Ma, X., N. Heerink, E.C. van Ierland, X. Shi. "Land tenure insecurity and rural-urban migration in rural China "

6.1 Introduction

Migrants from rural areas are an important component of the labor force in urban areas in China. According to the National Bureau of Statistics (NBS), the Chinese rural workforce in cities amounted to 140.41 million people at the end of 2008, and increased to 158.63 million people at the end of 2011 (NBS 2012). Rural-urban migration in China has two specific features which distinguish it from internal migration flows in many other developing countries. Firstly, a large share of the rural-urban migration flows is temporary. Most rural-urban migrants return to their native rural areas after some years spent working in, often informal, urban labor markets (Murphy 2002; Mullan *et al.* 2011). Even during this migratory stage of life, rural migrants keep moving back and forth between their home villages and the destination urban areas (Tao and Xu 2007). Secondly, the majority of migration is individual migration⁴³. Family migration only accounts for 21% of all migration in 2011 (NBS (2012).

Low levels of migration are widely considered to have negative impacts on economic growth and sustainable natural resource management during the process of economic development⁴⁴. When farmers do not move in large numbers from agriculture to manufacturing and service sectors when urban employment opportunities increase, overall labor productivity at a national level is depressed and rural-urban and regional inequality will generally grow (Au and Henderson 2006), while the urbanisation process may slow down (Zhang and Song 2003; Tao and Xu 2007). Within the rural economy, low levels of internal migration imply a limited use of remittances or migrants' savings for productive investments or consumptive investments, prohibiting a move to improved production technologies and living standards (de Brauw and Rozelle 2002; Du *et al.* 2005; de Brauw and Rozelle 2008). It also means that the pressure on rural resources and the environment is not relieved, and thereby contributes to land degradation and deforestation (Ezra 2003; Liu *et al.* 2005), and to poor health (de Brauw and Mu 2011) and poor education of children (Liang and Chen 2007).

Obstacles to migration may arise either in potential destinations (pull factors) or in the residence of migrants (push factors). The household registration (*hukou*) system is one main obstacle in potential destinations in China. It creates labor market segmentation and prevents rural migrants from accessing social security, health, education, housing and other benefits associated with legal residence in cities (Meng and Zhang 2001; Lu and Song 2006; Whalley and Zhang 2007). Migrant workers are therefore a major discriminated group in Chinese cities.

⁴³ Individual migration is defined as individual family members migrating to urban areas while leaving other household members behind, while family migration is defined as all family members, normally including parents and children, migrating to urban areas.

⁴⁴ Rural-urban migration may also have negative effects. In the rural economy, it may decrease agricultural productivity, especially when hiring agricultural labour incurs large transaction costs and hired labour is not as efficient as family labour (Wouterse 2006; Feng *et al.* 2010). In the urban economy, it may increase the costs associated with crime, pollution, congestion, and so on (Andersen 2002).

Does Tenure Security Matter?

Obstacles to migration in the residence of migrants also need to be taken into consideration. As Mullan *et al.* (2011) pointed out, even when the household registration constraints would be eased, labor mobility may not increase and temporary migration may not be replaced by permanent migration if barriers at the migrant residence side remain. Among others, rural land tenure arrangements are an important obstacle⁴⁵. Households risk losing their rights to use agricultural land if they migrate permanently; this creates an additional cost to migration in the form of lost future income (Yang 1997; de La Rupelle *et al.* 2010; Mullan *et al.* 2011). Possessing rights to transfer land can reduce the opportunity cost of migration and result in higher rates of migration (de Brauw and Mueller 2009; de La Rupelle *et al.* 2010).

Empirical tests of the impact of tenure security on migration in different parts of the world have generally confirmed its importance. Valsecchi (2010) finds that having access to a formal land title increases Mexican emigration to the US, and de Brauw and Mueller (2009) find that improved land transferability rights have a robust positive effect on migration in Ethiopia. With regard to China, two studies based on 1995-2002 rural data in four provinces (Anhui, Henan, Jiangsu and Shanxi) and 2002 rural data in 22 representative provinces, respectively, find a substantial negative impact of land rights insecurity on migration, caused by the threat of periodical land reallocations within villages (de La Rupelle *et al.* 2010; Giles and Mu 2012). A study based on data collected for the period 2003-2005 in Guizhou Province and Ningxia Province finds that greater tenure security tends to increase migration when land rental rights are complete, while it reduces migration when renting agricultural land is restricted (Mullan *et al.* 2011). In other words, the latter study suggests that tenure security and land renting should be considered jointly when analysing migration incentives.

Since 1998, the Chinese government has implemented a number of market-oriented land tenure reforms that are meant to improve tenure security and stimulate transferability of rural land. Four main laws issued since then aim to (1) grant farmers with perpetual and usufructuary rights; (2) issue land certificates to farmers; (3) significantly limit the scope of administrative land reallocations; (4) prohibit that village leaders take rented land back unless the landlords in question have moved to a city and registered as urban citizens. Although these reforms have contributed to improved formal (legal) tenure security, it is not clear to what extent they stimulate rural-urban migration. What matters for migration decisions is the tenure security perceived by households, which may differ from formal tenure security as it depends on how the laws in question are implemented, and how information about these laws is distributed among stakeholders.

⁴⁵ Other important obstacles in migrants' residences include changes in the income differentials between origin and destination areas due to agricultural seasonality (Knight and Song 2003) and psychological costs of migration, especially related to family ties (Djajic and Milbourne 1988).

To our knowledge, the only research that examines the effect of perceived land tenure security on rural-urban migration is Mullan *et al.* (2011). Their study uses answers given by village leaders to measure village-level perceptions on future land reallocation and land rental rights⁴⁶. Although it provides a number of important new insights, their study suffers from a number of shortcomings.

Firstly, the perceived importance of land certificates in protecting land rights is another important aspect of tenure security in China in addition to perceptions about future land reallocation. Land titles (certificates) are likely to be of less importance for tenure security where enforcement is repeatedly lacking, where the formal juridical system is unfair and where there is simply a general distrust in the formal rights and enforcement system (Pagiola 1999). Since the implementation of the market-oriented tenure reforms, which instruct the issuance of land certificates to farm households and officially stipulate that a land certificate can protect farmers' land rights, perceptions about the importance of land certificates are likely to play an important role in rural household decision making. For example, households will generally perceive less risk of losing their land without compensation, due to land reallocations or other reasons, if they are convinced that land certificates do protect their land use rights. In the same vein, household perceptions about land certificates are likely to affect household decisions on rural-urban migration as well.

Secondly, it is not so much having land rental rights or not that plays a role in migration decisions, but the actual level of land market development in a village. The actual level of land market development not only depends on land rental rights but also on other factors, such as trust among villagers.

Thirdly, village leader perceptions about tenure security may often be biased, because their responses are more likely to reflect legal tenure security, as specified in national laws, rather than the actual situation in a village. For example, the results of our survey conducted in 2010 in Minle County in Gansu Province, that will be introduced in Section 6.3, show that more than 90% of the interviewed village leaders expect that the land within their own village will not be reallocated within the next five years, while only 38% of the interviewed households hold the same opinion.

The objective of this paper is to examine the effect of rural household perceptions of land tenure security on rural-urban migration decisions in China. Expectations about land reallocations in the near future and importance attached to land certificates in protecting land rights are used as indicators of household perceptions of land tenure security. A distinction is made in the analysis between villages with a relatively developed land rental market and villages with an underdeveloped land rental market.

⁴⁶ The question used to measure perception on future land reallocation is "Do you expect agricultural land to be reallocated again; and if so, when?" while the question used to measure land rental rights is "Are households permitted to rent out agricultural land to other households?"(Mullan *et al.* 2011:128).

Does Tenure Security Matter?

A cross-section data set, containing household-level data on migration, perceived tenure security, land renting and other relevant factors is used for empirically testing the impact of land tenure perceptions on migration decisions. The data was collected in 21 villages in Minle County, Gansu province, northwest China in 2008 and 2010. We use a Probit model to estimate the determinants of migration participation decisions, and a Censored Tobit model to estimate the determinants of the share of migrants in a household and the migration duration.

The paper is organized as follows. Section 6.2 describes recent developments in legal and perceived tenure security in rural China, and explains how land tenure security may affect household migration decisions. Section 6.3 describes the data set used in this study, presents the definitions and descriptive statistics of the variables used in the empirical analysis, and discusses the expected effects of the independent variables. Section 6.4 presents the estimation strategy that we apply for estimating the models, while Section 6.5 summarizes and discusses the estimation results. The paper ends with concluding remarks in Section 6.6.

6.2 Role of land tenure security in migration decisions

6.2.1 Land tenure security in China

An important distinction to be made in examining effects of land tenure security is that between legal tenure security and perceived tenure security. Legal tenure security is defined by land titling and land-related laws (regulations), while perceived tenure security is defined as a sense of security that is derived from a probability estimate of the chance of eviction or other factors that threaten a tenure situation and may cause involuntary relocation (Van Gelder 2007:221). Perceived tenure security is to some extent interrelated with legal tenure security, but both are generally not equated. The extent to which both are related may vary from situation to situation and is ultimately an empirical question (Van Gelder 2009).

The household responsibility system (HRS), implemented in China between 1979 and 1983, leads to frequent reallocations in response to changes in household sizes (Tan *et al.* 2006; Deininger and Jin 2009; Wang *et al.* 2011) and ill-defined land property rights (Tan *et al.* 2011). Under the HRS land use rights were assigned to rural households for a period of 15 years, while land ownership remained with the collective (Tan *et al.* 2011). The size of the land assigned to households within a village was determined by the household size and/or the number of laborers in a household. In order to maintain the egalitarian principles underlying this system of land allocation, administrative reallocations of land over some or all households in a village have been used by village officials to address demographic changes that have occurred within a village (Tan *et al.* 2006).

Since 1998, the Chinese government has issued four major land laws aimed at introducing market mechanisms and providing households with more secure land rights. First, the 1998 Land Management Law stipulates that the duration of land use rights will be extended by another 30 years, that land certificates will be issued to protect farmers' land use rights, that land transfer rights are offered to farmers, and that acceptance by two-thirds of villagers' representatives and approval of higher-level governments is needed for land reallocations within villages. Second, the Rural Land Contract Law (RLCL) of 2002 confirms that farmland tenure security must be maintained for at least 30 years after the nationwide reallocation that started in 1998⁴⁷. It further states that full-scale land reallocations within villages are completely prohibited and that partial land reallocations are only allowed in case of a natural disaster, land expropriation or other special circumstances, in which case they depend on acceptance by two-thirds of villagers' representatives and approval by higher-level (e.g. township) authorities. In addition, it specifies that the collective cannot take back land from individual users without providing compensation. The RLCL marks a clear increase in the security and transferability of land tenure from the state (Deininger and Jin 2009; Wang *et al.* 2011). The third law is the Property Law (PL), adopted in 2007, which further increased land tenure security in rural (and urban) areas. It implicitly grants farmers with perpetual rights, as it states that farmers should retain and inherit their rights according to relevant rules when the 30 years period has passed. Moreover, the PL for the first time defines farmers' land use rights as usufructuary. Usufruct rights allow a better protection of farmers' interests (Piotrowski 2009). Further legal support of farmers' interests also comes from the Mediation and Arbitration of Rural Land Contract Disputes Law, adopted in 2009, which sets out principles related to the use of mediation or arbitration to settle land disputes.

Although the legal tenure security has increased significantly since 1998, actual tenure security and household perceptions of land tenure security stay behind in many parts of China. Results from an almost nationally representative rural survey collected in 119 villages located in six provinces across China in 2008 show that the average frequency of (full-scale and partial) land reallocations within villages has declined from 2.6 before 1998 to 1.0 during the period 1998-2008 (Wang *et al.* 2011). Hence, despite the policy reforms that started in 1998, land reallocations are still a frequently observed phenomenon in present-day rural China. The same survey finds that as much as 60 percent of the responding farmers do not endorse the central government's attempt to stabilize farmland tenure. A survey covering 526 households in 11 villages of three different counties in Jiangxi Province, carried out by the first author of this paper in 2011⁴⁸, found that 53 percent of the respondents do not agree

⁴⁷ The contracts assigning land use rights to rural households expired around 1998. The land was reallocated in most regions in China before land use rights were assigned to households for another 30 years.

⁴⁸ The survey was carried out within the framework of SURE project, funded by the Programme Strategic Scientific Alliances (PSA) of the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Ministry of Science and Technology of P.R. China.

Does Tenure Security Matter?

with the central government policy of stabilizing land tenure, that only 18 percent of the respondents expect that land readjustments will not occur within next five years, and that only 35 percent of the respondents believe that land certificates are important for protecting individual land rights.

Results from the survey in Minle County, Gansu province that we use for this study (see Section 6.3 for an introduction into the survey) show that interviewed households experienced on average 0.83 land readjustments since 1979. Almost one-half of the respondents does not endorse the central government's policy of stabilizing land tenure. All interviewed village leaders in the 21 villages that we surveyed state that they have issued land certificates to all households in their villages, and more than 95 percent of the interviewed households state that they indeed possess land certificates. However, only 80 percent of the respondents believe that a land certificate is an important document for protecting individual land rights. And only 38 percent of the respondents expect that no land readjustments will occur within the next five years.

These results show that perceived land tenure security differs considerably from legal land tenure security in many parts of rural China. What matters for household decision making is perceived tenure security, rather than legal tenure security. In the remainder of this paper we will therefore focus on the effect of perceived land tenure security on household rural-urban migration.

6.2.2 Theoretical considerations

The theory of the new economics of labor migration (NELM) emphasizes that migration decisions are household decisions, not individual decisions. The NELM hypothesizes that migration is an important way for rural households to overcome credit constraints, through remittance flows, and insurance constraints, through income diversification (Taylor and Martin 2001; Taylor *et al.* 2003; Shi *et al.* 2007). Empirical studies confirm that individual off-farm participation decisions are part of household strategies (Zhao 1999; Kimhi 2004). Evidence supporting the NELM in the case of rural China can be found, for example, in Taylor *et al.* (2003).

Land tenure (in)security may play an important role in household migration decisions. Three different effects can be distinguished. The first is the asset enhancing effect of tenure security. A higher level of land rights security can reduce the risk of land expropriation, and thereby boost migration incentives (Zhao 1999; de La Rupelle *et al.* 2010; Mullan *et al.* 2011). Migration entails a decrease in the size of a household living in a village. When land reallocations based on principles of egalitarianism take place, a household with one or more migrants is exposed to an increased risk of land expropriation. Risk of land expropriation may also arise for migrant households when local governments expropriate land for urban or rural infrastructure development, or when tenants refuse to return rented land because the household that rents out the land has one or more migrants. The asset enhancing effect

reflects that a higher degree of land tenure security induces rural workers to start migrating and/or to migrate for longer periods.

The second effect that we distinguish is the income effect. A higher level of land rights security can reduce the risk of land expropriation and induce the development of land rental markets (Benjamin and Brandt 2002; Bezabih and Holden 2006; Deininger *et al.* 2011). The income obtained from leasing land to others can reduce the constraints of failing credit markets on rural-urban migration. In economically less developed areas, households interested in migration may not be able to afford the initial costs of it. These initial costs consist of transportation costs, accommodation costs, costs of job searching, and so on. By leasing out (part of) their land, these households can cover the initial costs of migration. The income effect of land tenure security is therefore expected to induce more rural workers to migrate.

The third effect is the push reduction effect. As argued by Mullan *et al.* (2011), a decrease in the probability of land expropriation implies that a household will retain more land, which needs farm labor and thereby decreases migration incentives. The effect results from the complementarity between land (as a productive input) and farm labor. In other words, if a household perceives that it can protect its land from loss in the future, it is more likely to remain involved in farming or part-time farming combined with local off-farm jobs and less likely to participate in rural-urban migration.

These three effects may to some extent offset each other, because the asset enhancing effect and income effect stimulate migration, whereas the push reduction effect reduces migration. How does the development of a land rental market interact with these effects? The positive income effect of increased tenure security clearly becomes stronger when the land rental market develops, allowing migrants to rent out land at lower risks and use the land rent to cover the initial migration costs. The push reduction effect, on the other hand, becomes weaker because the retained land due to increased land tenure security may also be rented out instead of cultivated with family labor. Hence, the net impact of increased tenure security on migration is expected to be more positive or less negative when there is a well-functioning land rental market in the village where the household is living.

As discussed above, the ongoing land laws and regulations stipulate that land reallocation is prohibited and farmers' land will never be taken away unless the household registers in the city. Due to the scarcity of rural land, the egalitarianism inherent in farmers' thinking, and the incomplete implementation of the relevant laws, household land is still being readjusted in some parts of rural China (Wang *et al.* 2011). The risk of land expropriation arises during land reallocations, when land is requisitioned for urban or infrastructure development or when tenants refuse to return rented land. When a household perceives that its land certificate cannot fully protect its land rights, the risk of land

Does Tenure Security Matter?

expropriation perceived by the household will become larger, because the bargaining power in all these three cases is smaller. Legal land tenure security is therefore not sufficient to reduce the risk of land expropriation a migrant family faces. A household considering whether or not to participate in migration will take its perceived tenure security into account in assessing the risk of land expropriation in the near future.

6.3 Data Set

6.3.1 Data collection

This study uses data that were collected during two rounds of a farm household and village leader survey that were held in Minle County, Gansu Province in northwest China in May 2008 and May 2010, respectively. The surveys aimed to collect information about agricultural production, off-farm employment, land and water use, income and expenditures, assets and related issues of households and villages in the area. They were carried out by staff and students from Gansu Academy of Social Sciences in Lanzhou, Gansu Agricultural University in Lanzhou, and Nanjing Agricultural University. Collected information refers to the years 2007 and 2009, respectively.

The surveys were carried out among household heads and village leaders. It covered 317 households in 21 villages in May 2008, and 315 households in the same 21 villages in May 2010. In each of the ten townships in Minle County, 10% of the villages were selected randomly for the survey in May 2008. Within each selected village, 15 households were randomly chosen to be interviewed.⁴⁹ If possible, the same households were also interviewed in May 2010. In 50 cases the same household could not be found, and it was replaced by another, randomly selected, household in the same village.

Although 265 households were interviewed in both years, we cannot exploit the panel nature for our analysis. The reasons are that questions about subjective perceptions of land tenure were asked only in the May 2010 survey, and that we need to introduce lagged values of some variables in our analysis to avoid endogeneity problems. Omitting six households that were not involved in agricultural production in 2009, we use a cross-section data set of 259 households that were interviewed in both years for the analysis.

6.3.2 Definitions, descriptive statistics and expected effects

Table 6.1 presents the definitions of the variables used in the regression analysis, their descriptive statistics, and the expected signs of the effects of the independent variables. We categorize the variables into migration variables, land tenure security variables and other independent variables. The

⁴⁹ In the first two villages, 16 instead of 15 households were interviewed.

latter group includes village characteristics, household characteristics, land characteristics and regional characteristics.

(1) Migration

Available statistics and studies on rural-urban migration in China define migration in many different ways. A migrant worker is defined as an individual who has left his registered place of residence in order to work for at least 6 months (NBS 2012), or at least three months (Rozelle *et al.* 1999), in a given year. Other studies define a migrant worker as an individual who worked outside the home county (de La Rupelle *et al.* 2010), or outside the village (Zhao 1999; Mullan *et al.* 2011), whatever the duration of out-migration.

The time spent being a migrant is an important aspect of migration that is likely to be related to land tenure security. For the purpose of this study, a migrant is therefore defined as an individual who has lived outside the home county for employment purposes⁵⁰ during the year preceding the interview, whatever the duration of out-migration. Our definition excludes those members who lived outside the home village but within the home county. Household members who work and live elsewhere within the same county can more easily travel between the home village and the place of work and continue to contribute to on-farm production. For that reason, we exclude them from our analysis.

We use three different indicators to measure migration in our analysis. The first indicator is a binary variable that takes the value 1 for households with at least one member living outside the county for employment purposes during the year preceding the survey, and 0 for other households. This variable measures whether a household is involved in migration or not. The second indicator is the share of migrants to all workers (aged between 16 and 65) in a household. It measures a household's degree of involvement in migration. The third indicator is the share of working time allocated to migration in a household. It is measured as the time spent working outside the county, divided by the total time spent working by all workers (aged between 16 and 65) of a household. This indicator measures the migration duration of a household.

In our research area, 51% of the interviewed households were involved in migration in 2009 (see Table 6.1). This fits remarkably well with the survey by Mullan *et al.* (2011) done for two other western provinces, Guizhou and Ningxia, for the year 2005 that also found that 51% of the surveyed households had one or more migrant workers. A study by Shi *et al.* (2007) on three villages in Jingxi Province in central China found that 65% of the households were involved in migration in the year 2000. In our survey, 44% of the workers in migrant households (i.e. 1.41 household members) were migrants on average and were working an average period of 6.84 months outside the county in 2009.

⁵⁰ In our definition we exclude household members who lived outside the home county for study.

Does Tenure Security Matter?

Table 6.1 Definition of variables and descriptive statistics

Variable	Definition	Mean	S.D.	Exp. signs
Migration variables				
Migration dummy	1= households with at least one member living outside the county for employment purposes during the year preceding the survey, and 0= other households	0.51	0.50	n.a.
Share of migrants	Share of migrants to all workers (aged between 16 and 65) in a household	0.44 ^a	0.19	n.a.
Migration duration	Share of the time spent working outside the county to the total time spent working by all workers (aged between 16 and 65) of a household	0.24 ^a	0.18	n.a.
Perceived land tenure security variables				
Village perception on land reallocations	Average expectation of no land readjustments in the village in the next five years of the other sampled households that live in the same village as the surveyed household	0.38	0.16	+/-
Village perception on land certificates	Average perception on the importance of land certificates in protecting land rights of the other sampled households that live in the same village as the surveyed household	4.14	0.36	+/-
Village characteristics				
Distance to county	Average distance from the village to the nearest county seat (km)	21.36	15.85	+/-
Village migration prevalence	Average number of migrants per household within the village in 2007	0.85	0.26	+
Household characteristics				
Children ratio	Ratio of children (aged <16) to all workers in the household	0.28	0.32	+/-
Elderly people ratio	Ratio of elderly people (aged >65) to all workers in the household	0.12	0.27	+/-
Female ratio	Ratio of female workers to all workers in the household	0.48	0.16	-
Average age	Average age of all workers in the household (years)	39.71	7.00	-
Education of household head	Years of formal education of the head of household (years)	7.43	3.49	+/-
Past migration experience	Largest duration of migration for all migrants in the household (years)	1.37	3.01	+
Wealth	Value of agricultural devices, livestock, electronic instruments, house, furniture and transportation vehicle (RMB)	59332	60067	+/-
Land characteristics				
Contracted land – worker ratio	Ratio of contracted (= allocated) land area to all workers in the household (mu)	5.69	4.60	-
Water rights – irrigated land ratio	Ratio of water rights to the irrigated land area in the household	0.93	0.95	-
Land rental market development	1 = more than 10% of the households in a village rent out land, 0 = otherwise	0.18	0.39	n.a. ^b

Large land holding	1= households with above-average per capita landholdings in the village, 0= other households	0.41	0.49	n.a. ^b
Regional characteristics				
Tongziba	1= farmer resides in Tongziba irrigation district; 0= otherwise	0.29	0.45	+/-
Hongshuihe	1= farmer resides in Hongshuihe irrigation district; 0= otherwise	0.34	0.47	+/-
Haichaoba	1= farmer resides in Haichaoba irrigation district; 0=otherwise	0.10	0.31	+/-
Daduma	1= farmer resides in Daduma irrigation district; 0=otherwise	0.13	0.34	+/-

Source: Household survey.

^a Calculated based on the sub-sample of 132 households involved in migration.

^b Variable is used only as an interaction term with other variables in the estimated models.

n.a.= Not applicable

(2) Perceived land tenure security

Household land tenure security perceptions are measured by expectations on land readjustments in the near future and by the perceived importance of land certificates in protecting land rights⁵¹. Expectations on future land redistribution take the value 1 if a household does not expect a land redistribution within 5 years, and 0 if the household expects a redistribution to occur within 5 years, or does not have an idea. Perceived importance of land certificates reflects a household's assessment of the significance of land certificates for protecting land rights. It is defined on a scale from 1 (= not important) to 5 (= very important).

It should be noted that migration may increase the perceived risk of expropriation for individual households (Mullan *et al.* 2011). In order to minimize the potential endogeneity bias, we use mean village-level land perceived tenure security as an approximation⁵². It is defined as the average tenure security perception of the other sampled households within the same village.

Perceptions on future land reallocation and on the importance of land certificates are expected to capture the net effect of the asset enhancing effect, the income effect and the push reduction effect on migration. The net effect can be positive, negative or zero, since it depends on the magnitude of these three countervailing effects.

(3) Other independent variables

⁵¹ Household perceptions are derived mainly from the responses of household heads. Instead of household heads, in few cases, other family members who understand household choices well were interviewed if the household heads had migrated at the time of the interview.

⁵² This is an alternative approach to reduce the impact of potential endogeneity on estimated results in absence of effective instrumental variables. A similar approach is used by Mullan *et al.* (2011). Giles and Mu (2012) use the timing of exogenously scheduled elections and heterogeneity across villages in the size of the largest patrilineal clan as instruments for the probability of village-wide land reallocation. We do not have such information for the villages in our survey.

Does Tenure Security Matter?

The other independent variables used in the models to explain household migration decisions can be subdivided into village characteristics, household characteristics, land characteristics and regional characteristics. They are selected on the basis of previous studies on the determinants of migration in China (e.g. Rozelle *et al.* 1999; Zhao 1999; Yao 2001; Giles and Mu 2007; Shi *et al.* 2007; Mullan *et al.* 2011; Giles and Mu 2012) .

Village characteristics include two variables: distance to the nearest county seat and village migration prevalence. Distance from the village to the nearest county is used as an indicator of market access. It can have mixed effects on migration. The larger the distance from the village to the county seat, the higher the transportation costs involved in migration will probably be. On the other hand, the larger the distance between the village and the nearest county seat, the fewer local off-farm employment opportunities for which workers do not need to migrate, are available. Village migration prevalence is measured as the average number of migrants per household within the village. Due to the potential endogeneity between the village migration prevalence and household migration, we calculate it for the year 2007. Village migration prevalence is expected to have a positive effect on migration, because transaction costs involved in migration (such as costs of finding a job and finding accommodation) are generally lower when many villagers have already migrated.

We distinguish seven household characteristics in our analysis. The first two characteristics are the ratio of children and elderly people, respectively, to workers in the household. The effect of dependents on migration is ambiguous. On the one hand, some workers may have to stay at home to take care of dependents and cannot migrate. On the other hand, households with more dependents need to spend relatively more on food, education, health care and other purposes, and thereby experience a higher pressure to migrate. The ratio of female workers to all workers is included and expected to have a negative effect on migration, because female members of a household may have fewer possibilities to migrate. The average age of the workers in the household is expected to have a negative impact on migration. Younger household members generally have more opportunities to migrate than older members. The education level of the head of household has an ambiguous effect on migration. More educated persons have better opportunities to find an off-farm job, both locally and in other counties or provinces. The largest duration of migration for all migrants in the household is used as a proxy for past migration experience of the household. It is expected to have a positive impact on migration, because transaction costs will generally be lower for households with more migration experience. Household wealth is used as an indicator of the economic and social power of a household within the village. The available empirical evidence suggests a nonlinear effect of wealth on migration (McKenzie and Rapoport 2007). When migration costs are sufficiently large that subsistence and liquidity constraints bind for some households, migration will first increase and then decreases with wealth. We therefore introduce also the square of household wealth.

Land characteristics include contracted land area (i.e. the land allocated to the household by the village leader) per worker and the ratio of water rights land⁵³ to irrigated land. These are indicators of land quantity and land quality, respectively. Both are expected to have a negative impact on migration, because households with higher land quantity and quality have more resources available for agricultural production.

We introduce two more land-related variables in the analysis, namely land rental market development in the village and above-average landholding size. These two variables will be modelled as cross-products with the tenure security variables. Land rental market development is measured by a binary variable which equals 1 if more than 10% of the households in a village rent out land in 2009, and equals 0 otherwise. We add the cross product of land rental market development and each of the two land tenure security variables to the migration equations to capture the difference in the impact of tenure security between villages with a developed and an underdeveloped land rental market. The cross products are expected to have a positive impact on migration.

The literature suggests that increased land tenure security, particularly expectations that land reallocations will not occur in the near future, has different effects for households with small landholdings as compared to those with large landholdings (Yao 2001). In villages with a larger probability of land reallocation, households with above-average per-capita landholding are more likely to engage in migration than households with below-average holdings. To test this hypothesis, following Yao's (2001) method, we created a dummy variable labelled 'large land holding' that equals one for households with above-average per capita landholdings in the village. We add the cross product of the large land holding dummy and expectation about future land reallocations to our equations to capture the difference in the impact between households with below-average and above-average per capita landholdings. Like the other two cross products, it is expected to have a positive impact on migration.

Finally, four dummy variables are introduced for four of the five irrigation districts to which the interviewed households belong. These dummies are meant to control for major unobserved differences between irrigation districts in factors such as irrigation infrastructure and water availability which may affect household migration decisions.

⁵³ Water availability is an important factor influencing land quality in our research area. Irrigation water is allocated according to a household's size of land with water user rights. Hence, the more water rights land a household has, the more irrigation water it can use.

6.4 Estimation strategy

To examine the separate and the combined impacts of the two tenure security variables, we estimate three groups of models. The first group examines the effect on migration decisions of household expectations with respect to future land reallocation. The second group of models examines the effect of household opinions on the importance of land certificates in protecting land rights. And the third group of models examines the joint effect of the two perceived tenure security variables by introducing an interaction term. In order to facilitate the explanation of interaction effects, we transform village-level expectations on future land reallocations into a binary variable. It equals 1 if the value of village-level expectations on future land reallocation is larger or equal to 0.5, and equals 0 if its value is smaller than 0.5.

As discussed in Section 6.2.2, the (positive) income effect is expected to become stronger and the (negative) push reduction effect is expected to become weaker when the land rental market develops. In order to test this hypothesis, the interaction between the perceived land tenure security variables and the land rental market development variable is introduced into all three models. Moreover, the cross product of the large land holding dummy and future land reallocation expectation is included in the first and third model. This interaction term is meant to capture the potentially different effects of land reallocation perceptions for households with small landholdings and large landholdings. The three models are specified as:

$$M_i = a_0 + a_1LR_i + a_2LR_i \times MD_i + a_3LR_i \times LLH_i + \sum a_{4j}X_{ji} + u_{1i} \quad (6.1)$$

$$M_i = b_0 + b_1LC_i + b_2LC_i \times MD_i + \sum b_{3j}X_{ji} + u_{2i} \quad (6.2)$$

$$M_i = c_0 + c_1LC_i + c_2LC_i \times LR_i + c_3LR_i \times MD_i + c_4LC_i \times MD_i + c_5LR_i \times LLH_i + \sum c_{6j}X_{ji} + u_{3i} \quad (6.3)$$

M_i denotes the values of the three migration variables, i.e. migration participation decision, share of migrants and migration duration, for household i ; LR_i denotes the expectation about absence of land reallocations in the near future of household i ; LC_i denotes the importance attached to land certificates in protecting land rights of household i ; MD_i is a dummy variable indicating village-level land rental market development for household i ; LLH_i is a dummy variable indicating whether household i has above-average per capita landholding; X_{ji} is the set of control variables for household i ; and u_{1i} , u_{2i} and u_{3i} are the residuals in the three models.

It should be noted that LR_i is not included in Equation (6.3). The reason is that there exists high multicollinearity in the model. Tests for multicollinearity among the included variables show that variance inflation factor (VIF) for LR_i and the interaction term $LC_i \times LR_i$ are 984 and 906, respectively. The main purpose of equation (6.3) is to examine the potential difference in the effect of the

importance attached to land certificates between villages with different expected probabilities of land reallocation in the near future. For that reason, we drop LR_i from the equation.

We use a Probit model to estimate the factors influencing whether a household has a migrated worker. Migration occurs if the expected net utility from a migrating member, rather than all members remaining within the village, is positive. Otherwise, migration is not expected to occur.

Both the share of migrants and the migration duration of a household cannot be less than 0 or greater than 1. In our data 49% of the households are left censored, 2% of the households are right censored for share of migrants, and 1% of the households are right censored for migration duration. This kind of response variable is a corner solution outcome, so censored Tobit model (corner solution model) is suitable to estimate it. However, there may be a selection bias between migration participation decision and share of migrants as well as migration duration. Some unobserved characteristics that influence the probability to migrate could also influence the decision on the share of migrants and migration duration. Neglecting this selectivity effect is likely to give biased estimates. We used the Heckman selection model to test for possible selection bias, and did not find evidence of a significant selection bias in our data set⁵⁴. We therefore use two censored Tobit models to estimate the determinants of the share of migrants and migration duration.

6.5 Estimation results

Table 6.2 reports the results for model (6.1). We observe that (village level) expectations of no land redistribution within the next 5 years have a significant negative impact on all three migration variables. This finding indicates that the negative push reduction effect outweighs the positive income and asset enhancing effects. The interaction term between land reallocation perceptions and land rental market has a significant positive impact on all three migration variables. This result supports our hypothesis that the (positive) income effect becomes stronger and the (negative) push reduction effect becomes weaker when the land rental market develops. We further test the significance of the sum of the first two coefficients (of land reallocation perception and the interaction term with the land rental market), and find that we cannot reject the hypothesis that the sum of the two coefficients is equal to zero⁵⁵. Hence, we conclude that expectations about the absence of land reallocations in the near future have a negative impact on migration in villages with an underdeveloped land rental market, while the effect is not significantly different from zero in villages where the land rental market has developed.

⁵⁴ Two-step estimates in STATA report an inverse Mills ratio of -0.27 (P-value=0.79) for share of migrants, and an inverse Mills ratio of -1.27 (P-value=0.20) for migration duration. We thus cannot reject the null hypothesis that there is no selection bias.

⁵⁵ The likelihood ratio test statistic (χ^2) for the sum of first two coefficients being equal to zero is 0.06 (P-value 0.81) in the participation decision equation, 0.55 (P-value 0.46) in the share of migrants equation, and 0.41 (P-value 0.52) in the migration duration equation.

Does Tenure Security Matter?

Table 6.2 Regression results for perceptions about land reallocations

Variable	Participation decision		Share of migrants		Migration duration	
Model	Probit		Tobit		Tobit	
Variable	Coefficient	Z-value	Coefficient	Z-value	Coefficient	Z-value
Perceived land tenure security variables						
Village perception on land reallocations	-0.74**	-2.24	-0.24**	-2.29	-0.15**	-1.97
Village perception on land reallocations × Land rental market	0.83*	1.69	0.32**	2.09	0.20*	1.81
Village perception on land reallocations × Large land holding	0.08	0.16	0.09	0.57	0.03	0.25
Village characteristics						
ln(Distance to nearest county)	0.21	1.50	0.03	0.70	0.02	0.74
Village migration prevalence	0.94**	2.17	0.31**	2.08	0.15	1.53
Household characteristics						
Children ratio	0.39	1.37	0.19**	1.97	0.07	1.11
Elderly people ratio	0.15	0.45	0.30**	1.93	0.18*	1.77
Female ratio	-1.18**	-2.10	-0.43**	-2.11	-0.26*	-1.82
Average Age	-0.01	-0.59	-0.01	-1.53	0.00	-1.40
Education of household head	-0.04*	-1.56	-0.02**	-2.07	-0.01***	-2.68
Past migration experience	0.17**	1.95	0.05***	3.67	0.04***	3.83
ln(Wealth)	2.97***	2.57	1.01***	2.58	0.60***	2.63
ln(Wealth) - squared	-0.13***	-2.39	-0.05***	-2.44	-0.03***	-2.45
Land characteristics						
Contracted land – workers ratio	-0.04	-1.36	-0.01	-1.03	-0.01	-1.51
Water rights – irrigated land ratio	-0.20***	-2.67	-0.06**	-2.08	-0.04*	-1.73
Observations	259		259		259	
Mean VIF ^a	2.03		2.03		2.03	

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a Mean VIF tests the degree of multicollinearity among the independent variables, excluding ln(Wealth) squared.

Our findings are consistent with those obtained in Mullan *et al.* (2011) for migration participation.⁵⁶ Their study finds that “increasing the security of land tenure, in the absence of complete rental rights, reduces the likelihood of migration. [...] However, rental rights in combination with increased tenure security raise the probability of migration. As the ability to freely transfer the land weakens the link between household labor supply and returns to land, it is unsurprising that we no longer observe that households facing a lower risk of losing land are less likely to migrate” (Mullan *et al.* 2001: p. 129).

⁵⁶ In their model explaining the number of migrants in a household, however, Mullan *et al.* (2011) did not find a significant effect for the land tenure security variable.

In all three models, the estimated coefficient of the interaction between expectation about future land reallocation and the large land holding dummy does not differ significantly from zero. This finding indicates that the impact of increased land tenure security, as measured by land reallocation expectations, does not differ significantly between households with relatively large and relatively small landholdings.

With respect to village-level characteristics, we find that village-level migration prevalence has a significant positive effect on the migration participation decision and the share of migrants, but no significant impact on migration duration. Hence, the lower transaction costs that result from a large number of villagers who have already migrated seem to affect in particular the initial costs of migration. Distance to the nearest county, on the other hand, does not have a significant impact in any of the three migration models.

Four of the household characteristics have a significant impact on migration in all three models. As expected, we find that a larger share of female workers in the household has a negative impact on migration participation, share and duration, while past migration experience has a positive effect. Consistent with the findings of McKenzie and Rapoport (2007) for Mexico, we find an inverse U-shaped relationship between wealth and migration. The education level of the household head is found to have a negative effect on migration. This is consistent with the findings of Guang and Zheng (2005) and de La Rupelle *et al.* (2010). Contrary to our expectations, we do not find a significant impact for the average age of the workers in the household in any of the migration equations. The share of dependents, however, does matter. Both the share of children and the share of elderly do not affect the participation decision itself, but do have a significant positive effect of the share of migrants. And we also find some evidence that the migration duration is longer when there are more elderly in the household.

Finally, the results for the two land characteristics suggest that it is not the land quantity but the land quality that matters for migration decisions. Our indicator of land quality, the ratio of water rights land to irrigated land, has a significant negative impact on migration in all three models that we estimate.

Table 6.3 reports the results for the model with importance attached to land certificates in protecting land rights as the tenure security variable, model (6.2). We find that households that consider land certificates to be important in protecting land rights are more likely to participate in migration, and to allocate more labor and time to migration. The positive impact on migration contrasts with the negative impact found for expectations of no land redistribution within the next 5 years. It may be explained from the fact that land certificates provide a wide-ranging protection against land expropriation. There are three main sources of risks of land expropriation associated with rural-urban

Does Tenure Security Matter?

migration, i.e. (i) the risk of land expropriation by village groups during land reallocations, (ii) the risk of land expropriation by local governments for infrastructure development, and (iii) the risk of land expropriation by tenants refusing to return rented land. Land certificates can reduce all three types of risk. If land is expropriated in one way or another, a household is more likely to receive an appropriate compensation when land certificates functions well. Its asset enhancing effect is therefore likely to be relatively strong as compared to tenure security derived from the absence of land reallocations only. The income effect is also likely to be larger in the case of land certificates. Just like land rental fees, compensations paid for lost land may be used to cover the initial costs of migration. And the (negative) push reduction effect is likely to be smaller for tenure security provided by well-functioning land certificates, as compared to absence of land reallocations. The use of financial payments to compensate land losses means that less land will be retained, and hence less farm labor will be needed.

Table 6.3 Regression results for perceptions about land certificates

Variable	Participation decision		Share of migrants		Migration duration	
Model	Probit		Tobit		Tobit	
Variable	Coefficient	Z-value	Coefficient	Z-value	Coefficient	Z-value
Perceived land tenure security variables						
Village perception on land certificates	0.76**	2.03	0.22*	1.88	0.13*	1.65
Village perception on land certificates × Land rental market	-0.13	-1.60	-0.03	-1.11	-0.01	-0.57
Village characteristics						
ln(Distance to nearest county)	0.04	0.26	-0.02	-0.50	-0.01	-0.25
Village migration prevalence	0.82**	1.97	0.28*	1.85	0.14	1.48
Household characteristics						
Children ratio	0.22	0.80	0.13	1.40	0.04	0.62
Elderly people ratio	0.09	0.30	0.28*	1.83	0.17*	1.68
Female ratio	-1.23**	-2.19	-0.43**	-2.15	-0.26*	-1.82
Average Age	-0.01	-0.71	-0.01	-1.56	-0.01	-1.53
Education of household head	-0.04*	-1.66	-0.01**	-2.02	-0.01***	-2.62
Past migration experience	0.17*	1.87	0.04***	3.48	0.04***	3.71
ln(Wealth)	2.61***	2.49	0.89***	2.39	0.53***	2.46
ln(Wealth) - squared	-0.12**	-2.31	-0.04**	-2.27	-0.02**	-2.31
Land characteristics						
Contracted land – workers ratio	-0.03	-1.23	-0.01	-0.89	-0.01	-1.51
Water rights – irrigated land ratio	-0.16**	-2.16	-0.05*	-1.73	-0.03	-1.50
Observations	259		259		259	
Mean VIF ^a	2.02		2.02		2.02	

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a Mean VIF tests the degree of multicollinearity among the independent variables, excluding $\ln(\text{Wealth})$ squared.

The estimated coefficient of the interaction term between perceived importance of land certificates and land rental market does not differ significantly from zero in all three migration equations. The all-round protection against expropriation provided by land certificates and the likelihood of receiving an adequate compensation in case of expropriation imply that all three effects, the asset enhancing effect, the income effect and the push reduction effect, are very similar for villages with underdeveloped and villages with relatively developed land rental markets.

The results for the other independent variables are very similar to those obtained for the first model. The only differences are the coefficients for the share of children in the migration share equation and the coefficient for the water rights – irrigated land ratio in the migration duration equation, which are both not significantly different from zero in model (6.2). The results for all other independent variables are consistent with those obtained for model (6.1).

The regression results for model (6.3), which includes the cross-product of the two tenure security variables, are presented in Table 6.4. We find that the importance attached to land certificates in protecting land rights has a significant positive effect on migration decisions, as we find for model (6.2). The significant and negative coefficients of the interaction between tenure security derived from land certificates and from the absence of land reallocation in the near future suggest that the impact on migration of tenure security derived from land certificates is weaker in villages with lower probabilities of land reallocations. In villages with a low probability of land reallocation, the risk of land expropriation mainly comes from land expropriation for infrastructure development and from tenants not willing to return rented land. Hence, the incremental protection provided by land certificates as compared to no land certificates is larger in villages where land reallocations are likely to occur in the near future. This conclusion should, however, be treated with caution because we do not include the land reallocation tenure security variable (LR_i) itself in the equation due to its high correlation with the interaction variable ($LC_i \times LR_i$). Hence, our data set does not allow us to assess which of these two explanatory variables, or perhaps both variables, significantly affect migration decisions.

As we found for model (6.2), we do not find significant interaction effect between land rental market development and tenure security derived from land certificates. The results for the control variables are very similar to those reported in Table 6.2. Similar conclusions can be drawn about their impact on migration as was done for model (6.1).

Does Tenure Security Matter?

Table 6.4 Regression results for perceptions about land reallocations and land certificates

Variable	Participation decision		Share of migrants		Migration duration	
Model	Probit		Tobit		Tobit	
Variable	Coefficient	Z-value	Coefficient	Z-value	Coefficient	Z-value
Perceived land tenure security variables						
Village perception on land certificates	0.77**	1.91	0.23*	1.69	0.14*	1.66
Village perception on land certificates × Village perception on land reallocations	-0.17**	-2.27	-0.06***	-2.36	-0.04**	-1.99
Village perception on land reallocations × Land rental market	0.95	1.52	0.31*	1.61	0.16	1.13
Village perception on land certificates × Land rental market	-0.14	-1.57	-0.03	-1.07	-0.01	-0.45
Village perception on land reallocations × Large land holding	-0.09	-0.19	0.06	0.38	0.02	0.20
Village characteristics						
ln(Distance to nearest county)	0.09	0.63	0.00	0.02	0.01	0.18
Village migration prevalence	0.88**	2.03	0.30**	1.99	0.16*	1.58
Household characteristics						
Children ratio	0.28	0.94	0.17*	1.70	0.05	0.86
Elderly people ratio	0.08	0.24	0.28*	1.85	0.17*	1.71
Female ratio	-1.20**	-2.12	-0.42**	-2.10	-0.25*	-1.80
Average Age	-0.01	-0.64	-0.01	-1.59	0.00	-1.48
Education of household head	-0.05*	-1.79	-0.02**	-2.24	-0.01***	-2.76
Past migration experience	0.17**	1.94	0.05***	3.68	0.04***	3.84
ln(Wealth)	3.05***	2.62	1.01***	2.59	0.59***	2.57
ln(Wealth) - squared	-0.14***	-2.42	-0.05***	-2.44	-0.03***	-2.38
Land characteristics						
Contracted land – adult ratio	-0.03	-1.02	-0.01	-0.83	-0.01	-1.37
Water rights – irrigated land ratio	-0.19***	-2.50	-0.06**	-2.03	-0.04*	-1.77
Observations	259		259		259	
Mean VIF ^a	2.33		2.33		2.33	

Note: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

^a Mean VIF tests the degree of multicollinearity among the independent variables, excluding ln(Wealth) squared.

6.6 Conclusion

Available studies of the impact of land tenure security on rural household decisions mainly focus on land-related investments and land rental market participation, and the consequences for agricultural productivity. The impact of rural land tenure security on rural-urban migration has only recently received attention. At the same time it is also increasingly recognised that it is not so much legal tenure security, but the tenure security as perceived by households that matters for rural household

decisions. Yet, only few studies have examined the impact of tenure security perceptions on rural-urban migration decisions. This paper focuses on China, the country with the largest internal migration flows in the world and a country where legal land tenure security has increased substantially since the end of the 20th century through a series of market-oriented land tenure reforms. Household tenure security perceptions, however, are not always consistent with the tenure security provided through the legal system. Expectations about land reallocations in the near future and importance attached to land certificates in protecting land rights are used to examine the effect of rural household perceptions of land tenure security on rural-urban migration decisions,.

We identify three different effects (asset enhancing effect, income effect and push reduction effect) of increased land tenure security on rural-urban migration. The (positive) asset enhancing effect comes from the insurance function of land as a kind of asset, while the (positive) income effect comes from the fact that land rents may be used by credit constrained households to finance the initial costs of migration. The (negative) push reduction effect comes from the complementarity of land and labor in agricultural production. Well-functioning land rental markets are expected to increase the income effect and reduce the push reduction effect.

Empirical estimates are obtained for the impact of tenure security on the probability that a household member migrates, the share of migrants in a household, and the migration duration, using data collected among 259 households in Minle County in northwest China. In the empirical analysis, we can only observe the net effect of land tenure security on migration decisions, which depends on the relative magnitudes of the three counteracting effects.

The empirical findings show that expectations that no land reallocation will take place in the near future has a significant negative effect on rural-urban migration in villages where the land rental market is underdeveloped. But the effect does not differ significantly from zero in villages with developed land rental markets. The degree of importance attached to land certificates in protecting land rights, on the other hand, significantly increases rural-urban migration in villages with developed and underdeveloped land rental markets. In addition, we find some tentative evidence of a significant interaction effect between the two tenure security variables; it indicates that the positive effect on migration of the importance attached to land certificates is larger in villages with a relatively high probability of land reallocation in the near future.

The markedly different effects of the two perceived tenure security variables on migration can be explained from two factors. One is that a ban on land reallocations protects against one source of expropriation, namely expropriation by the village group in the next round of land reallocations. It does not protect against land expropriations by the local government for urban development or

Does Tenure Security Matter?

infrastructure construction purposes or by tenants who are not willing to return rented land. Land certificates are meant to protect against all sources of expropriation, and therefore have a larger asset enhancing effect. The second factor is the fact that appropriate compensation payments are more likely when households possess land certificates. Hence, the income effect is expected to be larger and the push reduction effect to be smaller for land certificates than for bans on land reallocations.

Rural-urban migration contributes to continued growth of the non-agricultural sectors, reduction of rural-urban and regional income inequality and a reduction of the pressure on the rural environment. The household registration (*hukou*) system, which is generally considered the main obstacle to rural-urban migration in China, has been eased in recent years in medium- and small size cities. However, constraints on migration that result from rural land tenure arrangements still exist. Despite legal reforms that are meant to increase tenure security, perceptions of tenure insecurity still exist among rural households. Our results show that policies aimed at guaranteeing that land certificates effectively protect the land rights of their holders and at stimulating the (further) development of land rental markets will stimulate more rural households to migrate to urban areas. Improving the enforcement system or conflict-resolution mechanisms associated with land certificates is likely to strengthen household perceptions on the importance of land certificates. Constraints on land rental market development may be removed by improving financial services for credit constrained rural households and enlarging household social network, such as provision of more collaboration opportunities among villagers or introduction of community-based development projects in which households are involved in project design and project management. With well-developed rural land rental markets, the negative impact of bans on land reallocations on rural-urban migration is expected to disappear as our regression results for model (6.1) show.

Although our study is limited to a relatively small region in northwest China, the issues discussed and the insights obtained are likely to be of relevance to other parts of rural China and a wider range of developing countries (e.g. Vietnam) with similar tenure systems and with legal reforms that aim to provide farmers with secure and long-term formal land rights. Formal land rights may become more secure through appropriate land laws and regulations, but persistent perceptions of land tenure insecurity may limit incentives to migrate. The focus on formal land rights in much of the ongoing research on migration therefore needs a re-orientation towards household perceptions of tenure security.

On the other hand, it is important to take the limitations of our study into account in generalising its results. One major limitation is the use of a cross-section data base for the empirical analysis. Unmeasured household characteristics (for example access to information) may affect both the dependent and the independent variables in the analysis, and thereby lead to biased results. Since

household characteristics tend to be relatively stable over time, panel data analysis may be used in future research in this field to reduce the potential bias caused by such omitted variables. In addition, similar studies may be carried out in other parts of China, like coastal regions where land has a higher value and initial costs of migration are lower than in our case study region, to check the robustness of the findings of our paper.

7. Land Tenure Security and Agricultural Productivity & Technical Efficiency in Northwest China ⁵⁷

Abstract: This article examines the impact of household perceptions of land tenure security on agricultural productivity and technical efficiency, using detailed household-level data collected in Minle County in northwest China. We contribute to the literature on the impact of land tenure on agricultural productivity by (1) examining the role of tenure security as perceived by rural households instead of formal tenure security as specified in land laws and land titling, (2) examining the impact on both agricultural productivity and technical efficiency, and (3) focusing on the land rental market effect and migration effect of land tenure security, while controlling for the investment and input effects that are widely examined in the existing literature. We find that (household perceptions of) the tenure security provided by land certificates stimulates temporary migration by individuals, and thereby encourages part-time farming with relatively low agricultural productivity and technical efficiency. The renting out of land by migrant households can only partly make up for this negative effect, because land rental markets are thin and highly fragmented. For tenure security provided by the expected absence of land reallocations in the near future, on the other hand, we find that it reduces temporary migration by individuals and thereby contributes to higher agricultural productivity and technical efficiency.

⁵⁷ This chapter is based on a paper submitted to *Environment and Development Economics* in November 2013, as Ma, X., N. Heerink, S. Feng, X. Shi. "Land Tenure Security and Technical Efficiency: Puzzling Evidence from Northwest China"

7.1 Introduction

Agricultural growth is receiving renewed attention in recent years as a means for poverty alleviation and welfare increase in developing countries (World Bank 2007; De Janvry and Sadoulet 2010). Secure land property rights are considered an important catalyst for agricultural growth, and thus a large share of the existing literature focuses on the relationship between land tenure security and agricultural productivity. Empirical results, based on data collected from the Asian and African continents, are mixed. Studies based on Asian experiences suggests a positive, but small in magnitude, effect of land tenure security on productivity (Feder 1988; Feder and Nishio 1998; Li *et al.* 2000; Jacoby *et al.* 2002). Some studies on Uganda and Ethiopia find that tenure security has a positive impact on productivity (Deininger and Castagnini 2006; Deininger *et al.* 2008; Deininger and Jin 2006), while other studies on the same two countries find no evidence of productivity differences across different bundles of land rights (Place and Otsuka 2002; Pender *et al.* 2004; Gavian and Ehui 1999). The ambiguous results can often be related to the local context and the overarching macro and sectoral conditions within which tenure systems operate (Place 2009).

The available theory suggests that secure property rights to land are likely to raise investments and the inputs used in farming through reducing the risk of investments and/or increasing capital availability through improved credit market access and land transfers (Feder 1988). The existing empirical literature, therefore, focuses on the effect of land investments and input use resulting from improved tenure security on productivity (Jacoby *et al.* 2002; Smith 2004; Deininger and Ali 2008; Feng *et al.* 2010). Two other effects distinguished in the literature have received less attention in empirical studies so far. The first effect is the so-called land market effect. Land rental markets can transfer land to more efficient farmers. It also called the factor equalization effect (Deininger *et al.* 2003). The second effect is the migration effect. Improved land tenure security can induce household participation in rural-urban migration (de La Rupelle *et al.* 2010; Mullan *et al.* 2011), which might contribute to less efficient farm management practices of households with one or more migrated members. The land market effect is expected to raise agricultural production, just like the investment and input effects, while the migration effect will generally lower it. Empirical studies should take all four effects into account in order to contribute to a better understanding of the impact of land tenure security on agricultural production.

An important choice to be made in empirical studies of land tenure security and productivity is that of the measure of productivity. One group of studies uses land productivity, defined as total output divided by farm size (see e.g. Hossain and Hussain 1977; Place 2009). This measure is a partial measure of productivity, focusing on land input and ignoring other factors of production and inputs (Masterson 2007). A second group of studies uses agricultural productivity, defined as the agricultural

Does Tenure Security Matter?

output divided by the inputs used to produce it. A related measure is total factor productivity (TFP), which measures the portion of (growth in) output not explained by the (growth in) amount of inputs used in production (e.g. Chand and Yala 2009). And a third group of studies uses technical efficiency, which measures the amount of output obtained from a given amount of inputs, compared to the maximum output that can be derived under best practices from these inputs (e.g. Ahmed *et al.* 2002; Tan *et al.* 2010; Reddy 2011). Assuming constant technology, changes in technical efficiency are regarded as one of the biggest contributors to TFP. The choice of the dependent variable may greatly affect the results obtained in empirical studies of the impact of tenure security, and partly explain the mixed findings obtained so far.

The existing literature in this field mainly focuses on the impact of formal land rights (legal land tenure) derived from land laws and regulations, land certification, and tenancy status (Li *et al.* 2000; Smith 2004; Holden *et al.* 2007; Zhang 2007; Feng 2008; Reddy 2011). But what matters for household decision making, such as land investments, input use, participation in land rental markets and migration, are household perceptions of their land rights (that is, perceived land tenure). Several recent studies (Migot-Adholla *et al.* 1991; Jansen and Roquas 1998; Sjaastad and Bromley 2000) have argued and provided evidence that household perceptions of tenure security may be more important for household decision making in various fields than legal security and its implementation.

Legal land tenure security has been enhanced by the market-oriented land tenure reforms⁵⁸ initiated by the Chinese government since 1998. But household perceptions of land tenure may not be as secure as dictated by the legal tenure reforms. Differences in legal land tenure (derived from land titling, land certification, and bans on land readjustments⁵⁹ and land expropriation) across households may be small, and cannot contribute much to explaining observed differences in tenure-related household behavior. Perceived security of land rights, on the other hand, may vary significantly across households even when they face the same legal tenure situation. It may thereby be an important explanatory factor of observed differences in agricultural productivity and technical efficiency. Yet, the relationships are currently not well understood and more empirical research is needed to gain more insight into the role of perceived tenure security in promoting (or suppressing) agricultural productivity and efficiency.

The main objective of this paper is to examine the effect of perceived land tenure security on agricultural productivity and technical efficiency⁵⁹ in China. We focus on the land rental market effect and rural-urban migration effect of tenure security by controlling for land quality and input use in

⁵⁸ The laws in question include the Land Administration Law of 1998, the Rural Land Contract Law of 2002, the Property Law of 2007, the Mediation and Arbitration of Rural Land Contract Disputes Law of 2009. For a more detailed discussion of the market-oriented land tenure reforms since 1998 in China see e.g. Ma *et al.* (2013a, 2013b).

⁵⁹ For a more detailed discussion of rural land allocation and land readjustments in China see e.g. Tan *et al.* (2006).

agriculture. A cross-section data set, containing household-level data on agricultural production, tenure security and other relevant factors, is used to estimate the determinants of land productivity and technical efficiency. The data were collected among 259 households in 21 villages in Minle County, Gansu province, northwest China. A production function approach and a stochastic frontier approach are used for land productivity and technical efficiency, respectively.

This paper contributes to the literature on the effect of land tenure security on agricultural productivity: (i) by focusing on the land rental market effect and migration effect of land tenure security, while controlling for the investment and input effects that are widely examined in the existing literature; (ii) by examining the effect of land tenure security on both agricultural productivity and technical efficiency; (iii) by examining the role of tenure security as perceived by rural households instead of formal tenure security as specified in land laws and land titling.

The paper is organized as follows. Section 7.2 presents the conceptual model which links land tenure security and agricultural productivity. The data set is introduced in Section 7.3. Section 7.4 presents the model that we use for the empirical analysis and the strategy that we apply for estimating the models. Section 7.5 reports and discusses the estimation results. The paper ends with some concluding remarks in Section 7.6.

7.2 Conceptual model linking tenure to agricultural productivity

Feder (1988) developed a seminal conceptual model linking land tenure and productivity in Thai agriculture. This conceptual model has subsequently been used by many economists to test for linkages between tenure security, investment, and productivity as well as the impact of promoting land market development and other policy instruments (Place 2009). Three important economic relationships between land titles and productivity are included in Feder's (1988) model: (1) Land title can be used as collateral to improve access to credit for agricultural investment, (2) title can increase security of tenure and enhance farmers' willingness to make medium and long-term investments, and (3) title may stimulate land markets that will facilitate the transfer of land resources to more productive farmers. One important modification of Feder's model is the impact that investments in land may have on enhancing tenure security, leading to a bidirectional link between the two (Besley 1995; Brasselle *et al.* 2002; Jacoby *et al.* 2002; Abdulai *et al.* 2011).

Another influential conceptual economic model linking land tenure and productivity is developed by Place (2009). It emphasizes that privatization of land rights can increase investments in agriculture and the purchase of variable inputs, and thereby increase productivity. Feder's (1988) model does not consider that higher tenure security may increase the use of variable inputs (e.g. fertilizers or labor). Place's (2009) model, on the other hand ignores the factor equalization effect of land markets. Both

Does Tenure Security Matter?

models do not take into account the potential impact of land tenure security on rural–urban migration (labor mobility), and its consequences for productivity. Figure 7.1 presents a more comprehensive conceptual model of the effect of perceived tenure security on agricultural production in China. Agricultural production in the model is a result of land investments (investment effect), increased use of variable inputs (input effect), transferring land to more productive farmers (land market effect), and less efficient agricultural management practices resulting from rural-urban migration (migration effect). The investment effect and input effect directly affect agricultural production (depicted by dashed arrows in Figure 7.1), while the land market effect and migration effect have an indirect impact that goes through agricultural productivity (depicted by solid arrows in Figure 7.1).

The investment effect indicates that more secure tenure increases long-term land investments. Land investments, such as trees planting, terracing, green manure plantation, organic application, well-digging, land leveling, surface irrigation, drainage and terracing, can improve soil quality and thereby increase agricultural production in the long term. Secure property rights may reduce the risks involved in making such long-term investments. This effect has been widely discussed and examined (Besley 1995; Banerjee and Ghatak 2004; Abdulai *et al.* 2011). However, the aim of some long-term land investments may be to enhance tenure security, rather than increase land quality and agricultural production (Brasselle *et al.* 2002). We therefore must be cautious in examining the relationship between tenure security and investments in land. It should also be noted that more secure tenure may indirectly affect land investments by the increased capital availability resulting from improved credit market access (see Figure 7.1).

The input effect is through increased use of variable inputs, such as chemical fertilizers, pesticides and herbicides. Secure land can be used as collateral to improve access to credit when land sales markets exist; increased availability of credit may stimulate the purchase of variable inputs (Feder 1988; Feder and Feeny 1991). This effect is also called the collateralizability effect in the existing literature. In China, however, land is not allowed to be used as collateral by the current laws and regulations. Yet, more secure property rights can affect input use in an indirect way by stimulate rural-urban migration (Mullan *et al.* 2011). The remittances sent home by migrants increase household incomes, and thereby the available capital for purchase of material inputs (Rozelle *et al.* 1999; Taylor *et al.* 2003). Hence, increased tenure security may affect variable input use because it increases migrant remittances, not the access to formal credit, in rural China (see Figure 7.1).

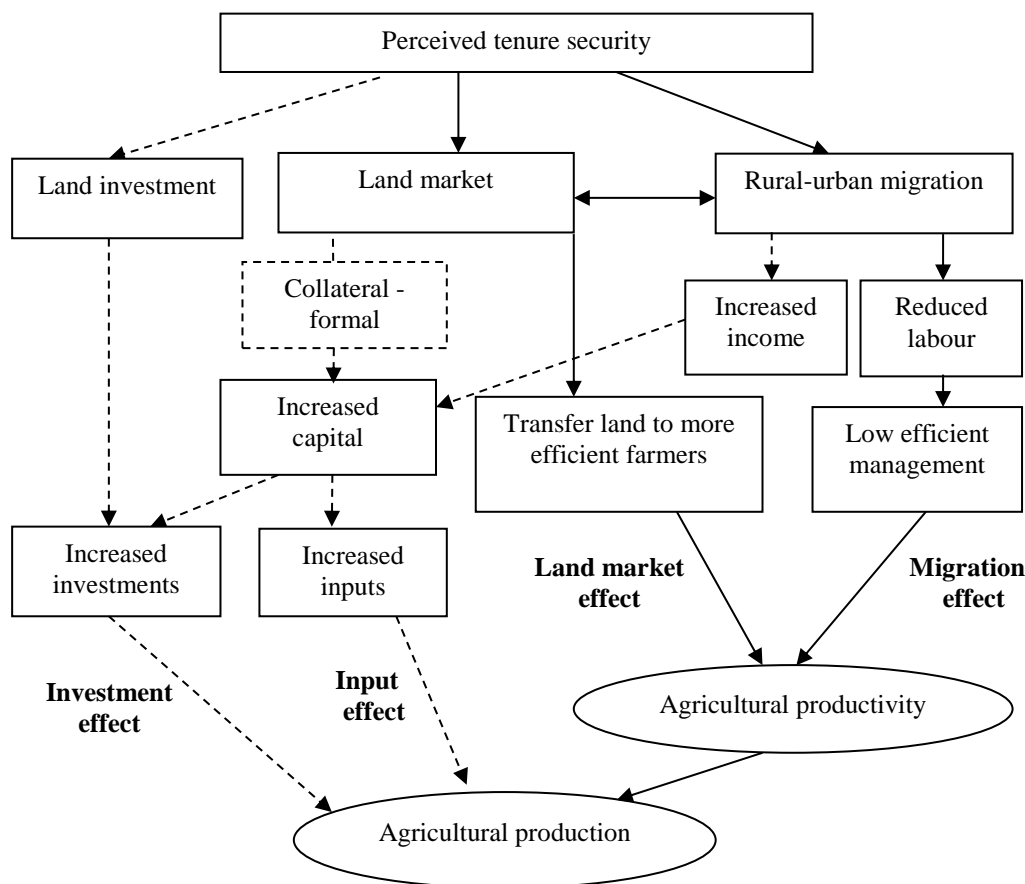


Figure 7.1 Conceptual model linking land tenure security and agricultural production in China

Note: Dashed arrows show the paths of the investment and input effects, while solid arrows show the paths of the land market and migration effects. The dashed square indicates that land is not allowed to be used as collateral in China.

The land market effect is through transferring land to more efficient farmers. Increased land tenure security induces land market development (Deininger and Zegarra 2003; Macours *et al.* 2004; Holden *et al.* 2007). In the case of absent or thin agricultural labor markets⁶⁰, the land rental market often plays an important role in enhancing productivity via transferring land to more productive producers.

The migration effect is through changing agricultural production and management modes. Rural-urban migration may reduce the efficiency of farm management practices, especially when hiring agricultural labor incurs large transaction costs or when hired labor is not as efficient as family labor (Wouterse 2006; Feng *et al.* 2010; Shi *et al.* 2011). An example is the application of large quantities of chemical fertilizers at the time of planting or sowing by farm households, instead of applications that are spread over time and depend on the requirements for plant growth, due to seasonal migration of family members. It should be noted, however, that improved tenure security may not stimulate migration if households have few options to rent out their land to others. In such cases, a decrease in

⁶⁰ High costs of supervision may prohibit large landowning households to hire labor up to the desired quantity so that the marginal product across households of varying farm sizes would be equalized (Binswanger *et al.* 1995).

Does Tenure Security Matter?

the probability of land expropriation implies that a household will retain more land, which needs farm labor and may thereby decrease migration incentives (Mullan *et al.* 2011). In other words, although the migration effect from improved tenure security is generally negative, it may also be positive if improved tenure security reduces migration incentives. We will come back to this issue in Section 7.5.3.

In the empirical model that we apply in this paper, land investments (or land quality) and agricultural inputs are used as control variables in explaining agricultural production. The observed effect of land tenure security on agricultural production is therefore the net effect of the (positive) land market effect and the (generally negative) migration effect. The overall effect depends on the magnitude of the land market effect and migration effect.

In the context of well-functioning land rental and labor markets, the net effect of land tenure security is expected to be positive. On the one hand, more secure tenure will induce the transfer of land from low productive households to high productive households in well-functioning land rental markets. On the other hand, low-productive households will shift from agriculture to non-agricultural sectors, and in many cases migrate permanently to urban areas when labor markets function well. Hence, the migration effect is expected to be (close to) zero, while the land market effect will be positive.

However, major bottlenecks still limit the functioning of the land rental and labor market in China. The current rural land rental market is highly segmented. The majority of land transfers takes place within villages and usually between households that are related through kinship. This seriously limits the transfer of land to high-productive households. The current *hukou* (household registration) system limits the number of labor migrants who take their families along and migrate permanently. The lack of social security and the relatively expensive access to housing and health and education facilities in urban areas for migrants with a rural *hukou* mean that many labor migrants leave their families behind and eventually return to their home villages. This short-duration, individual migration contributes to part-time farming that will often have a relatively low productivity. The observed overall effect of land tenure security on agricultural productivity may therefore even be negative.

7.3 Data

This study uses data from two farm household surveys that were held in Minle County, Gansu Province in northwest China in May 2008 and May 2010. The surveys were held to obtain more insights into the sustainability of land and water use of households living in the area, and were carried out by staff and students from Gansu Academy of Social Sciences in Lanzhou, Gansu Agricultural University in Lanzhou, and Nanjing Agricultural University. Collected information refers to the years 2007 and 2009, respectively. The surveys covered 317 households in 21 villages in May 2008, and

315 households in the same 21 villages in May 2010. In each of the ten townships in Minle County, 10% of the villages were randomly selected for the survey in May 2008. Within each selected village, 15 households were randomly chosen to be interviewed. If possible, the same households were also interviewed in May 2010. In cases where the same household could not be found, it was replaced by another, randomly selected, household in the same village.

Although 265 households were interviewed in both years, we cannot exploit the panel nature for our analysis. The reasons are that questions about subjective perceptions of land tenure were asked only in the 2010 survey, and that we need to introduce lagged values of some variables to avoid endogeneity problems. Six interviewed households did not engage in agricultural production in 2009. We therefore perform a cross-section analysis that is based on the sample of 259 households engaged in agriculture that were interviewed in both years.

7.4 Model choice and estimation strategy

7.4.1 Agricultural productivity model

Following Deininger and Jin (2006), Chand and Yala (2009) and Feng *et al.* (2010), we assume the production function to be Cobb-Douglas:

$$Q_i = A_i \left(\prod_j X_j^{\alpha_j} \right)_i, \text{ with } A_i = \exp(d_0 + d_1 M_i) \quad (7.1)$$

where Q_i is the level of output value of the i^{th} household, which is defined as the aggregated value for all cultivated crops, X_j denotes the j^{th} input, α_j is the input elasticity of input j . A_i is a measure of total factor productivity (agricultural productivity) which depends on land tenure security variables and other factors affecting total factor productivity (M_i). d_0 and d_1 are unknown coefficients. Taking the natural log of equation (7.1) and adding a random disturbance term, we can get the estimable form, which is as follows

$$\ln(Q_i) = d_0 + d_1 M_i + \sum_{j=1}^n \alpha_j \ln(X_j) + \varepsilon_i \quad (7.2)$$

where n denotes the number of inputs and ε_i represents a random disturbance term.

In addition to agricultural inputs and land tenure variables, we also include household characteristics, land characteristics and regional factors as explanatory variables in Equation (7.2). The definitions of the variables used in the agricultural production function are presented in Table 7.1.

Does Tenure Security Matter?

Table 7.1 Definition of variables and descriptive statistics

Variable	Definition	Mean	S.D.
Dependent variable			
Output value	Aggregated value for all crops cultivated by a household (yuan)	13341	10920
Input variables			
Land area	Total land area cultivated by a household (mu)	19.59	13.28
Labor	Amount of labor used for agricultural production by a household (man-days)	150.1	150.7
Machinery	Expenditures on own machinery and hiring machines by a household (yuan)	986.6	722.8
Seed	Cost of seed, includes purchased and own seed paid by a household (yuan)	1634	1101
Inorganic fertilizer	Cost of purchasing inorganic fertilizers by a household (yuan)	2359	1752
Water	Water fee paid by a household (yuan)	486.9	511.3
Organic fertilizer	Quantity of organic fertilizer used by a household (kg)	9509	27359
Land tenure security variables			
Village perception on land reallocations	Average expectation of no land readjustments in the village in the next five years of the other sampled households that live in the same village as the surveyed household	0.38	0.16
Village perception on land certificates	Average perception on the importance of land certificates for protecting land rights of the other sampled households that live in the same village as the surveyed household	4.14	0.36
Household characteristics			
Age	Age of the household head (years)	46.69	10.43
Education	Years of formal education of the household head (years)	7.43	3.49
Wealth	Value of agricultural devices, livestock, electronic instruments, house, furniture and transportation vehicle (yuan)	59332	60067
Female ratio	Ratio of female workers to all workers in a household	0.48	0.16
Land characteristics			
Number of plots	Total number of plots cultivated by a household	14.31	8.39
Land fertility	Respondent's subjective evaluation of land fertility, ranging from 1 (=poor) to 3 (=good)	2.51	0.54
Land slope	Respondent's subjective evaluation of land slope, ranging from 1 (= plain) to 2 (= sloping)	1.07	0.21
Regional characteristics			
Tongziba	1= farmer resides in Tongziba irrigation district; 0= otherwise	0.29	0.45
Hongshuihe	1= farmer resides in Hongshuihe irrigation district; 0= otherwise	0.34	0.47
Haichaoba	1= farmer resides in Haichaoba irrigation district; 0=otherwise	0.10	0.31
Daduma	1= farmer resides in Daduma irrigation district; 0=otherwise	0.13	0.34

Source: Household survey. ^a Number of laborers is standardized using the household' subjective evaluation (one person can be either a full laborer, half laborer or non-labor).

Input factors include labor, machinery, seed, inorganic fertilizer, water and organic fertilizer⁶¹. Labor used for agricultural production is measured in man-days. We asked farmers to estimate the number of man-days of their own labor and hired labor used for cultivating each major crop, including land preparation, seeding, weeding, fertilization and pesticide application, and harvesting. Machinery is measured in monetary cost, including farmers' own machinery cost (e.g. the cost of gas) and the cost of hired machines. Seed is measured in monetary cost, including farmers' own seed and purchased seed. The cost of farmers' own seed is calculated using the market price. Since many farmers plant cash crops, such as oilseed rape, garlic, Chinese medicine, sesame, seed maize, and caraway seed in our research area, the seed cost is substantial. Similarly, inorganic fertilizer is measured in terms of market purchase costs. Irrigation water is measured by water fees charged by the water users association. Organic fertilizer is measured by the amount of organic fertilizer used by farmers (in kg).

Household land tenure security perceptions are measured by expectations on the absence of land readjustments in the near future and by the perceived importance of land certificates in protecting land rights⁶². Expectations on future land redistribution take the value 1 if a household does not expect a land redistribution within 5 years, and 0 if the household expects a redistribution to occur within 5 years, or does not have an idea. Perceived importance of land certificates reflects a household's assessment of the significance of land certificates for protecting land rights. It is defined on a scale from 1 (= not important) to 5 (= very important).

It should be noted that household behavior (i.e. land investments) may have an impact on land tenure security perceptions (Besley 1995; Brasselle *et al.* 2002; Abdulai *et al.* 2011). Following Mullan *et al.* (2011), we use the mean village-level land tenure security perception as an approximation in order to minimize the potential endogeneity bias. It is defined as the average tenure security perception of the other sampled households within the same village.

Household characteristics include the age and education of the household head, household wealth and female ratio. Age of the household head is used as a proxy for the family's farming experience. The effect of age on productivity 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 (Feng 2008). Education of the household head is used as a proxy for the management skills of a family. Productivity is expected to increase with education as education increases the household's ability to utilize existing

⁶¹ In our research area, farmers also use pesticide and plastic film, but the sum cost of these two inputs only accounts for 4.5% of total cash inputs (purchased inputs and machinery). In addition, 62% households did not use plastic film in the preceding year of the survey. We thus neglect these two inputs in the analysis.

⁶² Household expectations and perceptions are derived mainly from the responses of household heads. Instead of household heads, in few cases, other family members who understand household heads well were interviewed if household heads were migrating at the interviewing time. We assume that respondents' perceptions can present household heads' perceptions, and thus it will not have a significant impact on our estimation results.

Does Tenure Security Matter?

technologies and make farm management decisions (Battese and Coelli 1995). Household wealth is an indicator of economic status of the household within the village. Households with more wealth, on the one hand, are expected to face fewer obstacles in agricultural production, as they have more resources available for paying fixed costs and for obtaining the information needed to adopt new technologies; on the other hand, they are expected to spend more time on leisure or off-farm employment. So the expected effect of household wealth is ambiguous. Female ratio is defined as the ratio of female worker to all workers. It is meant to capture the difference in land productivity between female and male workers, and expected to be negatively related to productivity.

Land characteristics include number of plots, land fertility, land slope. Number of plots is an indicator of land fragmentation, which can have either negative or positive effects on agricultural productivity (see e.g. Tan *et al.* 2008). On the one hand, given the total land area, more plots need more labor time for travelling, may be more difficult to manage, in particular using machinery, and may use a larger share of the land for boundaries. On the other hand, more plots can enable households to optimize their labor allocation over different crop species and seasons, especially if the market for agricultural labor is absent or faces high transaction costs. Land fertility and land slope are used as indicators of land quality. They are measured by asking the respondent about the fertility on a scale from 1 (poor) to 3 (good) and the slope (1 = flat, 2 = sloping) of plot(s) planted with a particular crop, and then calculating the weighted average using planting area as weights. Land fertility is expected to impact positively on productivity, while land slope is expected to impact negatively on productivity.

Finally, four dummy variables are introduced for four of the five irrigation districts to which the interviewed households belong. These dummies are meant to capture potential differences in productivity between irrigation districts.

7.4.2 Technical efficiency model

Technical efficiency is estimated using a stochastic production frontier⁶³. The approach imposes an explicit and possibly restrictive functional form on the technology. However, it permits the estimation of the determinants of inefficiency of households. The stochastic frontier model has been used, among others, to examine the effect of land rental and off-farm employment, land fragmentation, land reallocation, land tenure contracts on technical efficiency (Feng 2008).

The stochastic frontier model assumes an error term with two additive components – an asymmetric component, which accounts for pure random factors (θ_i), and a one-sided component, which captures

⁶³ An alternative approach is data envelopment analysis, which takes no account of the possible influence of measurement error and other noise in the data (Coelli 1996). However, measurement error and other noise might exist in small-scale agricultural production in China. The error and noise are subject to weather disturbances, heterogeneous environmental factors like soil quality and irrigation access, and households' inaccurate response to some of the questions due to e.g., varied perceptions.

the effects of inefficiency relative to the stochastic frontier (μ_i). The random factor (θ) is independently and identically distributed with $N(0, \sigma_\theta^2)$ while the technical inefficiency effect (μ) is often assumed to have a half normal distribution $|N(0, \sigma_\mu^2)|$. The model is expressed as

$$Y_i = X_i \beta + (\theta_i - \mu_i) \quad (7.3)$$

$$TE_i = Z_i \theta \quad (7.4)$$

Where X_i is the vector of input quantities of the i^{th} household, Z_i is the vector of household-specific factors determining inefficiency. The β and θ are unknown parameters to be estimated together with the variance parameters expressed as $\sigma^2 = \sigma_\theta^2 + \sigma_\mu^2$, and $\gamma = \sigma_\mu^2 / (\sigma_\theta^2 + \sigma_\mu^2)$. The parameter γ has a value between zero and one such that the value of zero is associated with the traditional response function, for which the non-negative random variable, μ_i , is absent from the model. Technical efficiency is defined as $TE_i = \exp(-\mu_i)$.

We use a translog specification for the frontier production, as is commonly done in the recent literature (see e.g. Tan *et al.* 2010; Zhang *et al.* 2011). The estimable form is specified as follows:

$$\ln(Q_i) = \beta_0 + \sum_{j=1}^n \beta_j \ln(X_{ji}) + \frac{1}{2} \sum_{j=1}^n \sum_{k=1}^n \beta_{jk} \ln(X_{ji}) \ln(X_{ki}) + \gamma C_i + \theta_i - \mu_i \quad (7.5)$$

$$TE_i = \theta_0 + \theta M_i \quad (7.6)$$

where n denotes the number of inputs, X_j denotes the quantity of input j used for crop production by a household, C_i is a vector of other variables that may affect agricultural output, i.e. regional characteristics, and $\beta_0, \beta_j, \beta_{jk}$ and γ are unknown coefficients. M_i is a vector denoting land tenure security and other factors affecting technical efficiency, and θ_0 and θ are unknown coefficients. In addition to land tenure variables, we include the same household characteristics, land characteristics and regional factors as specified in Table 7.1 as explanatory variables of technical efficiency. Moreover, following Reddy (2002), we include land area as an additional explanatory variable to examine whether small farmers are more efficient than large farmers.

7.4.3 Estimation strategy

The production function (Equation (7.2)) is estimated by using the ordinary least squares (OLS) method. The stochastic frontier model can be estimated using either one-step or two-step approaches. In the two-step procedure, the frontier production function (Equation (7.5)) and the firm's efficiency levels are estimated first, ignoring the set of variables that affect technical efficiency only. In the second step, technical efficiency is regressed against these explanatory variables (Equation (7.6)). However, the two-stage procedure has long been recognized to yield biased results because the model

Does Tenure Security Matter?

estimated at the first step is misspecified. A one-step procedure, in which the relationship between technical efficiency and its explanatory variables is imposed directly in estimating the frontier production function and the firm's efficiency levels, can be used to solve the problem (Kumbhakar *et al.* 1991; Wang and Schmidt 2002). The maximum likelihood estimates are obtained, using the one-step procedure, by FRONTIER Version 4.1 (Coelli 1996).

7.5 Estimation results and discussion

7.5.1 Agricultural productivity

Table 7.2 reports the regression results for agricultural production function. The most notable finding for the purpose of our research is that perceived tenure security derived from expectations on the absence of land reallocations in the near future has a significant positive impact on productivity, and that perceived tenure security from land certificates has a significant negative impact on productivity. This suggests that households who think land reallocations will not occur in the near future tend to have a higher productivity, while households who attach greater importance to land certificates in protecting their land rights tend to have a lower productivity. We will discuss this finding in more detail in Section 7.5.3.

Earlier research on China by Jacoby *et al.* (2002) found minimal yield gains from increasing the length of tenure in China. It should be noted, however, that their study includes the (positive) investment and input effects of improved tenure security on plot yields. Our study controls for those effects by focusing on agricultural productivity instead of land productivity.

As for the control variables, we find that land has the greatest contribution to agricultural production. Its output elasticity equals 0.69 (significant at the 1-percent testing level). Seed has the second greatest contribution, with an estimated elasticity of 0.15 (significant at the 5-percent testing level). The other five inputs, labor, machinery, inorganic fertilizer, water and organic fertilizer, have minor and insignificant contributions to agricultural production in our research area. Other noteworthy findings are that the education of household head positively affects productivity. The insignificant coefficient of the female ratio suggests that there is no significant difference in productivity between male and female workers. We also find that the age of household head, family wealth and number of plots does not impact significantly on productivity, as expected. One surprising finding is that two variables indicting land quality, land fertility and land slope, do not have a significant impact on land productivity. One possible reason is that instead of measuring topsoil depth, organic matter content and the slopes of specific plots, we use the weighted average of farmers' own opinions about land fertility and land slopes as explanatory variables.

Table 7.2 Estimation results for agricultural production function, OLS

Variable	Coefficient	T-ratio
Land tenure security variables		
Village perception on land reallocations	0.35*	1.78
Village perception on land certificates	-0.18**	-1.99
Input variables		
ln(Land)	0.69***	6.86
ln(Labor)	0.003	0.11
ln(Machinery)	-0.03	-0.95
ln(Seed)	0.15**	2.02
ln(Inorganic fertilizer)	0.07	1.59
ln(Water)	0.03	1.10
ln(Organic fertilizer)	0.001	0.17
Household characteristics		
Age	0.001	0.72
Education	0.01*	1.66
ln(Wealth)	0.03	1.37
Female ratio	-0.11	-0.91
Land characteristics		
ln(Number of plots)	-0.01	-0.18
Land fertility	0.01	0.13
Land slope	0.12	0.76
Observations	259	
R ²	0.77	
Mean VIF	2.06	

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

7.5.2 Technical efficiency

Tables 7.3a presents the maximum likelihood estimates of the parameters in the production frontier, given the specifications for the inefficiency effects.⁶⁴ The estimated value of γ is 0.788, and is significant at the 1-percent testing level. This finding indicates the presence of significant technical inefficiency, and implies that the production frontier parameters cannot be consistently estimated by using ordinary least squares.

⁶⁴ A test of the choice of functional form (Cobb–Douglas versus translog) confirms that the choice of translog production function is a better representation of the production structure. We use the likelihood ratio tests to test the hypothesis that the coefficients of the interactions between inputs are equal to zero ($H_0: \beta_{jk} = 0$). The likelihood ratio test statistic (χ^2) is 51.93, while the critical value of χ^2 with degrees of freedom of 28, and P-value of 0.01, is 48.28. The null hypothesis is therefore rejected.

Does Tenure Security Matter?

Table 7.3a Estimation results for stochastic production frontier, maximum likelihood

Variable	Coefficient	T-ratio
Production frontier		
Constant	5.438***	4.892
ln(Land)	-0.200	-0.244
ln(Labor)	-0.132	-0.222
ln(Machinery)	0.071	0.229
ln(Seed)	0.879**	1.814
ln(Inorganic fertilizer)	0.280	0.544
ln(Water)	-0.729*	-1.665
ln(Organic fertilizer)	-0.118	-1.259
ln(Land) ²	-0.039	-0.274
ln(Labor) ²	-0.039	-1.481
ln(Machinery) ²	0.016**	1.919
ln(Seed) ²	0.048	0.724
ln(Inorganic fertilizer) ²	0.026	1.228
ln(Water) ²	0.039***	2.907
ln(Organic fertilizer) ²	0.0005	0.185
ln(Land) × ln(Labor)	-0.036	-0.339
ln(Land) × ln(Machinery)	-0.019	-0.233
ln(Land) × ln(Seed)	-0.109	-0.895
ln(Land) × ln(Inorganic fertilizer)	0.261**	1.922
ln(Land) × ln(Water)	0.037	0.442
ln(Land) × ln(Organic fertilizer)	-0.005	-0.274
ln(Labor) × ln(Machinery)	0.002	0.036
ln(Labor) × ln(Seed)	-0.043	-0.718
ln(Labor) × ln(Inorganic fertilizer)	0.133	1.189
ln(Labor) × ln(Water)	-0.038	-1.200
ln(Labor) × ln(Organic fertilizer)	0.013*	1.622
ln(Machinery) × ln(Seed)	-0.007	-0.130
ln(Machinery) × ln(Inorganic fertilizer)	-0.053	-0.880
ln(Machinery) × ln(Water)	0.058	0.848
ln(Machinery) × ln(Organic fertilizer)	-0.014**	-2.222
ln(Seed) × ln(Inorganic fertilizer)	-0.182**	-2.152
ln(Seed) × ln(Water)	0.056	0.866
ln(Seed) × ln(Organic fertilizer)	0.036***	3.110
ln(Inorganic fertilizer) × ln(Water)	-0.031	-0.451
ln(Inorganic fertilizer) × ln(Organic fertilizer)	-0.002	-0.119
ln(Water) × ln(Organic fertilizer)	-0.012	-1.370
Model diagnostics		
$\sigma^2 = \sigma_{\eta}^2 + \sigma_{\mu}^2$	0.258***	6.196
$\gamma = \sigma_{\mu}^2 / (\sigma_{\eta}^2 + \sigma_{\mu}^2)$	0.788***	15.541
Observations	259	
Log likelihood function	-41.56	

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively (variables with either a plus- or a minus-sign were tested two-sided).

Table 7.3b Estimation results for technical efficiency model, maximum likelihood

Variable ^a	Coefficient	T-ratio
Constant	9.080***	3.732
Village perception on land reallocations	1.453**	2.116
Village perception on land certificates	-0.860***	-2.987
Age	-0.003	-0.448
Education	0.065***	2.934
ln(Wealth)	-0.294**	-2.716
Female ratio	-0.249	-0.311
ln(Number of plots)	0.437**	2.265
Land fertility	-0.105	-0.701
Land slope	0.359	0.676
ln(Land area)	-1.266***	-4.077
Observations	259	
Log likelihood function	-41.56	

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively (variables with either a plus- or a minus-sign were tested two-sided). a Dependent variable is technical efficiency measure determined in a single stage procedure together with the frontier function and estimated using Frontier 4.1.

The corresponding estimated input-output elasticities at the sample mean in the production frontier are reported in Table 7.4. The sum of the estimated input-output elasticities is 1.108. This is slightly larger than Chen et al. (2009), who estimated it equal to 1.00 for Hebei and Shanxi of North China based on data collected from 1995 to 1999, and also larger than Tan *et al.* (2010), who estimated it between 0.782 and 0.927 for Jiangxi province based on data collected in 2000 and 2001. Consistent with earlier studies (Nguyen *et al.* 1996; Wan and Cheng 2001; Feng 2008), our results indicate that land is the most important production factor in the present agricultural production system in China. The output elasticity of land is estimated at 0.619 (significant at the 1-percent testing level. Similar to the findings in Table 7.2, seed is the second most important input factor. Its output elasticity is estimated at 0.209, but it is not statistically significant. Previous production frontier studies for rice production systems in Jiangxi province in central-south China found small and negative output elasticities for seed (Feng 2008; Tan *et al.* 2010). The positive, and in the production function statistically significant, elasticity that we estimate for our research area in northwest China suggests that improved seed technology (pesticide-resistant seed, drought-resistant seed) plays a relatively more important role in cash crop production, such as oilseed rape, Chinese medicine, sesame, seed maize, and caraway seed. The other agricultural inputs, labor, machinery, inorganic fertilizer, water and organic fertilizer, have minor and insignificant elasticities in both the production function and the production frontier in our research.

The efficiency estimates range from 22 per cent to 97 per cent for the households in our sample, and equal 86 per cent on average. In other words, the interviewed farmers obtain on average 86% of the potential output that can be obtained with the current mixture of production inputs. This average technical efficiency is slightly larger than the estimate obtained by Chen et al. (2009), who found it to

Does Tenure Security Matter?

be equal to 80 per cent for farmers in Hebei and Shanxi Provinces of North China during the period 1995-1999. It is comparable to the average technical efficiencies of 0.80 (one-season rice), 0.89 (late rice) and 0.91 (early rice) estimated by Tan *et al.* (2010) for three villages in Jiangxi province.

Table 7.4 Input-output elasticities derived from production frontier

Input	Elasticity	T-ratio ^a
Land	0.619***	2.739
Labor	-0.036	-0.252
Machinery	0.037	0.402
Seed	0.209*	1.672
Inorganic fertilizer	0.151	0.860
Water	0.124	0.950
Organic fertilizer	0.004	0.160
Scale elasticity	1.108	-

Note: Calculated by authors from the coefficients of input factors in Table 7.3a and the mean value of the logarithms of production and input factors. ^a We calculated the input-output elasticities for all households in our sample, and derived the stand errors of the input-output elasticities which are used to calculate t-ratios. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.

The results for the two tenure security variables are similar to those obtained for the agricultural production function. Perceived tenure security derived from expectations on the absence of land reallocations has a significant positive impact on technical efficiency, while the importance attached to land certificates has a significant negative impact (see Table 7.3b). We will discuss this finding in more detail in Section 7.5.3.

As for the control variables, the education of the household head is found to have a positive impact on technical efficiency, as was the case for agricultural productivity. The female ratio, land fertility and land slope are found to have no significant impact on technical efficiency. Contrary to our expectations, we find that family wealth has a negative impact on technical efficiency. This finding suggests that more wealthy farmers manage their farms in a less efficient way than poorer farmers do. Likewise, we find that land area has a statistically significant negative effect on technical efficiency. Finally, land fragmentation measured by the number of plots on a farm is found to have a significant positive effect on technical efficiency. This finding is consistent with those of Sherlund *et al.* (2002) for Côte d'Ivoire and Tan *et al.* (2010) for Jiangxi Province in China.

7.5.3 Empirical linkage between land tenure security and agricultural productivity

Our findings so far indicate that improved land tenure security derived from the expected absence of land reallocations in the near future increases agricultural productivity and technical efficiency, while improved land tenure security derived from the role of land certificates in protecting land rights decreases agricultural productivity and technical efficiency. Because variable inputs and land

investment (land quality) are control variables in both models, the observed effects can be interpreted as the net results from a positive land market effect and a generally negative migration effect. The relative impacts of these two effects depends on the functioning of land and labor markets. In this section, we will provide further empirical evidence of the existence of land market and migration effects of tenure security, and of the existence of major land rental and labor market imperfections in the research area, and use these to interpret our findings.

First, in order to examine the existence of a land rental market and a migration effect, we estimate two Probit models for household participation in the land rental market and rural-urban migration, respectively. Besides the two tenure security perception variables, village characteristics, household characteristics and land characteristics are included in the models as control variables.⁶⁵ Table A7.1 in the Appendix presents definitions and descriptive statistics of the variables used in the two Probit models. For simplicity, those variables which are already presented in Table 7.1 are not included in Table A7.1.

Tables A7.2 and A7.3 in the Appendix report the regression results for the determinants of household participation in the land rental market and in rural-urban migration, respectively. We find that the importance attached to land certificates in protecting land rights positively affects both the probability of renting land and the probability that at least one of the household members has migrated. Expectations about the absence of land reallocations in the near future, on the other hand, do not have a significant impact on land renting. They have a significant negative impact on rural-urban migration in villages where the land rental market has hardly or not developed, due to a so-called push reduction effect (meaning that more labor is needed on retained farm land). But the impact on migration is insignificant in villages where a land rental market exists⁶⁶, as the rental market allows migrants to rent out land without the risk of losing it (Mullan *et al.* 2011).

Second, major market imperfections exist in the land rental market and labor market in our research area. The land rental market has developed on a small scale only and is highly segmented. Results of our household survey show that 15% of the households rented in land in 2009. The average rented-in land area was equal to 9.3% of the average contracted land allocated to renting households. More than 85% of the land transfers were between kinships, and only around 40% of the rental contracts were in writing, according to the interviewed tenants. The duration of the land renting was not specified in 88% of the contracts. The labor market in our research area is characterized by short duration migration of individuals, leading to a large share of households involved in part-time farming. The

⁶⁵ These variables are selected on the basis of the existing literature (e.g. Holden and Ghebru 2005; Tu *et al.* 2011; Deininger *et al.* 2003; Yao 2001; Zhao 2005; Giles and Mu 2007; Mullan *et al.* 2011).

⁶⁶ The null hypothesis that the sum of first two coefficients equates zero is not rejected. The impact on migration of tenure security attached to land certificates therefore does not differ significantly from zero in villages with land rental markets.

Does Tenure Security Matter?

results of our household survey show that 51% of the households had at least one member who migrated in 2009. Among the migrating households in our sample, on average only 1.41 members per household migrated and spent on average 6.84 months outside their county in 2009. Slightly more than 90% of the migrating households participated in (part-time) farming.

Hence, we find evidence for our research area that (household perceptions of) the tenure security provided by land certificates stimulates temporary migration by individuals, and thereby encourages part-time farming with relatively low agricultural productivity and technical efficiency. The renting out of land by migrant households can only partly make up for this negative effect, because land rental markets are thin and highly fragmented.

For (household perceptions of) the tenure security provided by the absence of land reallocations in the near future, on the other hand, we find that it reduces migration in villages where land rental markets have not developed. It thereby discourages part-time farming with relatively low agricultural productivity and technical efficiency. The migration effect therefore becomes positive. Moreover, the tenure security provided by the absence of land reallocations in the near future does not significantly affect household participation in the land rental market. The positive impact of tenure security provided by the absence of land reallocations on agricultural productivity and technical efficiency can therefore be explained as the net effect of a positive migration effect and an insignificant land market effect.

This leaves us finally with the question why tenure security provided by land certificates and by absence of land reallocations has such divergent impacts on land renting and migration. Land certificates provide protection against all types of land expropriation. Besides land reallocations initiated by the village leader, they also provide protection against land requisitioning for urban or infrastructure development and against tenants refusing to return rented land. Well-functioning land certificates may therefore provide a stronger incentive for participating in the land rental market than absence of land reallocations. In addition, households possessing land certificates are more likely to receive appropriate compensation payments in cases where land is expropriated. These payments may, for example, be used to cover the initial costs of migration. Hence, land certificates may stimulate migration while bans on land reallocations may reduce migration in villages where land rental markets have not developed.

7.6 Conclusions

This paper examines the role of land tenure security as perceived by rural households on agricultural productivity and technical efficiency in northwest China. By controlling for land investments and input use in the empirical analysis, we focus on two – potentially offsetting - effects of improved land

tenure security, namely the positive land rental market effect and the, generally negative, migration effect. When land rental and labor markets function well, the net impact of these two effects on agricultural productivity and technical efficiency will be positive. But when these markets are imperfect or incomplete, the net effect may well be negative.

Results from our empirical analysis for Minle County, Gansu province show that perceptions on the importance of land certificates in protecting land rights have a significant negative effect on agricultural productivity and technical efficiency. This negative effect results from the positive impact of land certificates on temporary migration by individual persons and the thin and highly fragmented land rental market in our research area. Due to the household registration (*hukou*) system, rural-urban migration tends to be temporary and migrants are usually single persons instead of entire families. This causes migrant households to continue (part-time) farming, which is characterized by relatively low productivity and efficiency (negative ‘migration effect’). This effect may be counterbalanced by the positive impact of improved tenure security derived from land certificates on land renting. But land transfers in the research area mainly take place between kinship, leading to minor improvements in productivity and efficiency (weakly positive ‘land market effect’).

We further find that tenure security derived from the expected absence of future land reallocation has a significant positive effect on agricultural productivity and technical efficiency. Rural-urban migration tends to be lower in villages where land reallocations are not expected in the near future and land rental markets are underdeveloped. These lower migration rates contribute to a lower prevalence of part-time farming with relatively low agricultural productivity and technical efficiency in these villages (and hence a positive ‘migration effect’). The tenure security derived from absence of land reallocations, however, does not significantly contribute to household participation in land markets (insignificant ‘land market effect’).

Existing empirical research for China indicates that the elasticity of agricultural yields with respect to changes in land rights is small (Li *et al.* 2000; Jacoby *et al.* 2002). The main explanation is that land investment plays a minor role in agricultural production compared with other agricultural inputs such as land, labor, and inorganic fertilizers (Yao 2007). Therefore, the contribution of land tenure reforms to agricultural productivity seems to be small if only the land investment effect is considered. In this study, however, we show that land rental market and migration effects of tenure security can be substantial and can even have a negative impact on agricultural productivity and efficiency.

We argue in this paper that the impact of more secure land tenure on agricultural productivity will be positive when well-developed land rental and labor markets exist. Removing existing obstacles to land rental market development and rural-urban migration will therefore indirectly contribute to reversing

Does Tenure Security Matter?

the negative relationship between land tenure security derived from land certificates and agricultural productivity. Improving legal land tenure security plays an important role in stimulating rural land renting and rural-urban migration (Deininger and Jin 2003; Holden and Ghebru 2005; Mullan *et al.* 2011). The Chinese government has implemented a number of land-related laws and regulations since 1998 and established a context of well-defined formal land property rights. Although these reforms improve legal tenure security, it is not clear to what extent they also improve household perceptions of land tenure security. The results of our research show that household perceptions about the importance of land certificates vary between households and have a significant impact on agricultural productivity. Supplementary measures may therefore be taken to provide information about the importance of land certificates for pursuing rights in land conflicts to rural households as a way to improve perceived tenure security and thereby the functioning of land rental markets.

Another important way to stimulate rental market development is to further develop and expand the rural social insurance systems. Well-functioning rural health, pension and other social insurance systems can reduce farmers' reliance on rural land as a means of social insurance, and thereby induce the renting in and out of land.

Agricultural productivity will be further stimulated if temporary migration by single persons would decline and permanent rural-urban migration by entire families would increase. In order to achieve this, the household registration system and associated urban social insurance systems will need to be further reformed.

Although our study is limited to just one county in northwest China, the issues discussed are likely to be of relevance to other parts of rural China characterized by imperfect and incomplete land rental and labor markets. The insights gained may also be useful for a wider range of developing countries (e.g. Ethiopia, Vietnam) with similar rural land tenure systems and underdeveloped land and labor markets. The main lessons to be learned from our study is that a focus on formal land rights in explaining agricultural productivity is likely to be too narrow, and that improved tenure security derived from land certificates may lower agricultural productivity due to the migration effect when land rental and labor markets are underdeveloped.

Another limitation of our study is the use of cross-section data (and lagged cross-section data) for the empirical analysis. It means that the potential endogeneity bias resulting from omitted variables, like unmeasured household characteristics, that influence both the dependent and the independent variables cannot be addressed. The robustness of the results obtained in our study should therefore preferably be checked through the use of panel data analysis (e.g. household fixed effect models) in future research.

Appendix: Regression results for participation in land rental market and rural-urban migration

Table A7.1 Definition of variables and descriptive statistics for land rental market and migration regressions

Variable	Definition	Mean	S.D.
Participation in land rental market and migration			
Renting in dummy	1= households rented in land, 0= otherwise	0.15	0.36
Migration dummy	1=households with at least one member living outside the county for employment purposes during the year preceding the survey, and 0 = other households	0.51	0.50
Village characteristics			
Distance to town	Average distance from the village to the nearest town (km)	4.81	4.32
Distance to county	Average distance from the village to the nearest county (km)	21.36	15.85
Village migration prevalence	Average number of migrants per household within the village in 2007	0.85	0.26
Land rental market	1 = village has more than 10% households rent out land in 2009, 0 = otherwise	0.18	0.39
Household characteristics			
Household trust towards kinship	Trust towards kinship, calculated by comprehensive questions about trust, in 2007	0.96	0.06
Household trust towards known people	Trust towards known people, calculated by comprehensive questions about trust, in 2007	0.79	0.11
Household trust towards strangers	Trust towards strangers, calculated by comprehensive questions about trust, in 2007	0.44	0.20
Risk aversion	Opinion about risk aversion statement, 1= disagree, 2=no opinion, 3= agree	1.85	0.98
Children ratio	Ratio of children (aged <16) to all workers in the household	0.28	0.32
Elderly people ratio	Ratio of elderly people (aged >65) to all workers in the household	0.12	0.27
Female ratio	Ratio of female workers to all workers in the household	0.48	0.16
Past migration experience	Largest duration of migration for all migrants in the household (years)	1.37	3.01
Land characteristics			
Lagged rented land area	Total area of land rented in by renting household in 2007 (mu)	2.29	6.50
Contracted land – labor ratio	Ratio of contracted (= allocated) land area to labor in the household (mu)	7.33	5.48
Water rights – irrigated land ratio	Ratio of water rights to the irrigated land area in the household	0.93	0.95

Does Tenure Security Matter?

Table A7.2 Regression results for participation in land rental market

Variable	Coefficient	Z-value
Land tenure variables		
Village perception on land readjustments	-0.60	-0.65
Village perception on land certificates	1.01**	2.33
Trust variables		
Trust towards kinship	0.47	0.19
Trust towards known people	0.96	0.80
Trust towards strangers	-0.81	-1.28
Other independent variables		
Lagged rented land area	1.56***	3.44
Distance to town	0.07**	2.03
Education of household head	-0.07**	-2.10
ln(Wealth)	0.14	1.27
Risk aversion	-0.38***	-3.20
Contracted land – labor ratio	-0.05	-1.42
Number of obs.	259	
(Pseudo) R ²	0.33	
% correct prediction	89.2	
Mean VIF	1.66	

Notes: *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

Table A7.3 Regression results for determinants of rural-urban migration

Variable	Coefficient	Z-value
Land tenure variables		
Village perception on land reallocations	-0.76***	-2.35
Village perception on land reallocations × Land rental market	0.89*	1.48
Village perception on land certificates	0.75**	1.88
Village perception on land certificates × Land rental market	-0.14*	-1.56
Other independent variables		
Distance to county	0.10	0.70
Village migration prevalence	0.90**	2.06
Children ratio	0.30	1.06
Elderly people ratio	0.09	0.28
Female ratio	-1.21**	-2.12
Average Age	-0.01	-0.67
Education of household head	-0.05*	-1.80
Past migration experience	0.17**	1.95
ln(Wealth)	3.09***	2.64
ln(Wealth) ²	-0.14***	-2.44
Contracted land – adult ratio	-0.03	-1.19
Water rights – irrigated land ratio	-0.19***	-2.53
Observations	259	
Mean VIF	1.87	
χ^2 - statistic for the sum of first two coefficients equates zero (P-value)	0.06(0.80)	
χ^2 - statistic for the sum of third and fourth coefficients equates zero(P-	2.54(0.10)	

Note: coefficient and Z-values are shown. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels respectively. Standard errors are robust to heteroskedasticity.

8. Discussion and Conclusions

8.1 Introduction

The main purpose of China's agricultural and rural policy is to maintain national food security and contribute to global food security through sustainable use of natural resources and improvements in long-term agricultural production capacity (Rosegrant and Cline 2003; Chen 2007). The rural land tenure system, as a fundamental institution shaping landholders behavior, plays a very important role in farm production as well as natural resource use, and has received much attention of researchers in China and other regions in the world (Besley 1995; Wen 1995; Deininger et al. 2002; Jacoby et al. 2002; Abdulai et al. 2011; Mullan et al. 2011). Since 1998, the Chinese government has implemented a series of market-oriented land tenure reforms that are meant to improve tenure security and stimulate transferability of rural land. Relevant laws include the Land Administration Law of 1998, the Rural Land Contract Law of 2002, the Property Law of 2007, and the Mediation and Arbitration of Rural Land Contract Disputes Law of 2009. Although these reforms have contributed to improved formal tenure security, it is not clear to what extent they contribute to agricultural production growth and sustainable land resource use.

This study systematically investigates the relationships between land tenure security, as affected by the recent market-oriented tenure reforms, and agricultural production in China. Based on the existing literature, four relationships are examined, namely the relationships between tenure security and land investments, land rental market development, rural-urban migration, and agricultural productivity and technical efficiency, respectively. The results of the study are intended to provide a full picture of the major linkages between land tenure security, household decisions and agricultural productivity in China. The obtained insights are expected to be relevant for the ongoing reforms of China's rural land tenure system and for related agricultural and rural policies in China. They may also prove useful for other developing countries having similar tenure systems that aim to provide rural households with secure and long-term formal land use rights.

The objective of this chapter is to present and discuss key findings emanating from the six independent chapters of this thesis and their potential policy implications. Moreover, the limitations of the study and some suggestions for further research are also discussed in this chapter. The remainder of the chapter is structured as follows. Section 8.2 briefly summarizes the key findings of this study. Section 8.3 presents two overall conclusions that can be drawn by combining the findings of all chapters. Section 8.4 discusses the contribution to ongoing scientific debates, and Section 8.5 presents policy implications. Section 8.6 concludes by presenting limitations of the study and offering some suggestions for further research.

8.2 Key findings

8.2.1 Actual and perceived tenure security are weaker than legal tenure security

The results of the investigation on the status of land tenure security indicate that actual land tenure security is lower than legal tenure security, and that large regional differences exist in actual tenure security. Although the recent land tenure reforms equally apply to all regions in China, we find that the ban on land reallocations is not enforced effectively in the case study area in Jiangxi Province, while the possession of land certificates is also much lower in that area than in the case study area in Gansu province.

Perceived tenure security is also lower than legal tenure security, and seems to be related to actual tenure security. Large shares of the interviewed household heads in both regions, but especially those in Jiangxi Province, do not agree with the policy of stabilizing land tenure and do not expect that no land reallocations will take place in the near future. Respondents in Gansu Province are much more positive about the importance of land certificates in protecting land rights than those in Jiangxi Province.

8.2.2 Land tenure reforms improve long-term investment environment

The results from the analysis using the real option model show that the market-oriented land tenure reforms have both a present value effect (PVE) and an option value effect (OVE) on land investments. The PVE represents the conventional impact of tenure (in)security on the present value of a land investment project. The OVE represents the change in the real option value of a land investment project, i.e. an indirect economic benefit to investment projects that are not undertaken immediately. If we ignore the OVE, we may underestimate the impact of market-oriented land tenure reforms on land value, and also incorrectly predict the likelihood of farmers undertaking investments in their land. In fact, by improving tenure security and land transferability, China's market-oriented land tenure reforms improve the long-term investment environment of land and eventually increase land value and farmers' welfare through increasing the indirect economic benefit (OVE) of land investment.

8.2.3 Causal relationships exist between perceived tenure security and investment

The results of this study indicate significant causal relationships between perceived land tenure security and land investment. Households who consider land certificates as important for protecting land rights are found to invest significantly more in irrigation canals construction and maintenance as compared to those who attach lower importance to land certificates. On the other hand, we find that perceived tenure security does not significantly affect individual investments in land leveling but that individual investments in land leveling contribute to higher perceived land tenure security. Households

Does Tenure Security Matter?

who made investments in land leveling expect fewer land reallocations in the future and attach a higher importance to land certificates in protecting land rights.

8.2.4 Tenure security induces land rental market development

The findings of this study show that the importance attached to land certificates in protecting land rights positively affects the probability of leasing land, the quantity of land that is leased, and the probability that a formal contract is used in the rental transaction. It suggests that well-functioning land certificates play a crucial role in the development of land rental markets. Expectations about the absence of land redistributions in the near future positively affect the likelihood that informal rental contracts are used, but have no significant effects on the probability of land renting and its quantity.

8.2.5 Tenure security has a mixed impact on rural-urban migration

This study finds that a greater importance attached to land certificates in protecting land rights significantly increases rural-urban migration. Households that expect that no land reallocation will occur in the near future show less rural-urban migration in villages where the land rental market has not developed, but the effect is insignificant in villages where a land rental market exists. The results further provide some tentative evidence that the positive effect on migration of well-functioning land certificates is larger in villages where land reallocation is expected to take place in the near future.

8.2.6 Tenure security has a mixed impact on agricultural productivity

This study focuses on the impact of tenure security on agricultural productivity through land rental market and migration effects, while controlling for the investment and input effects that are widely examined in the existing literature. The findings show that perceived tenure security provided by land certificates stimulates temporary migration by individuals, and thereby encourages part-time farming with relatively low agricultural productivity and technical efficiency. The renting out of land by migrant households can only partly make up for this negative effect, because land rental markets are thin and highly fragmented. For perceived tenure security provided by the absence of land reallocations in the near future, on the other hand, we find that it reduces migration in villages where land rental markets have not developed. As a consequence, tenure security provided by the absence of land reallocations in the near future has a positive impact on agricultural productivity and technical efficiency.

8.3 Overall conclusions

We can draw two main conclusions from the study as a whole. They are discussed in the following two sub-sections.

8.3.1 Perceived tenure security matters for household decisions

From Chapter 2 we learn that perceived tenure security is much weaker than legal tenure security, even though they are related to each other. The results from Chapter 4, 5 and 6 further indicate that in the context of well-defined legal land rights, as a case in Minle County, household perceptions of stronger tenure security have a significant impact on household decisions via (1) inducing household self-governed investments in irrigation canals construction and maintenance; (2) encouraging household participation in the land rental market; and (3) encouraging household participation in rural-urban migration. These positive relationships are found in particular for the importance attached by households to land certificates in protecting their land rights. Perceived tenure security provided by the absence of land reallocations in the near future, however, has either insignificant or opposite effects on the aforementioned household decisions. The main reason is that land certificates provide protection against all types of land expropriation. Besides land reallocations initiated by the village leader, they also provide protection against land requisitioning for urban or infrastructure development and against tenants refusing to return rented land. Moreover, households possessing land certificates are more likely to receive appropriate compensation payments in cases where land is expropriated.

8.3.2 Tenure reform performance is limited by imperfect factor markets

The conceptual framework in Chapter 7 indicates the existence of a land investment effect, an input use effect, a land market effect and a migration effect of land tenure security on agricultural productivity. However, these effects are limited by imperfections in the land rental and labor markets in China. Firstly, the investment effect is limited by underdeveloped land rental markets. The theoretical analysis from Chapter 3 indicates that the market-oriented reforms are more likely to elicit land investments in areas where land markets are well-developed. The empirical results from Chapter 5 further indicate that the rural land rental market is emerging but remains underdeveloped. Therefore, the investment incentive is weak in theory. This hypothesis is also supported by the empirical evidence obtained in Chapter 4 that land tenure security induces self-governed irrigation canals construction and maintenance but not individual land investments.

Secondly, the positive direct effect of tenure security on variable inputs use does not exist in China, because the current laws and regulations do not allow the use of land as collateral. Thirdly, the land market effect is weak because of underdeveloped and segmented rural land rental markets. The empirical results from Chapter 5 show that improved perceived tenure security provided by land certificates significantly affects land rental transactions, but that perceived tenure security provided by the absence of land reallocations in the near future does not significantly affect land rentals. The findings in Chapter 7 show that the majority of land transfers take place within villages and usually between households that are related through kinship. This seriously limits the transfer of land to high-productive households, and thereby decreases the positive land rental market effect of tenure security

Does Tenure Security Matter?

on productivity. And fourthly, the migration effect of tenure security on agricultural productivity is strongly negative under prevailing labor market imperfections. Empirical results from Chapter 6 show that improved land tenure security significantly stimulates rural-urban migration, but it is characterized by short duration migration of single persons instead of permanent migration by entire families. The results from Chapter 7 provide support for the hypothesis that part-time farming resulting from short duration, individual migration significantly reduces agricultural productivity.

In conclusion, theoretical arguments show that increased land tenure security can induce land investment, land rental market development and rural-urban migration, and can consequently improve agricultural productivity. However, the empirical evidence from a region characterized by important land rental and labor market imperfections shows that the impact is very limited under such circumstances and may even result in a negative impact of improved tenure security on agricultural productivity.

8.4 Scientific debates

The study contributes to ongoing scientific debates in the field of land tenure by providing theoretical and empirical evidences from a case study in China.

8.4.1 What matters for household decisions, perceived tenure or legal tenure?

There is a strong disagreement as to what constitutes land tenure security amongst development scholars and practitioners. Some have maintained that legal titles play a crucial role in farmers' decisions on investment, participation in land market, and other decisions, thus relying on the principle of legal tenure security (Deininger and Jin 2003; Smith 2004; Holden *et al.* 2007). Several recent studies (Migot-Adholla *et al.* 1991; Jansen and Roquas 1998; Sjaastad and Bromley 2000), on the other hand, stress that household perceptions of tenure security may be more important for investment decisions than legal arrangements and their implementation.

Some studies show that perceived tenure security matters for household investments in housing improvements (e.g. Migot-Adholla *et al.* 1991; Jansen and Roquas 1998; Sjaastad and Bromley 2000), for land investments (e.g. Holden and Yohannes 2002; Jacoby *et al.* 2002), and for rural-urban migration (e.g. Mullan *et al.* 2011). These studies use estimated probability of land tenure expropriation or expectation of the absence of land reallocations in the near future to measure perceived tenure security. This study uses a more comprehensive measure of perceived tenure security (i.e. household expectation of the absence of land reallocations in the near future, and importance attached by households to land certificates in protecting land rights) and provides empirical evidence for Minle County, Gansu Province in northwest China. First, the results show that farmer's perceived land tenure security is affected to some extent by legal tenure security, but the two are not the same

(Chapter 2). This finding is consistent with recent arguments that there may be considerable discrepancies between the two when the state capacity of implementing the rule of law is limited (Van Gelder 2007; Van Gelder 2009). Second, this study provides evidence that household perceptions of land tenure security have a significant impact on household decisions such as land investments (Chapter 4), participation in land rental market (Chapter 5) and rural-urban migration (Chapter 6).

8.4.2 Tenure security and investment: a reverse causal relationship?

Available studies claim that secure property rights over land encourage land investments through strengthening claims to the fruits of the investment (Banerjee and Ghatak 2004), allowing for gains from trade (Besley 1995; Deininger and Jin 2006) and increasing access to capital (Feder and Feeny 1991). In many traditional tenure systems in Africa, however, the primary purpose of households' investments, such as planting trees, is to establish implicit property rights to land and increase existing levels of tenure security (Deininger and Jin, 2003). Therefore, a reverse causal relationship is found between tenure security of informal (customary) land rights and land investments in some studies on Africa.

The reverse causal relationship is neglected in studies on China, because land tenure insecurity results to a large extent from land readjustments which are usually decided at the village level and are independent from household land management and investment decisions (Liu *et al.* 1998; Brandt *et al.* 2004). Yet, perceptions of tenure security may vary between households within the same village and may therefore affect household investment decisions. The results of Chapter 4 show that perceived land tenure security does not affect land leveling investments, but that investments in land leveling contribute to higher perceived land tenure security. This study therefore finds a reverse causal relationship between perceived tenure security and land investments in the case study region in northwest China.

8.4.3 Are household decisions linked to each other?

Rural household decisions, such as land investment, participation in land rental market, and rural-urban migration, may depend on observed and unobserved household and farm characteristics. A household therefore might make these decisions jointly. A crucial aspect here is the access of rural households to land, labor and other markets and the transaction costs involved in using these markets (De Janvry *et al.* 2006; De Janvry and Sadoulet 2006). Feng (2006) finds that household decisions of participation in land rental markets and off-farm employment are interlinked in a case study in Jiangxi Province. Interdependence of household decisions results in potential endogeneity of these decisions, which should be carefully addressed when examining the determinants of a particular decision.

Does Tenure Security Matter?

This study does not directly test the interdependence of household decisions on investments, land renting and migration. However, the findings do provide some important inputs into the debate. The analysis in Chapter 3 indicates that the recent market-oriented reforms are more likely to elicit land investments in areas where land markets are well-developed. The empirical results presented in Chapter 5 further suggest that household expectations that no land reallocations will occur in the near future have a negative impact on rural-urban migration in villages where the land rental market is underdeveloped, but no significant effect on rural-urban migration in villages where the land rental market has developed. Moreover, the findings of Chapter 4 and 5 show that the land rental market is thin and highly segmented in our research area while the labor market faces important bottlenecks, implying potential existence of interdependence between land renting and migration decisions.

8.4.4 Tenure security and productivity: incentive or disincentive?

Secure land tenure is considered an important catalyst for agricultural growth. However, the available empirical evidence is mixed. Studies on Asian experiences suggest a positive, but small in magnitude, effect of land tenure security on land productivity (Feder 1988; Feder and Nishio 1998; Li *et al.* 2000; Jacoby *et al.* 2002). The available evidence from studies on African experiences, however, is less conclusive. Some studies find that tenure security increases productivity (Deininger and Castagnini 2006; Deininger *et al.* 2008), but others find no evidence of productivity differences across different bundles of land rights (Place and Otsuka 2002; Pender *et al.* 2004).

This study argues that land tenure security can have four separate effects on agricultural production: an investment effect, an input effect, a land market effect and a migration effect. The investment and input effects affect land productivity, but not agricultural productivity (i.e. the ratio of agricultural output to the inputs used in producing it), because they affect the use of capital and variable inputs used in agricultural production. This study examines the impact of tenure security on agricultural productivity, and therefore focuses on the land market and migration effects. The strengths of these two effects are dependent on the local context and conditions within which tenure systems operate.

The land market effect and migration effect can play an important role in stimulating agricultural productivity in the context of well-developed land labor markets. A well-functioning land rental market will transfer land from low productive households to high productive households, and a well-functioning labor market will transfer households with low agricultural productivity from the agricultural sector to the non-agricultural sector. Therefore, more secure land tenure is expected to boost agricultural productivity. However, neither do well-functioning land rental markets nor labor market exists in many parts of rural China. Thin and segmented land markets limit the transfer of land to high productive households, and short-duration migration by single persons contributes to low efficient part-time farming. More secure land tenure may in fact suppress agricultural productivity

under such conditions, as we found for the tenure security derived from land certificates in our case study area.

8.5 Policy implications

The insights gained by this study may contribute to China's national food self-sufficiency goal and to global food security. In particular, policy implications coming out of the study refer to measures that can increase land investments, improve the functioning of the rural land rental market and remove rural-urban migration bottlenecks. Two strands of policies seem fundamental.

8.5.1 Land tenure reforms that focus on enhancing tenure security perceptions

Since 1998, the Chinese government has implemented a number of land-related laws and regulations which aim to increase legal land tenure security and transferability. These laws and regulations have established a context of well-defined formal land property rights from the perspective of legislation. However, household perceptions of land tenure security lag behind. It is the perceived tenure situation that forms the basis upon which a household can be expected to take decisions associated with land resource use. Perceived land tenure security is a crucial complement of legal tenure security. The focus of land tenure reforms may therefore shift towards measures which can improve perceived tenure security, rather than further legal land rights reforms or even privatization of land rights. Despite ongoing debates about the urgency of privatization of land rights in China, privatization of land right does not seem necessary nor urgent. Besides their current political unfeasibility, private land rights do not necessarily mean higher perceived tenure security, and therefore have an ambiguous impact on agricultural productivity in China.

Supplementary measures aimed at improving perceived tenure security consist of two major types. First, it is necessary to improve the dissemination of clear information about land-related laws and regulations, such as the scope of land reallocations and the importance of land certificates for pursuing rights in land conflicts. The results of Chapter 2 show that farm households frequently lack adequate information on their land rights. Second, household land rights stipulated by land-related laws and regulations need to be fully protected during mediation and arbitration of rural land conflicts. If properly implemented, the Mediation and Arbitration of Rural Land Contract Disputes Law (2009) may play an important role in this respect. The evidence presented in Chapter 2 shows that farmers in the two case study areas in Jiangxi and Gansu Province are still very reluctant to use legal ways for solving land conflicts.

8.5.2 Institutional reforms that improve the functioning of rural land rental and labor markets

As shown in this study, the impact that land tenure reforms have on farm household decisions depends to a large extent on the functioning of land rental and labor markets. Institutions such as the rural social insurance systems, the household registration system, and urban social insurance systems are important factors in land rental market development and rural-urban migration. Reforms of these systems may contribute to providing a better institutional environment in which more secure land tenure will have a more positive impact on agricultural productivity. First, it seems necessary to expand the current rural social insurance systems, so that farmers' reliance on rural land as a source of insurance against unemployment and health problems and as a source of income at old ages is reduced. When the insurance function of land is reduced, land rental market activities are expected to increase significantly. Second, the household registration system has been gradually reformed in recent years to relax constraints on rural-urban migration. Yet, at present urban social insurance is not fully offered to migrant households, and migrants continue to be constrained in their access to housing and education and health facilities, especially in mega-cities like Beijing, Shanghai and Guangzhou. These remaining institutional bottlenecks contribute to the high prevalence of short-duration and individual migration. Improving the access of migrant households to urban social insurance and other social services in urban areas is expected to reduce the prevalence of part-time farming in China, and thereby contribute to higher agricultural productivity. Third, trust plays a crucial role in land rental transactions. To reduce the current segmentation of land rental markets, it seems important to improve trust among non-kinship households. This may be done by stimulating more farmers' cooperatives and other collaboration opportunities among villagers.

8.6 Limitations and suggestions for further research

8.6.1 Limitations of this study

The approach used in this study faces four major limitations. Firstly, as in any other study in the field using cross-section data, this study might encounter endogeneity problems caused by omitted variables. Variables such as entrepreneurship or other unmeasured household characteristics that are not included in the analysis may be correlated with both the dependent variables and the regressors. The results obtained in the study are therefore valid to the extent that the impact of such omitted variables is negligible. Further tests, preferably based on panel data sets and controlling for relatively stable household characteristics, are needed to examine the robustness of the results obtained in this study.

Secondly, using real option value theory, Chapter 3 distinguishes a present value effect (PVE) and an option value effect (OVE) of the recent market-oriented land tenure reforms on land investments. The

OVE represents the change in the real option value of a land investment project. The cross-section, household level data used in this study, however, does not allow to estimate the size of the OVE. Panel data at the household level is needed to estimate this invisible indirect benefit of policy reforms, using real option model approaches (see e.g. approaches used by Carey and Zilberman 2002; Rahim *et al.* 2007; Wesseler *et al.* 2007; Towe *et al.* 2008; Wesseler 2009).

Thirdly, this study uses household-level data to examine the effect of land tenure security on land investment and agricultural production. However, both land investment and productivity are linked to specific plots. The use of plot level data allows to contrast the differences in land investment and agricultural production on different plots (i.e. contracted plots, formally rented plots and informally rented plots) that a household cultivates. This approach has also been suggested as a way to control for household-level unobservable effects (see Shaban 1987). Moreover, individual plot characteristics, such as fertility, slope and topsoil depth, can be used as control variables when examining the impact of plot-level investments on productivity (see e.g. approaches used by Jacoby *et al.* 2002; Feng *et al.* 2010).

Lastly, this study focuses on a relatively small region (Minle County, Gansu Province) within rural China. Many of the characteristics of this region, like the underdeveloped land rental and labor markets, can also be found in other economically underdeveloped regions within China. The insights gained in this study are therefore expected to be relevant for those regions too. In economically more developed areas, such as Jiangsu Province, Zhejiang Province and Guangdong Province, the land rental market is often more developed and more rural-urban migration is taking place. Care should therefore be taken in extrapolating the results from this study to those more developed rural areas in China.

8.6.2 Suggestions for further research

As will be clear from the previous section, future research in this field may in particular focus on collecting and analyzing panel data at the household and plot level in regions that differ in their level of economic development. This will make it possible to: (i) estimate the option value effect on investments; (ii) reduce the potential endogeneity bias caused by omitted variables through controlling for fixed effects; (iii) examine the effect of tenure security in economically developed areas in China, which are not addressed in the present study.

Moreover, based on the results and conclusions emanating from this study the following important research questions can be identified for future research. Firstly, Chapter 2 implies that both the formal institutional environment and informal (customary) rules determine the status of implementation of land tenure reforms and existing household perceptions of land tenure security. By identifying formal-

Does Tenure Security Matter?

and informal-specific key factors that explain differences in perceived and legal tenure security, further research would provide deeper insight into how to enhance land tenure security.

Secondly, Chapter 5 examines household choices of land rental contracts with a focus on the tenant and on formal versus informal contracts. As contract choice depends on negotiations between tenants and landlords, the landlord side should also be taken into account. Moreover, other contract features, such as kinship vs. non-kinship contracts, contract duration, rent type (output share or fixed rent), may also play an important role in shaping the contribution of further land rental market development to agricultural productivity. The analysis in Chapter 5, therefore, can be extended in future research by building up an integrated contract choice model which integrates tenant and landlord characteristics within a game theory framework, and by examining the key factors that determine the choice between kinship and non-kinship contracts, contract duration and rent type.

Thirdly, the empirical results of Chapter 7 indicate that the tenure security derived from land certificates has a negative effect on agricultural productivity and technical efficiency under the prevailing land and labor market conditions in our research area. Future research that quantifies the separate magnitudes of the land market effect and the migration effect will allow estimating the productivity gains from improvements in land rental markets and labor markets, respectively. Insight gained by such research, like those gained from research on the aforementioned two topics, may provide important background information for designing agricultural and rural policy reforms in China in the near future.

References

- Abdulai, A., V. Owusu and R. Goetz (2011). "Land tenure differences and investment in land improvement measures: Theoretical and empirical analyses." Journal of Development Economics **96**(1): 66-78.
- Ahmed, M.M., B. Gebremedhin, S. Benin and S. Ehui (2002). "Measurement and sources of technical efficiency of land tenure contracts in Ethiopia." Environment and Development Economics **7**(3): 507-527.
- Andersen, L.E. (2002). "Rural–urban migration in Bolivia: Advantages and disadvantages." La Paz, Bolivia: Instituto de Investigaciones Socio-económicas, Universidad Católica Boliviana. <http://www.econstor.eu/handle/10419/72834>.
- Arnot, C.D., M.K. Luckert and P.C. Boxall (2011). "What is tenure security? Conceptual implications for empirical analysis." Land Economics **87**(2): 297-311.
- Au, C.C. and J.V. Henderson (2006). "How migration restrictions limit agglomeration and productivity in China." Journal of Development Economics **80**(2): 350-388.
- Banerjee, A.V. and M. Ghatak (2004). "Eviction threats and investment incentives." Journal of Development Economics **74**(2): 469-488.
- Battese, G.E. and T.J. Coelli (1995). "A model for technical inefficiency effects in a stochastic frontier production function for panel data." Empirical Economics **20**(2): 325-332.
- Benin, S., M. Ahmed, J. Pender and S. Ehui (2005). "Development of land rental markets and agricultural productivity growth: the case of Northern Ethiopia." Journal of African Economies **14**(1): 21-54.
- Benjamin, D. and L. Brandt (2002). "Property rights, labor markets, and efficiency in a transition economy: the case of rural China." Canadian Journal of Economics **35**(4): 689-716.
- Berg, J., J. Dickhaut and K. McCabe (1995). "Trust, reciprocity, and social history." Games and Economic Behavior **10**(1): 122-142.
- Besley, T. (1995). "Property rights and investment incentives: Theory and evidence from Ghana." Journal of Political Economy **103**(5): 903-937.
- Bezabih, M. and S. Holden (2006). "Tenure insecurity, transaction costs in the land lease market and their implications for gendered productivity differentials." Paper presented at 26th International Conference of the International Association of Agricultural Economists, Brisbane, Australia. http://www6.bwl.uni-kiel.de/phd/downloads/schneider/ws0607/paper_bezabih.pdf.
- Binswanger, H.P., K. Deininger and G. Feder (1995). "Power, distortions, revolt and reform in agricultural land relations." In: T.P. Schultz and J. Strauss (eds.) Handbook of Development Economics. Amsterdam: North-Holland.
- Bouma, J., E. Bulte and D. Van Soest (2008). "Trust and cooperation: Social capital and community resource management." Journal of Environmental Economics and Management **56**(2): 155-166.
- Bouquet, E. (2009). "State-led land reform and local institutional change: Land titles, land markets and tenure security in Mexican communities." World Development **37**(8): 1390-1399.
- Brandt, L., S. Rozelle and M.A. Turner (2004). "Local government behavior and property right formation in rural China." Journal of Institutional and Theoretical Economics **160**(4): 627-662.
- Brasselle, A.S., F. Gaspart and J.P. Platteau (2002). "Land tenure security and investment incentives: Puzzling evidence from Burkina Faso." Journal of Development Economics **67**(2): 373-418.

Does Tenure Security Matter?

- Brogaard, R.J. (2005). "Land tenure insecurity and inequality in Nicaragua." Development and Change **36**(5): 845-864.
- Bromley, D. (2005). "The empty promises of formal titles: Creating Potemkin villages in the tropics." Madison, Wisconsin: University of Wisconsin, Department of Agricultural and Applied Economics.
- Bruce, J.W. and S.E. Migot-Adholla (eds.) (1994). Searching for Land Tenure Security in Africa. Dubuque: Kendall/Hunt.
- Cameron, A.C. and P.K. Trivedi (2010). Microeconometrics using Stata, revised edition, College Station, TX: Stata Press.
- Carey, J.M. and D. Zilberman (2002). "A model of investment under uncertainty: Modern irrigation technology and emerging markets in water." American Journal of Agricultural Economics **84**(1): 171-183.
- Carter, M.R. and P. Olinto (2003). "Getting institutions "right" for whom? Credit constraints and the impact of property rights on the quantity and composition of investment." American Journal of Agricultural Economics **85**(1): 173-186.
- Castro, V.W., N. Heerink, X. Shi and W. Qu (2010). "Water savings through off-farm employment?" China Agricultural Economic Review **2**(2): 167-184.
- Chand, S. and C. Yala (2009). "Land tenure and productivity: Farm-level evidence from Papua New Guinea." Land Economics **85**(3): 442-453.
- Chen, F. and J. Davis (1998). Land Reform in Rural China Since the Mid-1980s. Rome, Italy: FAO. ftp://ftp.fao.org/SD/SDA/SDAA/Lr98_2/art-9.pdf.
- Chen, J. (2007). "Rapid urbanization in China: A real challenge to soil protection and food security." Catena **69**(1): 1-15.
- Chen, Z., W. E. Huffman and S. Rozelle (2009). "Farm technology and technical efficiency: Evidence from four regions in China." China Economic Review **20**(2): 153-161.
- Coelli, T.J. (1995). "Recent developments in frontier modelling and efficiency measurement." Australian Journal of Agricultural Economics **39**(03).
- Coelli, T.J. (1996). "A guide to FRONTIER version 4.1: A computer program for stochastic frontier production and cost function estimation." Centre for Efficiency and Productivity Analysis (CEPA) working paper No. 96-07. Armidale, Australia: University of New England, Department of Econometrics.
- de Brauw, A. and R. Mu (2011). "Migration and the overweight and underweight status of children in rural China." Food Policy **36**(1): 88-100.
- de Brauw, A. and V. Mueller (2009). Do limitations in land rights transferability influence low mobility rates in Ethiopia?, mimeo. <http://www.csae.ox.ac.uk/conferences/2010-edia/papers/081-Mueller.pdf>.
- de Brauw, A. and S. Rozelle (2002). "Household investment through migration in rural China." Unpublished manuscript. Williamstown, MA: Williams College Department of Economics. http://scholar.google.com.hk/scholar?q=Household+investment+through+migration+in+rural+China&btnG=&hl=zh-CN&as_sdt=0%2C5#.
- de Brauw, A. and S. Rozelle (2008). "Migration and household investment in rural China." China Economic Review **19**(2): 320-335.
- De Janvry, A., M. Fafchamps and E. Sadoulet (1991). "Peasant household behaviour with missing markets: Some paradoxes explained." Economic Journal (**101**): 1400-1417.

- De Janvry, A. and E. Sadoulet (2006). "Progress in the modeling of rural households' behavior under market failures." In: A. de Janvry and R. Kanbur (eds.) Poverty, Inequality and Development: Essays in Honor of Erik Thorbecke. Boston, MA: Springer.
- De Janvry, A. and E. Sadoulet (2010). "Agricultural growth and poverty reduction: Additional evidence." World Bank Research Observer **25**(1): 1-20.
- de La Rupelle, M., D. Quheng, L. Shi and T. Vendryes (2010). "Land rights insecurity and temporary migration in rural China." IZA Discussion Paper No. 4668, Bonn, Germany: Institute for the Study of Labor (IZA). http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1530672IZA.
- de Souza, F.A.M. (1998). "Land tenure security and housing improvements in Recife, Brazil." Habitat International **23**(1): 19-33.
- de Souza, F.A.M. (2001). "Perceived security of land tenure in Recife, Brazil." Habitat International **25**(2): 175-190.
- de Vos, B.I. and A.P.J. Mol (2010). "Changing trust relations within the Dutch fishing industry: The case of National Study Groups." Marine Policy **34**(5): 887-895.
- Deininger, K. (2003). "Land markets in developing and transition economies: Impact of liberalization and implications for future reform." American Journal of Agricultural Economics **85**(5): 1217-1222.
- Deininger, K. and D.A. Ali (2008). "Do overlapping land rights reduce agricultural investment? Evidence from Uganda." American Journal of Agricultural Economics **90**(4): 869-882.
- Deininger, K., D.A. Ali and T. Alemu (2011). "Impacts of land certification on tenure security, investment, and land market participation: Evidence from Ethiopia." Land Economics **87**(2): 312-334.
- Deininger, K., D.A. Ali and T. Yamano (2008). "Legal knowledge and economic development: The case of land rights in Uganda." Land Economics **84**(4): 593-619.
- Deininger, K. and R. Castagnini (2006). "Incidence and impact of land conflict in Uganda." Journal of Economic Behavior & Organization **60**(3): 321-345.
- Deininger, K. and G. Feder (2001). "Land institutions and land markets." In: B.L. Gardner and G.C. Rausser (eds.) Handbook of Agricultural Economics. Amsterdam: North-Holland.
- Deininger, K. and S. Jin (2002). "Land rental markets as an alternative to government reallocation? Equity and efficiency considerations in the Chinese land tenure system." World Bank Policy Research Working Paper 2930. Washington, DC: World Bank.
- Deininger, K. and S. Jin (2003). "The impact of property rights on household's investment, risk coping, and policy preferences: Evidence from China." Economic Development and Cultural Change **51**(4): 851-882.
- Deininger, K. and S. Jin (2003). "Land sales and rental markets in transition: Evidence from rural Vietnam." World Bank Policy Research Working Paper No. 3013. Washington, DC: World Bank.
- Deininger, K. and S. Jin (2005). "The potential of land rental markets in the process of economic development: Evidence from China." Journal of Development Economics **78**(1): 241-270.
- Deininger, K. and S. Jin (2006). "Tenure security and land-related investment: Evidence from Ethiopia." European Economic Review **50**(5): 1245-1277.
- Deininger, K. and S. Jin (2009). "Securing property rights in transition: Lessons from implementation of China's rural land contracting law." Journal of Economic Behavior & Organization **70**(1): 22-38.

Does Tenure Security Matter?

- Deininger, K., S. Jin, X. Zude and S. Rozelle (2004). "Implementing China's New Land Law: Evidence and Policy Lessons." http://iis-db.stanford.edu/pubs/21648/land_rental_and_community_land_laws_jin.pdf.
- Deininger, K. and E. Zegarra (2003). "Determinants and impacts of rural land market activity: Evidence from Nicaragua." *World Development* **31**(8): 1385-1404.
- Deininger, K. (2003). *Land Policies for Growth and Poverty Reduction*. Washington, DC: World Bank.
- Deininger, K., J.S. Chamorro and W.B.D.R. Group (2002). "Investment and income effects of land regularization." Policy Research Working Paper no. 2752. Washington D.C, World Bank.
- Demsetz, H. (1967). "Toward a theory of property rights." *American Economic Review* **57**(2): 347-359.
- Dixit, A.K. and R.S. Pindyck (1994). *Investment Under Uncertainty*. Princeton: Princeton University Press.
- Djajic, S. and R. Milbourne (1988). "A general equilibrium model of guest-worker migration: The source-country perspective." *Journal of International Economics* **25**(3-4): 335-351.
- Du, Y., A. Park and S. Wang (2005). "Migration and rural poverty in China." *Journal of Comparative Economics* **33**(4): 688-709.
- Ezra, M. (2003). "Environmental vulnerability, rural poverty, and migration in Ethiopia: a contextual analysis." *Genus* **59**(2): 63-91.
- Feder, G. (1988). *Land Policies and Farm Productivity in Thailand*. Baltimore: Johns Hopkins University Press.
- Feder, G. and D. Feeny (1991). "Land tenure and property rights: Theory and implications for development policy." *World Bank Economic Review* **5**(1): 135-153.
- Feder, G., L. Lawrence J. and J.Y. Lin (1992). "The determinants of farm investment and residential construction in post-reform China." *Economic Development and Cultural Change* **41**(1): 1-26.
- Feder, G. and A. Nishio (1998). "The benefits of land registration and titling: Economic and social perspectives." *Land Use Policy* **15**(1): 25-43.
- Feng, S. (2006). *Land Rental Market and Off-farm Employment-rural Households in Jiangxi Province, P.R.China*. Ph.D. thesis. Wageningen, The Netherlands: Wageningen University.
- Feng, S. (2008). "Land rental, off-farm employment and technical efficiency of farm households in Jiangxi Province, China." *NJAS-Wageningen Journal of Life Sciences* **55**(4): 363-378.
- Feng, S., N. Heerink, R. Ruben and F. Qu (2010). "Land rental market, off-farm employment and agricultural production in Southeast China: A plot-level case study." *China Economic Review* **21**(4): 598-606.
- Fenske, J. (2010). "Land tenure and investment incentives: Evidence from West Africa." *Journal of Development Economics* **95**(2): 137-156.
- Fischer, J.A.V. (2008). "Is competition good for trust? Cross-country evidence using micro-data." *Economics Letters* **100**(1): 56-59.
- Fukuyama, F. (1995). *Trust: The Social Virtues and the Creation of Property*. London: Penguin.
- Gavian, S. and S. Ehui (1999). "Measuring the production efficiency of alternative land tenure contracts in a mixed crop-livestock system in Ethiopia." *Agricultural Economics* **20**(1): 37-49.
- Gebremedhin, B., J. Pender and S. Ehui (2003). "Land tenure and land management in the highlands of northern Ethiopia." *Ethiopian Journal of Economics* **8**(2): 47-63.
- Giles, J. and R. Mu (2007). "Elderly parent health and the migration decisions of adult children: Evidence from rural China." *Demography* **44**(2): 265-288.

- Giles, J. and R. Mu (2012). Village political economy, land tenure insecurity and the rural to urban migration decision: Evidence from China. Unpublishing manuscript.
<http://www.aeaweb.org/aea/2013conference/program/retrieve.php?pdfid=455>.
- Guang, L. and L. Zheng (2005). "Migration as the second-best option: Local power and off-farm employment." China Quarterly **181**(1): 22-45.
- Hagos, F. and S. Holden (2006). "Tenure security, resource poverty, public programs, and household plot-level conservation investments in the highlands of northern Ethiopia." Agricultural Economics **34**(2): 183-196.
- Hazell, P. (1993). "Productivity effects of indigenous land tenure systems in sub-Saharan Africa." American Journal of Agricultural Economics **75**(1): 10-19.
- Heckman, J.J. (1979). "Sample selection bias as a specification error." Econometrica **47**(1): 153-161.
- Hill, R.V. (2010). "Investment and abandonment behavior of rural households: An empirical investigation." American Journal of Agricultural Economics **92**(4): 1065-1086.
- Hinrichs, J., O. Musshoff and M. Odening (2008). "Economic hysteresis in hog production." Applied Economics **40**(3): 333-340.
- Ho, P. (2005). Institutions in Transition: Land Ownership, Property Rights, and Social Conflict in China. Oxford: Oxford University Press..
- Holden, S., K. Deininger and H. Ghebru (2007). "Impact of land certification on land rental market participation in Tigray region, Northern Ethiopia." MPRA Paper No. 5211, Norwegian University of Life Sciences.
<http://mpa.ub.uni-muenchen.de/5211>.
- Holden, S. and H. Ghebru (2005). "Kinship, transaction costs and land rental market participation." Discussion paper, Department of Economics and Management, Norwegian University of Life Sciences.
http://www.umb.no/statisk/dreprojects/data/discussion_paper_files/kinship_and_land_rental_market_participation3.pdf.
- Holden, S. and H. Yohannes (2002). "Land redistribution, tenure insecurity, and intensity of production: A study of farm households in Southern Ethiopia." Land Economics **78**(4): 573.
- Hossain, M. and M. Hussain (1977). "Farm size, tenancy and land productivity: an analysis of farm level data in Bangladesh agriculture." Bangladesh Development Studies **5**(3): 285-348.
- Huang, J., R. Hu, S. Rozelle and C. Pray (2005). "Insect-resistant GM rice in farmers' fields: Assessing productivity and health effects in China." Science **308**(5722): 688-690.
- Huang, J., F. Qiao, L. Zhang and S. Rozelle (2001). "Farm pesticide, rice production, and human health." EPSEA Research report. Singapore: EEPSEA. <http://www.eepsea.net/pub/rr/10536115330ACF268.pdf>
- Jacoby, H.G., G. Li and S. Rozelle (2002). "Hazards of expropriation: Tenure insecurity and investment in rural China." American Economic Review **92**(5): 1420-1447.
- Jansen, K. and E. Roquas (1998). "Modernizing insecurity: the land titling project in Honduras." Development and Change **29**(1): 81-106.
- Jin, S. and K. Deininger (2009). "Land rental markets in the process of rural structural transformation: Productivity and equity impacts from China." Journal of Comparative Economics **37**(4): 629-646.

Does Tenure Security Matter?

- Kabubo-Mariara, J., V. Linderhof and G. Kruseman (2010). "Does land tenure security matter for investment in soil and water conservation? Evidence from Kenya." African Journal of Agricultural and Resource Economics **4**(2): 123-139.
- Kabubo-Mariara, J., V. Linderhof, G. Kruseman, R. Atieno and G. Mwabu (2006). "Household welfare, investment in soil and water conservation and tenure security: Evidence from Kenya." PREM Working Paper, No. 06-6. <http://www.prem-online.org/archive/9/doc/PREM%20WP%2006-06.pdf>.
- Kassie, M., M. Jaleta, B.A. Shiferaw, F. Mmbando and M. Mekuria (2012). "Interdependence in farmer technology adoption decisions in smallholder systems: Joint estimation of investments in sustainable agricultural practices in rural Tanzania." Paper presented at 2012 Annual Meeting of Agricultural and Applied Economics Association, August 12-14, 2012, Seattle, Washington. <http://purl.umn.edu/126791>.
- Keys, E. and W.J. McConnell (2005). "Global change and the intensification of agriculture in the tropics." Global Environmental Change **15**(4): 320-337.
- Kimhi, A. (2004). "Family composition and off-farm participation decisions in Israeli farm households." American Journal of Agricultural Economics **86**(2): 502-512.
- Knack, S. and P. Keefer (1997). "Does social capital have an economic payoff? a cross-country investigation." Quarterly Journal of Economics **112**(4): 1251-1288.
- Knight, J. and L. Song (2003). "Chinese peasant choices: Migration, rural industry or farming." Oxford Development Studies **31**(2): 123-148.
- Krusekopf, C.C. (2002). "Diversity in land-tenure arrangements under the household responsibility system in China." China Economic Review **13**(2): 297-312.
- Kuiper, M., N. Heerink, S. Tan, Q. Ren and X. Shi (2001). "Report of village selection for the three villages survey." Unpublished manuscript. Wageningen, The Netherlands: Wageningen University.
- Kumbhakar, S.C., S. Ghosh and J.T. McGuckin (1991). "A generalized production frontier approach for estimating determinants of inefficiency in US dairy farms." Journal of Business & Economic Statistics **9**(3): 279-286.
- Kung, J.K. (2000). "Common property rights and land reallocation in rural China: Evidence from a village survey." World Development **28**(4): 701-719.
- Kung, J.K. and S. Liu (1997). "Farmer's preferences regarding ownership and land tenure in post-Mao China: Unexpected evidence from eight counties." China Journal **38**: 33-63.
- Kung, J.K. (2002). "Off-farm labor markets and the emergence of land rental markets in rural China." Journal of Comparative Economics **30**(2): 395-414.
- Lemel, H. (1988). "Land titling: Conceptual, empirical and policy issues." Land Use Policy **5**(3): 273-290.
- Leonard, T., R.T.A. Croson and A. De Oliveira (2010). "Social capital and public goods." Journal of Socio-Economics **39**(4): 474-481.
- Li, G., S. Rozelle and L. Brandt (1998). "Tenure, land rights, and farmer investment incentives in China." Agricultural Economics **19**(1): 63-71.
- Li, G., S. Rozelle and J. Huang (2000). "Land rights, farmer investment incentives, and agricultural production in China." Working paper No.00-024, Davis, CA: University of California, Department of Agricultural and Resource Economics.

- Liang, Z. and Y.P. Chen (2007). "The educational consequences of migration for children in China." *Social Science Research* **36**(1): 28-47.
- Lin, J.Y. (1992). "Rural reforms and agricultural growth in China." *American Economic Review* **82**(1): 34-51.
- Lin, Z. and L. Zhang (2006). "Gender, land and local heterogeneity." *Journal of Contemporary China* **15**(49): 637-650.
- Liu, S., M.R. Carter and Y. Yang. (1998). "Dimensions and diversity of property rights in rural China: Dilemmas on the road to further reform " *World Development* **26**(10): 1789-1806.
- Liu, Y., D. Wang, J. Gao and W. Deng (2005). "Land use/cover changes, the environment and water resources in Northeast China." *Environmental Management* **36**(5): 691-701.
- Lohmar, B., J. Wang, S. Rozelle, J. Huang and D. Dawe (2003). "China's agricultural water policy reforms: Increasing investment, resolving conflicts, and revising incentives." Agriculture Information Bulletin Number 782. Washington, DC: United States Department of Agriculture, Economic Research Service.
<http://naldc.nal.usda.gov/download/34136/PDF>
- Lohmar, B., Z. Zhang and A. Somwaru (2001). "Land rental market development and agricultural production in China." Paper presented at Annual Meeting of the American Agricultural Economics Association.
<http://ageconsearch.umn.edu/bitstream/20683/1/sp01lo01.pdf>
- Lu, Z. and S. Song (2006). "Rural–urban migration and wage determination: The case of Tianjin, China." *China Economic Review* **17**(3): 337-345.
- Ma, X., N. Heerink, E. van Ierland, M. van den Berg and X. Shi (2013a). "Land tenure security and land investments in Northwest China." *China Agricultural Economic Review* **5**(2): 281-307.
- Ma, X., J. Wesseler, N. Heerink and F. Qu (2013b). "Land tenure reforms and land conservation investments in China – what does real option value theory tell us?" *Review of Economics & Finance* **3**: 19-33.
- Maart-Noelck, S.C. and O. Musshoff (2013). "Investing today or tomorrow? An experimental approach to farmers' decision behaviour." *Journal of Agricultural Economics* **64**(2): 295-318.
- Macours, K., A. De Janvry and E. Sadoulet (2004). "Insecurity of property rights and matching in the tenancy market." CUDARE Working Paper Series 0992, Berkeley, CA: University of California, Department of Agricultural and Resource Economics and Policy. <http://escholarship.org/uc/item/8r7938m3>.
- Macours, K. and J. F. M. Swinnen (2002). "Patterns of agrarian transition." *Economic Development and Cultural Change* **50**(2): 365-394.
- Masterson, T. (2007). "Productivity, technical efficiency, and farm size in Paraguayan agriculture." Working Paper No. 490. Annandale-on-Hudson, NY: Bard College, Levy Economics Institute.
www.levyinstitute.org/pubs/wp_490.pdf
- Mbah, M.L.N., G.A. Forster, J.H. Wesseler and C.A. Gilligan (2010). "Economically optimal timing for crop disease control under uncertainty: an options approach." *Journal of the Royal Society Interface* **7**(51): 1421-1428.
- McDonald, R.L. and D. Siegel (1986). "The value of waiting to invest." *Quarterly Journal of Economics* **101**(4): 707–727.
- McKenzie, D. and H. Rapoport (2007). "Network effects and the dynamics of migration and inequality: Theory and evidence from Mexico." *Journal of Development Economics* **84**(1): 1-24.

Does Tenure Security Matter?

- McMillan, J., J. Whalley and L. Zhu (1989). "The impact of China's economic reforms on agricultural productivity growth." Journal of Political Economy **97**(4): 781–807.
- Meng, X. and J. Zhang (2001). "The two-tier labor market in urban China: Occupational segregation and wage differentials between urban residents and rural migrants in Shanghai." Journal of Comparative Economics **29**(3): 485-504.
- Migot-Adholla, S., P. Hazell and B. Blarel (1991). "Indigenous land rights systems in sub-Saharan Africa: a constraint on productivity?" World Bank Economic Review **5**(1): 155-175.
- Mullan, K., P. Grosjean and A. Kontoleon (2011). "Land tenure arrangements and rural–urban migration in China." World Development **39**(1): 123-133.
- Murphy, R. (2002). How Migrant Labor is Changing Rural China, Cambridge, UK: Cambridge University Press.
- National Bureau of Statistics (NBS) (2010a). China Statistical Yearbook. Beijing: China Statistical Publishing House. (in Chinese)
- National Bureau of Statistics (NBS) (2010b). China Rural Statistical Yearbook. Beijing: China Statistical Publishing House. (in Chinese)
- National Bureau of Statistics (NBS) (2011a). China Statistical Yearbook. Beijing, China Statistical Publishing House. (in Chinese)
- National Bureau of Statistics (NBS) (2011b). China Rural Statistical Yearbook (in Chinese). Beijing, China Statistical Publishing House. (in Chinese)
- National Bureau of Statistics (NBS) (2012). Report on the Situation of Rural Migrant Workers in 2011. Beijing: China Statistical Publishing House. (in Chinese)
- Nguyen, T., E. Chen and C. Findlay (1996). "Land fragmentation and farm productivity in China in the 1990s." China Economic Review **7**(2): 169-180.
- Oostendorp, R.H. and F. Zaal (2012). "Land acquisition and the adoption of soil and water conservation techniques: a duration analysis for Kenya and the Philippines." World Development **40**(6): 1240-1254.
- Ostrom, E. (1998). "A behavioral approach to the rational choice theory of collective action: Presidential address, American Political Science Association, 1997." American Political Science Review **92**(1): 1-22.
- Pagiola, S. (1999). "Economic analysis of rural land administration projects." Washington DC: World Bank, Land Policy and Administration Thematic Team.
http://scholar.google.com.hk/scholar?q=Economic+analysis+of+rural+land+administration+projects&btnG=&hl=zh-CN&as_sdt=0%2C5.
- Parks, C.D. and L.G. Hulbert (1995). "High and low trusters' responses to fear in a payoff matrix." Journal of Conflict Resolution **39**(4): 718-730.
- Payne, G.K. (2002). Land, Rights & Innovation: Improving Tenure Security for the Urban Poor. London: ITDG.
- Pender, J., E. Nkonya, P. Jagger, D. Sserunkuuma and H. Ssali (2004). "Strategies to increase agricultural productivity and reduce land degradation: evidence from Uganda." Agricultural Economics **31**(3): 181-195.
- Piotrowski, S. (2009). Land Property Rights and Natural Resource Use: An Analysis of Household Behavior in Rural China. Frankfurt, Germany: Peter Lang.

- Place, F. (2009). "Land tenure and agricultural productivity in Africa: a comparative analysis of the economics literature and recent policy strategies and reforms." *World Development* **37**(8): 1326-1336.
- Place, F. and K. Otsuka (2002). "Land tenure systems and their impacts on agricultural investments and productivity in Uganda." *Journal of Development Studies* **38**(6): 105-128.
- Qu, F., N. Heerink and W. Wang (1995). "Land administration reform in China: Its impact on land allocation and economic development." *Land Use Policy* **12**(3): 193-203.
- Qu, F., A. Kuyvenhoven, X. Shi and N. Heerink (2011). "Sustainable natural resource use in rural China: Recent trends and policies." *China Economic Review* **22**(4): 444-460.
- Rahim, A., E. van Ierland and J. Wesseler (2007). "Economic incentives for entry and exit in gum arabic agroforestry system in Sudan." *Forest Policy and Economics* **10**(1): 36-47.
- Reddy, M. (2011). "Implication of tenancy status on productivity and efficiency: Evidence from Fiji." *Sri Lankan Journal of Agricultural Economics* **4**(1): 19-37.
- Rivers, D. and Q.H. Vuong (1988). "Limited information estimators and exogeneity tests for simultaneous probit models." *Journal of Econometrics* **39**(3): 347-366.
- Roquas, E. (2002). *Stacked Law: Land, Property and Conflict in Honduras*. Amsterdam: Rozenberg..
- Rosegrant, M.W. and S.A. Cline (2003). "Global food security: challenges and policies." *Science* **302**(5652): 1917-1919.
- Rosegrant, M.W., M.S. Paisner, S. Meijer and J. Witcover (2001). *Global Food Projections to 2020*. Washington D.C.: International Food Policy Research Institute.
- Rozelle, S., L. Guo, M. Shen, A. Hughart and J. Giles (1999). "Leaving China's farms: Survey results of new paths and remaining hurdles to rural migration." *China Quarterly* **158**(3): 367-393.
- Rozelle, S., J.E. Taylor and A. de Brauw (1999). "Migration, remittances, and agricultural productivity in China." *American Economic Review* **89**(2): 287-291.
- Ruttan, V.W. (2002). "Productivity growth in world agriculture: Sources and constraints." *Journal of Economic Perspectives* **16**(4): 161-184.
- Sarkar, S. (2000). "On the investment–uncertainty relationship in a real options model." *Journal of Economic Dynamics and Control* **24**(2): 219-225.
- Shaban, R.A. (1987). "Testing between competing models of sharecropping." *Journal of Political Economy* **95**(5): 893-920.
- Sherlund, S.M., C.B. Barrett and A.A. Adesina (2002). "Smallholder technical efficiency controlling for environmental production conditions." *Journal of Development Economics* **69**(1): 85-101.
- Shi, X. (2007). *Away from the Farm - The Impact of Off-farm Employment on Farm Production, Factor Market Development and Sustainable Land Use in Jiangxi Province, P. R. China*. Maastricht, Netherlands: Shaker.
- Shi, X., N. Heerink and F. Qu (2007). "Choices between different off-farm employment sub-categories: an empirical analysis for Jiangxi Province, China." *China Economic Review* **18**(4): 438-455.
- Shi, X., N. Heerink and F. Qu (2011). "Does off-farm employment contribute to agriculture-based environmental pollution? New insights from a village-level analysis in Jiangxi Province, China." *China Economic Review* **22**(4): 524-533.

Does Tenure Security Matter?

- Shiferaw, B. and S.T. Holden (1998). "Resource degradation and adoption of land conservation technologies in the Ethiopian Highlands: a case study in Andit Tid, North Shewa." Agricultural Economics **18**(3): 233-247.
- Shreve, S.E. (2004). Stochastic Calculus for Finance II: Continuous-Time Models. New York: Springer.
- Sjaastad, E. and D.W. Bromley (2000). "The prejudices of property rights: On individualism, specificity, and security in property regimes." Development Policy Review **18**(4): 365-389.
- Smith, R.E. (2004). "Land tenure, fixed investment, and farm productivity: Evidence from Zambia's southern province." World Development **32**(10): 1641-1661.
- Tan, R., F. Qu, N. Heerink and E. Mettepenningen (2011). "Rural to urban land conversion in China - How large is the over-conversion and what are its welfare implications?" China Economic Review **22**(4): 474-484.
- Tan, S. (2006). Land Fragmentation and Rice Production: A Case Study of Small Farms in Jiangxi Province, P.R. China. Ph.D. thesis. Wageningen, The Netherlands: Wageningen University.
- Tan, S., N. Heerink, A. Kuyvenhoven and F. Qu (2010). "Impact of land fragmentation on rice producers' technical efficiency in South-East China." NJAS-Wageningen Journal of Life Sciences **57**(2): 117-123.
- Tan, S., N. Heerink and F. Qu (2006). "Land fragmentation and its driving forces in China." Land Use Policy **23**(3): 272-285.
- Tao, R. and Z. Xu (2007). "Urbanization, rural land system and social security for migrants in China." Journal of Development Studies **43**(7): 1301-1320.
- Taylor, J. E. and P. L. Martin (2001). "Human capital: Migration and rural population change." In: B.L. Gardner and G.C. Rausser (eds.) Handbook of Agricultural Economics. Amsterdam: North-Holland.
- Taylor, J. E., S. Rozelle and A. de Brauw (2003). "Migration and incomes in source communities: a new economics of migration perspective from China." Economic Development and Cultural Change **52**(1): 75-101.
- Teklu, T. and A. Lemi (2004). "Factors affecting entry and intensity in informal rental land markets in Southern Ethiopian highlands." Agricultural Economics **30**(2): 117-128.
- Towe, C.A., C.J. Nickerson and N. Bockstael (2008). "An empirical examination of the timing of land conversions in the presence of farmland preservation programs." American Journal of Agricultural Economics **90**(3): 613-626.
- Trigeorgis, L. (1998). Real Options. Cambridge, MA: MIT Press.
- Tu, Q. and E. Bulte (2010). "Trust, market participation and economic outcomes: Evidence from rural China." World Development **38**(8): 1179-1190.
- Tu, Q., A.P.J. Mol, L. Zhang and R. Ruben (2011). "How do trust and property security influence household contributions to public goods? The case of the sloping land conversion program in China." China Economic Review **22**(4): 499-511.
- Valsecchi, M. (2010). "Land certification and international migration: Evidence from Mexico." Working Papers in Economics 440. Gothenburg, Sweden: University of Gothenburg, School of Business, Economics and Law, Department of Economics. <https://gupea.ub.gu.se/handle/2077/22255>.
- Van Gelder, J.L. (2007). "Feeling and thinking: Quantifying the relationship between perceived tenure security and housing improvement in an informal neighbourhood in Buenos Aires." Habitat International **31**(2): 219-231.

- Van Gelder, J.L. (2009). "Legal tenure security, perceived tenure security and housing improvement in Buenos Aires: an attempt towards integration." International Journal of Urban and Regional Research **33**(1): 126-146.
- Van Gelder, J.L. (2010). "What tenure security? The case for a tripartite view." Land Use Policy **27**(2): 449-456.
- Vendryes, T. (2010). "Land rights in rural China since 1978: Reforms, successes, and shortcomings." China Perspectives, <http://chinaperspectives.revues.org/5345>.
- Wan, G.H. and E. Cheng (2001). "Effects of land fragmentation and returns to scale in the Chinese farming sector." Applied Economics **33**(2): 183-194.
- Wang, H., C. Liu and L. Zhang (2002). "Water-saving agriculture in China: an overview." Advances in Agronomy **75**: 135-171.
- Wang, H., J. Tong, F. Su, G. Wei and R. Tao (2011). "To reallocate or not: Reconsidering the dilemma in China's agricultural land tenure policy." Land Use Policy **28**(4): 805-814.
- Wang, H.J. and P. Schmidt (2002). "One-step and two-step estimation of the effects of exogenous variables on technical efficiency levels." Journal of Productivity Analysis **18**(2): 129-144.
- Weaver, R.D. and J. Wessler (2004). "Monopolistic pricing power for transgenic crops when technology adopters face irreversible benefits and costs." Applied Economics Letters **11**(15): 969-973.
- Wen, G.J. (1995). "The land tenure system and its saving and investment mechanism: the case of modern China." Asian Economic Journal **9**(3): 233-260.
- Wessler, J. (2009). "The Santaniello theorem of irreversible benefits." AgBioForum **12**: 8-13.
- Wessler, J., S. Scatista and E. Nillesen (2007). "The maximum incremental social tolerable irreversible costs (MISTICs) and other benefits and costs of introducing transgenic maize in the EU-15." Pedobiologia **51**(3): 261-269.
- Whalley, J. and S. Zhang (2007). "A numerical simulation analysis of (Hukou) labor mobility restrictions in China." Journal of Development Economics **83**(2): 392-410.
- Wong, K.P. (2007). "The effect of uncertainty on investment timing in a real options model." Journal of Economic Dynamics & Control **31**(7): 2152-2167.
- Wooldridge, J.M. (2002). Econometric Analysis of Cross Section and Panel Data. Cambridge, MA: MIT Press.
- World Bank (2001). China: Air, land and water. Washington, D.C., World Bank.
- World Bank (2007). World Development Report 2008: Agriculture for Development. Washington, DC, World Bank.
- World Commission on Environment and Development (WCED) (1987). Our Common Future. Oxford, UK: Oxford University Press.
- Wouterse, F.S. (2006). Survival or Accumulation: Migration and Rural Households in Burkina Faso. Ph.D. thesis. Wageningen, The Netherlands: Wageningen University.
- Xing, L., S. Fan, X. Luo and X. Zhang (2006). "Village inequality in Western China: Implications for development strategy in lagging regions." DSGD discussion papers 31. Washington, DC: International Food Policy Research Institute. <http://www.ifpri.org/sites/default/files/publications/dsgdp31.pdf>
- Yang, D.T. (1997). "China's land arrangements and rural labor mobility." China Economic Review **8**(2): 101-115.

Does Tenure Security Matter?

- Yao, Y. (1995). "Institutional arrangements, tenure insecurity and agricultural productivity in post reform rural China." Working Paper. Madison, WI: University of Wisconsin, Department of Agricultural Economics.
- Yao, Y. (2001). "Egalitarian land distribution and labor migration in rural China." China Center for Economic Research Working Paper Series, E2001007. <http://old.ccer.edu.cn/workingpaper/paper/e2001007.pdf>.
- Yao, Y. (2007). "The Chinese land tenure system: Practice and perspectives." In: A. Gulati and S. Fan (eds.) The Dragon and the Elephant: A Comparison of China and India. Baltimore, Md.: Johns Hopkins University Press.
- Zhang, J. (2007). "Barriers to water markets in the Heihe River basin in northwest China." Agricultural Water Management **87**(1): 32-40.
- Zhang, K.H. and S. Song (2003). "Rural–urban migration and urbanization in China: Evidence from time-series and cross-section analyses." China Economic Review **14**(4): 386-400.
- Zhang, Q.F., M. Qingguo and X. Xu (2004). "Development of land rental markets in rural Zhejiang: Growth of off-farm jobs and institution building." China Quarterly **180**(1): 1050-1072.
- Zhang, Y., X. Wang, T. Glauben and B. Brümmer (2011). "The impact of land reallocation on technical efficiency: evidence from China." Agricultural Economics **42**(4): 495-507.
- Zhao, Y. (1999). "Leaving the countryside: rural-to-urban migration decisions in China." American Economic Review **89**(2): 281-286.

Summary

The main purpose of China's agricultural and rural policy is to maintain national food security and to contribute to global food security through sustainable use of natural resources and improvements in long-term agricultural production capacity. In many parts of China, however, intensive agriculture and the associated degradation of land and water resources are deteriorating the long-term agricultural production capacity. The land tenure system, as a fundamental institution shaping landholders behavior, plays a very important role in farm production as well as natural resource use, and has received much attention of researchers in China and other regions in the world. Since 1998, the Chinese government has implemented a series of market-oriented land tenure reforms that are meant to improve tenure security and stimulate transferability of rural land. Relevant laws include the Land Administration Law of 1998, the Rural Land Contract Law of 2002, the Property Law of 2007, and the Mediation and Arbitration of Rural Land Contract Disputes Law of 2009. Although these reforms have contributed to improved formal tenure security, it is not clear to what extent they contribute to agricultural production and sustainable land resource use.

This study systematically investigates the relationships between land tenure security, as affected by the recent market-oriented tenure reforms, and agricultural production in China. Based on the existing literature, four relationships are examined, namely the relationships between tenure security and land investments, land rental market development, rural-urban migration, and agricultural productivity and technical efficiency, respectively. The results of the study are intended to provide a full picture of the major linkages between land tenure security, household decisions and agricultural productivity in China. The obtained insights are expected to be relevant for the ongoing reforms of China's rural land tenure system and for related agricultural and rural policies in China. They may also prove useful for other developing countries having similar tenure systems that aim to provide rural households with secure and long-term formal land use rights.

Several recent studies stress that the tenure situation as perceived by landholders forms the basis upon which landholders can be expected to take decisions and to act, whatever the legal situation of a piece of land. Therefore, what matters for household decisions associated with natural resource use and agricultural production in China is the tenure security as perceived by its rural households. This may differ from formal tenure security, as it depends on the way land laws and land titling are being implemented, and on how information about these laws is being distributed among stakeholders. Much attention is therefore paid in this study to household perceptions of their tenure security.

The information used for the empirical analyses mainly comes from two farm household surveys that were held in Minle County, Gansu Province in northwest China in May 2008 and May 2010. Collected

Does Tenure Security Matter?

information refers to the years 2007 and 2009, respectively. The surveys were held to obtain more insights into the sustainability of land and water use of households living in the area. In addition, information from a similar farm household survey held in Shangrao County and Yingtan County in Jiangxi province in August 2011, and referring to the year 2010, is used in one chapter.

Chapter 2 examines the magnitudes of legal security, actual security and perceived security of land tenure, and the causes of currently prevailing land tenure insecurity in China. Actual land tenure refers to the actual control of land, regardless of the legal status in which it is held. The second survey conducted in Minle County, Gansu province in 2010 and the survey held in Shangrao County and Yingtan County, Jiangxi province in 2011 are used as case studies. Although the recent market-oriented land tenure reforms have improved legal tenure security, the results show that households still experience substantial insecurity of actual and perceived land tenure, especially in the case study region in Jiangxi province. The degrees of actual tenure security and perceived tenure security are closely correlated, but perceived tenure security is much weaker than actual tenure security in both case study regions. We argue that egalitarianism inherent in farmers' thinking, ambiguous formulations of laws, and village self-governance rules are three important factors contributing to actual and perceived insecurity of land tenure.

Chapter 3 uses a real option model to investigate the expected impact of the market-oriented tenure reforms implemented in China since 1998 on land conservation investment incentives. It intends to shed light on the full impact of land tenure reforms on land investments, and to provide a better understanding of the relationship between the land tenure reforms and land conservation investments. The results indicate that the market-oriented tenure reforms are more likely to elicit land conservation investments in areas where land markets are developing, and that benefits of the land tenure reforms will be underestimated if only the intrinsic but not the time value of changes in the investment incentives are considered.

Chapter 4 examines the relationships between perceived land tenure security and land quality improvement investments. It provides empirical evidence about the direction of the causality between tenure security and land investments in China. The results show that perceived land tenure security significantly affects self-governed investments but does not affect individual investments in land quality improvements. In particular it is found that households that consider land certificates as important for protecting land rights invest significantly more in irrigation canals construction and maintenance. The results further provide evidence that individual investments in land quality improvement contribute to higher perceived land tenure security. The latter finding provides an

explanation for the phenomenon that land readjustments still take place in some parts of China, but not in others.

Chapter 5 examines the impact of perceived land tenure security and trust on the leasing of land. Besides tenure insecurity, lack of trust in potential transaction partners is often considered to be a major bottleneck in the development of land rental markets. The empirical results show that the importance attached to land certificates in protecting land rights positively affects the probability of leasing land, the quantity of land that is leased, and the probability that a formal contract is used in the rental transaction. Expectations about the absence of land redistributions in the near future positively affect the likelihood that informal rental contracts are used, but have no significant effects on the probability of land renting and its quantity. Trust towards known people positively affects the probability and intensity of land renting and the use of informal contracts, while trust towards kinship does not significantly affect any of the land rental variables in our sample. The insights obtained from this chapter may contribute to more effective policies that stimulate the development of land rental markets, and thereby enhance both productivity and equity, in rural China.

Chapter 6 examines the impact of household perceptions of land tenure security on rural-urban migration decisions. The empirical results indicate that a greater importance attached to land certificates in protecting land rights significantly increases rural-urban migration. Households that expect that no land reallocation will occur in the near future, on the other hand, show less rural-urban migration in villages where the land rental market has not developed. The effect of land reallocation expectations is insignificant in villages where a land rental market exists. The results also provide tentative evidence of interaction effects between the two tenure security variables, namely that perceptions on the importance of land certificates have a weaker effect on migration in villages with a lower expected probability of land reallocations. These findings confirm that land tenure security perceptions play an important role in migration decisions of households.

Chapter 7 uses a production function and a stochastic frontier approach to examine the impact of household perceptions of land tenure security on agricultural productivity and technical efficiency. It examines two effects of tenure security that are usually neglected in the empirical literature of agricultural productivity and efficiency, namely the land rental market effect and the migration effect. The results show that the tenure security provided by land certificates stimulates temporary migration by individuals, and thereby encourages part-time farming with relatively low agricultural productivity and technical efficiency. The renting out of land by migrant households can only partly make up for this negative effect, because land rental markets are thin and highly fragmented in the research area. For tenure security provided by the absence of land reallocations in the near future, on the other hand,

Does Tenure Security Matter?

we find that it reduces migration in villages where land rental markets have not developed and thereby contributes to higher agricultural productivity and technical efficiency.

Two main overall conclusions can be drawn from these results. The first main conclusion is that perceptions of tenure security do matter for household decisions. Perceived tenure security is much weaker than legal tenure security, even though they are related to each other, and differs between households and different regions. For the research area in Minle County, it is found that perceptions of more secure tenure security stimulate small-scale investments on irrigation canals construction and maintenance; encourage participation in the land rental market; and encourage rural-urban migration. These positive relationships are found in particular for the importance attached by households to land certificates in protecting their land rights. Perceived tenure security provided by the absence of land reallocations in the near future, however, has either insignificant or opposite effects on the aforementioned household decisions.

Secondly, the results of this study show that impact of tenure reforms on agricultural productivity is limited by factor markets imperfections. In theory, increased land tenure security can induce land investment, land rental market development and rural-urban migration, and can consequently improve agricultural productivity. However, the empirical evidence from Minle County, a region characterized by important land rental and labor market imperfections, shows that the impact is very limited under such circumstances and may even result in a negative impact of improved tenure security on agricultural productivity.

Based on these overall conclusions, two major policy recommendations are formulated. Firstly, it is recommended that land tenure reforms focus more on enhancing tenure security perceptions of households. In particular, given the existing ignorance among farm households about the scope of land reallocations and the importance of land certificates for pursuing rights in land conflicts, the dissemination at the grassroots level of clear information about existing land-related laws and regulations should receive a high priority. Secondly, it is recommended to improve the functioning of rural land rental and labor markets in a number of ways. The development of land rental markets may be stimulated by providing a full protection of household legal land rights during mediation and arbitration of rural land conflicts. Moreover, an expansion of the current rural social insurance systems may contribute to more land rental activities by reducing farmers' reliance on rural land as an insurance against unemployment and health problems and as a source of income at old ages is reduced. Lack of trust among non-kinship households is found to be another major factor limiting land rental transactions. To reduce the current segmentation of land rental markets, it is therefore recommended to stimulate trust among non-kinship households by promoting more farmers' cooperatives and other collaboration opportunities among villagers. Finally, the discrimination against

rural migrants in urban housing, health and education services and social insurances that results from the *hukou* (household registration) system in especially the largest cities contributes to the high prevalence of short-duration and individual migration. Improving the access of migrant households to urban social insurance and other social services in urban areas would not only contribute to improving their welfare, but is also expected to reduce the prevalence of part-time farming in China, and thereby to contribute to higher agricultural productivity.

Samenvatting

Het hoofddoel van China's landbouw- en plattelandsbeleid is behoud van voedselzekerheid in eigen land en bijdragen aan de voedselzekerheid in de wereld door duurzaam gebruik van natuurlijke hulpbronnen en verbetering van de landbouwproductiecapaciteit voor de lange termijn. In veel gebieden in China gaat de landbouwproductiecapaciteit op lange termijn echter achteruit door intensieve landbouw en de daarmee gepaard gaande degradatie van de hulpbronnen land en water. Het systeem van grondeigendom speelt, als fundamentele institutie die het gedrag van grondbezitters aanstuurt, een zeer belangrijke rol bij de landbouwproductie alsook bij het gebruik van natuurlijke hulpbronnen, en heeft veel belangstelling genoten van onderzoekers in China en andere regio's in de wereld. Sinds 1998 heeft de Chinese regering een reeks marktgeoriënteerde hervormingen in het grondeigendom ingevoerd die als doel hebben de eigendomszekerheid te verbeteren en de overdraagbaarheid van rurale grond te bevorderen. Relevante wetten behelzen de Wet Grondbeheer (Land Administration Law) uit 1998, de Wet Contracten Rurale Grond (Rural Land Contract Law) uit 2002, de Eigendomswet (Property Law) uit 2007, en de Wet Mediation en Arbitrage bij Geschillen inzake Contracten Rurale Grond (Mediation and Arbitration of Rural Land Contract Disputes Law) uit 2009. Ofschoon deze hervormingen bijgedragen hebben aan een verbeterde formele eigendomszekerheid, is het niet duidelijk in welke mate ze bijdragen aan landbouwproductie en duurzaam gebruik van de grond.

In deze studie worden systematisch de relaties onderzocht tussen grondeigendomszekerheid, zoals die wordt beïnvloed door de recente marktgeoriënteerde eigendomshervormingen, en de landbouwproductie in China. Op basis van de bestaande literatuur worden er vier relaties onderzocht, namelijk de relaties tussen eigendomszekerheid en, respectievelijk, grondinvesteringen, marktontwikkelingen betreffende grondpacht, ruraal-urbane migratie, en landbouwproductiviteit en technische efficiëntie. De resultaten van de studie beogen een volledig beeld te verschaffen van de belangrijkste relaties tussen grondeigendomszekerheid, beslissingen op het niveau van huishoudingen, en de landbouwproductiviteit in China. Naar verwachting zullen de verkregen inzichten relevant zijn voor de voortgaande hervormingen van het rurale grondeigendomssysteem en voor gerelateerd landbouw- en plattelandsbeleid in China. Ze zouden tevens van nut kunnen blijken voor andere ontwikkelingslanden met vergelijkbare eigendomssystemen die als doel hebben om huishoudens op het platteland te voorzien van gewaarborgde formele landgebruiksrechten voor de lange termijn.

In verscheidene recente studies wordt benadrukt dat de eigendomssituatie zoals die wordt ervaren door de grondbezitters de grondslag vormt waarop grondbezitters naar verwachting hun beslissingen en handelingen baseren, ongeacht de wettelijke status van een perceel. Dientengevolge is, voor de beslissingen van huishoudens in relatie met gebruik van natuurlijke hulpbronnen en

landbouwproductie in China, de eigendomszekerheid van belang zoals die ervaren wordt door huishoudens op het platteland. Deze kan afwijken van de formele eigendomszekerheid, aangezien die afhangt van de wijze waarop grondeigendomsrechten en -aanspraken verwezenlijkt worden, en van de wijze waarop informatie over deze wetten verspreid wordt onder belanghebbenden. In deze studie wordt daarom veel aandacht besteed aan de percepties van huishoudens met betrekking tot hun eigendomszekerheid.

De informatie die gebruikt is voor de empirische analyses is hoofdzakelijk afkomstig van twee enquêtes onder boerenhuishoudens die gehouden werden in het district Minle County in de Provincie Gansu in Noord-West China in mei 2008 en mei 2010. De verzamelde informatie verwijst respectievelijk naar de jaren 2007 en 2009. De enquêtes werden uitgevoerd om meer inzicht te verkrijgen in de duurzaamheid van land- en watergebruik door de in het gebied woonachtige huishoudens. Daarnaast wordt in één hoofdstuk informatie gebruikt van een vergelijkbare enquête uitgevoerd onder boerenhuishoudens in de districten Shangrao County en Yingtan County in de provincie Jiangxi in augustus 2011, met betrekking tot het jaar 2010.

In Hoofdstuk 2 worden de omvang van wettelijke zekerheid, feitelijke zekerheid en ervaren zekerheid van grondeigendom, en de oorzaken van de huidige heersende onzekerheid inzake grondeigendom in China onderzocht. Feitelijk grondeigendom verwijst naar de feitelijke zeggenschap over grond, onafhankelijk van de wettelijke status waarin deze zich bevindt. De tweede enquête, uitgevoerd in het district Minle County, in de provincie Gansu in 2010, en de enquête gehouden in de districten Shangrao County en Yingtan County, in de provincie Jiangxi in 2011, worden gebruikt als case studies. Ofschoon de recente marktgerichte grondeigendomshervormingen de wettelijke eigendomszekerheid verbeterd hebben, tonen de resultaten dat huishoudens nog steeds een substantiële onzekerheid ervaren met betrekking tot het feitelijke en waargenomen grondeigendom, vooral in het case study-gebied in de provincie Jiangxi. De mate van feitelijke eigendomszekerheid en van waargenomen eigendomszekerheid is sterk gecorreleerd, maar de waargenomen eigendomszekerheid is veel zwakker dan de feitelijke eigendomszekerheid in beide case study-gebieden. We beargumenteren dat egalitarisme inherent aan de denkwijze van boeren, ambigue formuleringen van wetten, en regels van dorpszelfbestuur drie belangrijke factoren zijn die bijdragen aan de feitelijke en waargenomen onzekerheid inzake grondeigendom.

In Hoofdstuk 3 wordt gebruik gemaakt van een reële-optiemodel om de verwachte impact te onderzoeken van marktgeoriënteerde grondeigendomshervormingen die sinds 1998 in China zijn doorgevoerd, op de investeringstimuli voor grondbehoud. Het beoogt licht te werpen op de volledige impact van grondeigendomshervormingen op investeringen in grond, en een beter begrip te verschaffen van de relatie tussen grondeigendomshervormingen en investeringen in grondbehoud. De

Does Tenure Security Matter?

resultaten geven aan dat het aannemelijker is dat de marktgeoriënteerde grondeigendomshervormingen investeringen in grondbehoud teweegbrengen in gebieden waar zich grondmarkten ontwikkelen, en dat de voordelen van de grondeigendomshervormingen onderschat zullen worden indien slechts de intrinsieke en niet de tijds waarde van veranderingen in de investeringsprikkels in ogenschouw worden genomen.

In Hoofdstuk 4 worden de relaties onderzocht tussen waargenomen grondeigendomszekerheid en investeringen in de verbetering van de grondkwaliteit. Er wordt empirisch bewijs geleverd over de causaliteitsrichting tussen eigendomszekerheid en grondinvesteringen in China. De resultaten tonen dat de waargenomen grondeigendomszekerheid een significante invloed heeft op zelfbestuurde investeringen maar geen invloed heeft op individuele investeringen ten behoeve van verbeteringen in grondkwaliteit. In het bijzonder wordt vastgesteld dat huishoudens die grondcertificaten van belang achten voor het beschermen van landrechten significant meer investeren in bouw en onderhoud van irrigatiekanalen. De resultaten tonen tevens aan dat individuele investeringen in de verbetering van grondkwaliteit bijdragen aan een hogere waargenomen grondeigendomszekerheid. Deze laatste bevinding levert een verklaring voor het verschijnsel dat herverkaveling in sommige delen van China nog steeds plaatsvindt doch in andere niet.

In Hoofdstuk 5 wordt de impact onderzocht van de waargenomen grondeigendomszekerheid en het vertrouwen bij het verpachten van grond. Naast onzekerheid over grondeigendom, wordt het gebrek aan vertrouwen in potentiële transactiepartners vaak beschouwd als belangrijke bottleneck in de ontwikkeling van grondpachtmarkten. De empirische resultaten tonen dat het belang dat gehecht wordt aan grondcertificaten bij het beschermen van landrechten een positieve uitwerking heeft op de waarschijnlijkheid van het verpachten van land, de hoeveelheid land die verpacht wordt, en de waarschijnlijkheid dat een formeel contract gebruikt wordt in de pachttransactie. Verwachtingen over de afwezigheid van herverdelingen van land in de nabije toekomst hebben een positief effect op de kans dat informele pachtcontracten gebruikt worden, maar hebben geen significante effecten op de waarschijnlijkheid dat land verpacht wordt of op de hoeveelheid verpacht land. Vertrouwen in bekenden heeft een positief effect op de kans en intensiteit van grondpacht en het gebruik van informele contracten, terwijl vertrouwen in verwanten geen significant effect heeft op enige van de grondpachtvariabelen in onze steekproef. De inzichten die in dit hoofdstuk verkregen zijn, zouden kunnen bijdragen aan effectievere beleidsvormen die de ontwikkeling van grondpachtmarkten bevorderen, en zodoende zowel de productiviteit als de billijkheid op het Chinese platteland vergroten.

In Hoofdstuk 6 wordt de impact onderzocht van de percepties van huishoudens omtrent grondeigendomszekerheid op beslissingen ten aanzien van ruraal-urbane migratie. De empirische resultaten geven aan dat als er meer belang wordt gehecht aan grondcertificaten bij de bescherming

van landrechten dit tot een significante toename in ruraal-urbane migratie leidt. Anderzijds is er bij huishoudens waar de verwachting heerst dat er in de nabije toekomst geen ruilverkaveling zal plaatsvinden, sprake van minder ruraal-urbane migratie in dorpen waar de grondpachtmarkt niet ontwikkeld is. Het effect van verwachtingen ten aanzien van ruilverkaveling is gering in dorpen waar een grondpachtmarkt bestaat. De resultaten verschaffen ook voorlopige indicaties voor interactie-effecten tussen de twee eigendomszekerheid-variabelen, namelijk dat percepties van het belang van grondcertificaten een zwakker effect hebben op de migratie in dorpen met een lagere verwachte waarschijnlijkheid van ruilverkavelingen. Deze bevindingen bevestigen dat percepties van grondeigendomszekerheid een belangrijke rol spelen in de beslissingen van huishoudens ten aanzien van migratie.

In Hoofdstuk 7 wordt gebruik gemaakt van een productiefunctie en een stochastische frontier benadering (SFA) om te onderzoeken welke impact de percepties van huishoudens omtrent grondeigendomszekerheid hebben op de landbouwproductiviteit en technische efficiëntie. Er worden daarbij twee effecten van eigendomszekerheid onderzocht waar gewoonlijk in de empirische literatuur geen acht op wordt geslagen, namelijk het grondpachtmarkt-effect en het effect van migratie. Uit de resultaten blijkt dat de eigendomszekerheid waarin voorzien wordt door de grondcertificaten tijdelijke individuele migratie bevordert, en op die manier het part-time boeren bevordert met relatief lage landbouwproductiviteit en technische efficiëntie.

Het verpachten van grond door migrantenhuishoudens kan dit negatieve effect slechts gedeeltelijk compenseren, aangezien de grondpachtmarkten in het onderzoeksgebied dunbezaaid en in hoge mate gefragmenteerd zijn. Anderzijds zien we voor eigendomszekerheid die verschaft wordt door de afwezigheid van ruilverkaveling in de nabije toekomst, dat de migratie afneemt in dorpen waar grondpachtmarkten niet ontwikkeld zijn en dat dit zodoende bijdraagt aan een hogere landbouwproductiviteit en technische efficiëntie.

Uit deze resultaten kunnen twee algemene hoofdconclusies getrokken worden. De eerste hoofdconclusie is dat percepties van eigendomszekerheid van belang zijn voor de beslissingen van huishoudens. Waargenomen eigendomszekerheid is veel zwakker dan wettelijke eigendomszekerheid, ondanks dat ze aan elkaar gerelateerd zijn, en verschilt tussen huishoudens en tussen verschillende regio's. Voor het onderzoeksgebied in het district Minle County is gevonden dat percepties van een hogere eigendomszekerheid kleinschalige investeringen in bouw en onderhoud van irrigatiekanalen stimuleren; deelname aanmoedigen in de grondpachtmarkt; en ruraal-urbane migratie bevorderen. Deze positieve relaties worden in het bijzonder gevonden voor het belang dat door huishoudens gehecht wordt aan grondcertificaten ter bescherming van hun landrechten. Waargenomen eigendomszekerheid die geboden wordt door de afwezigheid van ruilverkavelingen in de nabije

Does Tenure Security Matter?

toekomst heeft echter óf geringe óf tegengestelde effecten op de voornoemde beslissingen door huishoudens.

Ten tweede blijkt uit de resultaten van deze studie dat de impact van eigendomshervormingen op de landbouwproductiviteit beperkt wordt door de factor marktimperfecties. In theorie kan toegenomen grondeigendomszekerheid leiden tot investering in grond, ontwikkeling van grondpachtmarkten, en ruraal-urbane migratie, en kan dientengevolge leiden tot een verhoging van de landbouwproductiviteit. Het empirisch bewijs uit het district Minle County, een gebied dat gekenmerkt wordt door belangrijke imperfecties in de grondpacht- en arbeidsmarkten, toont echter aan dat onder dergelijke omstandigheden de impact zeer beperkt is en zelfs kan resulteren in een negatieve impact van verbeterde eigendomszekerheid op de landbouwproductiviteit.

Op basis van deze algemene conclusies worden er twee belangrijke beleidsaanbevelingen geformuleerd. Ten eerste wordt aanbevolen dat grondeigendomshervormingen zich meer richten op het vergroten van de percepties van huishoudens omtrent eigendomszekerheid. In het bijzonder gezien de bestaande onwetendheid bij boerenhuishoudens met betrekking tot de reikwijdte van ruilverkavelingen en het belang van grondcertificaten voor het uitoefenen van rechten bij conflicten om grond, zou hoge prioriteit verleend dienen te worden aan verspreiding naar de basis van heldere informatie over bestaande grondgerelateerde wet- en regelgeving. Ten tweede wordt aanbevolen om het functioneren van rurale grondpacht- en arbeidsmarkten op een aantal manieren te verbeteren. De ontwikkeling van grondpachtmarkten zou gestimuleerd kunnen worden door volledige bescherming te bieden van de wettelijke landrechten van huishoudens tijdens mediation en arbitrage bij grondconflicten op het platteland. Bovendien zou een uitbreiding van de huidige sociale verzekeringssystemen op het platteland kunnen bijdragen aan meer grondpachtactiviteiten door de afhankelijkheid te verminderen van boeren van rurale grond als verzekering tegen werkloosheid en gezondheidsproblemen en als bron van inkomsten op de oude dag. Gebrek aan vertrouwen onder niet-verwante huishoudens blijkt een andere belangrijke factor te zijn die beperkend is voor grondpachttransacties. Om de huidige segmentatie van grondpachtmarkten te verminderen, wordt daarom aanbevolen het vertrouwen tussen niet-verwante huishoudens te bevorderen door het promoten van meer boerencoöperaties en andere mogelijkheden van samenwerking tussen dorpingen. Tenslotte draagt de discriminatie jegens migranten van het platteland bij stedelijke huisvesting, gezondheids- en onderwijsdiensten en sociale verzekeringen die voortkomt uit het hukou-systeem (registratie van huishoudens), vooral in de grote steden bij aan het hoge niveau van kortdurende en individuele migratie. Verbetering van toegang van migrantenhuishoudens tot stedelijke sociale verzekeringen en andere sociale dienstverlening in stedelijke gebieden zou niet alleen bijdragen aan een verbetering van hun welzijn, maar zal naar verwachting tevens de gangbaarheid van het part-time boeren in China verminderen en, dientengevolge, bijdragen aan een hogere landbouwproductiviteit.

Acknowledgements

While researching and writing this thesis I have benefitted a lot from the guidance, enthusiasm and reflections of many people. Their contributions have helped shape this research and also influenced my academic career. I am very much grateful to them all and will mention a few in particular.

First of all, I would like to thank my promoters, Prof. Ekko van Ierland, Prof. Xiaoping Shi, Prof. Justus Wesseler and Dr. Nico Heerink for their wonderful guidance and comments throughout the research. My special word of thanks goes to Dr. Nico Heerink for his huge contribution to the research proposal, research methodology, questionnaire design, fieldwork survey, article writing, and English editing. His efforts helped shape my academic career. Also, I would like to mention his family - Wenhui and Linda for the wonderful moments that we spent together both in the Netherlands and China.

Many of the pages presented in this thesis are based on papers that are co-authored by others. I am very grateful to have collaborated with Ekko van Ierland, Nico Heerink, Xiaoping Shi, Justus Wesseler, Futian Qu, Shuyi Feng, Marrit van den Berg. Without their effort, I would not have accomplished this thesis. I extremely look forward to our continued collaboration.

I would like to thank my colleagues from the Environmental Economics and Natural Resources Group and the Development Economics Group of Wageningen University, and the Public Administration College of Nanjing Agricultural University for the great research environment and good advice that they provided: Erwin Bulte, Hans-Peter, Xueqin Zhu, Lei Pan, Joseph Tanui, Shumin Yu, Yan Wu, Niccolo, Peixin Zhu, Kaisheng Long. I want to reserve a special place to thank the departments' great administrative staff: Wil den Hartog, Gre Schurink-Heitkonig, Corry Rothuizen, Dineke Wemmenhove, Betty de Haan, Karin van der Heide and Marian Jonker-Mooi.

My special thanks to all of the organizations and officials in my research area for the efforts that they made in the field work: Nanjing Agricultural University, Gansu Academy of Social Sciences, Agricultural Bureau of Minle County, Water Management Bureau of Minle County. With their help, I managed to complete my field survey.

Last, but certainly foremost, I want to thank my wife and daughter, Liping Luan and Jingdi Ma, for their continued support and endurance. I would not have been able to complete this research without their support.

Curriculum vitae

Xianlei Ma was born on 16 April, 1981 in Jiangsu, China. He accomplished his B.Sc. and M.Sc. studies at the College of Land Management of Nanjing Agricultural University from 1999 to 2003, and from 2003 to 2005. He started his PhD study in Environmental Economics and Natural Resources at Wageningen University in 2007. In his research he examines sustainable management of natural resources in rural China from an institutional perspective, with a special focus on the evolvement and performance of land institutions (land rights) in recent years. He currently is an associate professor at Nanjing Agricultural University. He is the leader of two research projects funded by the National Natural Science Foundation and participates in several international cooperative projects funded by the governments of China and the Netherlands and by the European Union. He has published several papers in *China Agricultural Economics Review*, *Review of Economics & Finance*, *China Rural Economy*, *China Land Science*, *China Population Resources and Environment*, and in international conference proceedings.

Xianlei Ma
Wageningen School of Social Sciences (WASS)
Completed Training and Supervision Plan



Name of the activity	Department/Institute	Year	ECTS (1=28 hrs)
A) Project related competences			
Econometrics (AEP 21306)	WUR	2007	6
Advanced Econometrics (AEP 50806)	WUR	2007	6
Advanced Econometrics (Panel Data Analyses)	MG3S	2007	1.5
Micro-Theory, Empirical Approaches and the Economics of Development of China	Leuven University	2007	0
Economic Models (AEP 30806)	WUR	2007	6
Real option value workshop in IAAE conference	Beijing	2009	0
Writing Research Proposal	MG3S	2007	2
B) General research related competences			
Introduction course	MG3S	2007	1.5
Multidisciplinary Seminar	MG3S	2008	1
Research Methodology I: From topic to proposal	MG3S	2007	4
‘Land Tenure Reforms and Agricultural Production’	Asia-link project in Nanjing	2008	1
‘Land Tenure Reforms and household behaviour’	Workshop organized by the SURE project in Nanjing	2008	1
‘Land Tenure Reforms and Land Conservation Investments in China-A Theoretical Analysis’	International Conference on Combating Land Degradation in Agricultural Area (WASWAC) in Xi’ An	2010	1
‘Land Tenure Security and Land Rental Market Development’	Workshop organized by the SURE project in Lanzhou	2010	1
‘Land Tenure Security and Rural-urban Migration’	Workshop organized by the SURE project in Nanjing	2011	1
‘Land Tenure Reforms and Agricultural Production-An Institutional Analysis Framework’	Producing Economic Research: High Transaction Costs and Alternative Structures in Beijing	2012	1
‘Land Tenure Security and Land Conservation Investments in China-A Case in Minle County’	4th CAER-IFPRI Annual International Conference-transforming China’s Agricultural and Rural Sector: Challenges and Solutions in Beijing	2012	1
‘Land Tenure Insecurity and Temporary Rural-Urban Migration in Rural China’	The Chinese Economists Society Annual Conference: The Chinese Financial System in Transition: Reforms, Policies, and Practices in Chengdu	2013	1
‘Land Tenure Insecurity and Temporary Rural-Urban Migration in Rural China’	International Workshop on Regional, Urban, and Spatial Economics in China in Beijing	2013	1
TOTAL			37

Funding

This research described in this thesis was financially supported by the European Community (EM-ECW), the Programme Strategic Scientific Alliances of the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Ministry of Science and Technologies of P.R. China and by the National Natural Science Foundation of China (71003051).