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Property rights integrity, tenure security and forestland rental market participation: Evidence from Jiangxi Province, China

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Abstract

The decentralization of property rights is the focus of the forest tenure reforms in several developing countries. In China, it was achieved by the launch of a new round of collective forest tenure reform beginning in 2003, which provided farmers with more integrated and secure forestland rights. Drawing on household data collected in Jiangxi province in 2011 and 2013, this paper examines the impacts of households' recognition of property rights and improved tenure security on forestland rental activities. Our empirical results show that households with higher perceptions of more complete use rights and mortgage rights have a lower probability and intensity of renting-in land, while households with lower expectations of future forestland redistribution or expropriation are more likely to rent in forestland and more of it. These results imply that the development of a forestland rental market leading to better forest management requires an integrated forestland management approach consisting of decentralization of property rights and village governance. In particular, the central government may further clarify the rights and obligations affiliated to forestland ownership, contractual rights, and management rights; while the village collective may shift from direct intervention in the integrity and security of forestland rights to the supervision and protection of decentralized forestland rights to increase efficiency from the decentralization of property rights.

Keywords: Forest tenure reform; forestland rental market; decentralization; property rights integrity; tenure security.

1. Introduction

Forests are recognized as an important resource that not only contribute to combating rural poverty and ensuring food security, but also play a key role in maintaining stable ecological conditions and biodiversity (FAO, 2015). Since the early 1980s, the State Forestry Administration of China has carried out a series of comprehensive reforms in order to encourage more sustainable use of forest resources as part of the overall efforts at protecting the ecological environment (Liu *et al*., 2014a, 2014b). Among the reforms undertaken is the collective forest tenure reform introduced in 2003, which lately has taken center stage. This reform has distributed forest contractual and management (operation) rights from village collectives to individuals. This reform has enhanced farmers' tenure security, provided incentives for them to plant more trees and make other forestry-related investments, and helped improve the welfare of rural households living in forested areas (Qin and Xu, 2013; Xie *et al*., 2013).

However, the distribution of forest contractual and management rights to individuals has also resulted in fragmentation and decentralized management of forestland, which may lead to overexploitation of forestland and sub-optimal forestry production (Che, 2009; Xu *et al*., 2013). One solution to reduce forestland fragmentation and increase allocative efficiency is to promote the development of forestland rental transactions. Despite a series of legal reforms and policy regulations aimed at boosting forestland rentals, the level of forestland rental activities remains very low in China (Collective Forest Land Tenure Reform Research Group, 2012). It is found that the lack of an agency to evaluate forest resources, an underdeveloped labour market, low forest revenues, and an absence of a social security system are major obstacles to the development of forest rental market (Collective Forest Land Tenure Reform Research Group, 2012; Xu *et al*., 2013). However, there are few studies that investigate the relationship between forest tenure and forestland rental market; a lacuna we address in this paper. To the best of our knowledge, only Holden *et al*. (2011), Kimura *et al*. (2011), and Zhu *et al*.

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(2014) have analyzed the effect of forest tenure factors on forestland rentals in China.

These extant studies provide some important evidence to understand the effect of land tenure on the development of forestland rental markets, but leave out many other aspects. First, while property rights integrity could be correlated with tenure security (see e.g., Zhou *et al*., 2018), they are not the same. Property rights integrity indicates whether, and to what extent, a household currently possesses a specific right. It represents the degree of decentralization of property rights. In contrast, tenure security reflects that the certainty of a specific right to forestland will continue to prevail in the future. The impact of tenure reform on forestland rentals may be underestimated if either of these factors is ignored. Second, the extant literature mostly focuses on the impact of transaction cost on forestland rental activities (Kimura *et al*., 2011; Zhu *et al*., 2014). They do not consider that forest tenure could also affect forestland rental decisions by raising the value of forestland. This could push up potential land rental prices and reduce the incentive to rent-in forestland. This value-increasing effect is different from the transaction-cost-reducing effect that is widely discussed in the existing literature. Third, these recent studies do not take into account households' risk of losing forestland because of forestland expropriation. Due to rapid urbanization, large pieces of forestland have been converted to economic and ecological use. This is especially true in the southern forestry regions where farmland is limited, with forestland having a higher probability of being expropriated.

This study is based on household-level data collected in 2011 and 2013 in Suichuan county and Fengcheng city in Jiangxi province. It aims to examine the impact of forestland property rights integrity (including use rights, mortgage rights, and rental rights) and tenure security (denoted by expectations of expropriation or reallocation of forestland) on households' decisions to rent in forestland. We identify two channels through which forestland property rights integrity and tenure security can affect forestland rental decisions; namely, the transaction-cost-reducing effect and the value-increasing effect. These concepts are elaborated upon in the following section. Empirical analysis of this nature is dogged by problems of endogeneity, which we address by measuring property rights integrity/-tenure security at the village level. While our data is collected from two relatively small regions, the analysis nonetheless provides some novel insights into how forestland property rights integrity and security act on household decisions to rent in forestland. Testing whether these conclusions hold on a larger scale is part of ongoing efforts.

2. Trajectory of collective forest tenure reform in China

Decentralized management of forestland has gained popularity across the globe. This is the process where a central government relinquishes some of its powers and management responsibilities to local governments, local leaders, or community institutions. Decentralization has been advocated for various reasons, such as to enhance local participation, equity, efficiency, and sustainable use of a common resource. Community-based natural resource management to achieve the above-mentioned is now part of the strategy in use in many developed and developing countries. At least 60 countries claim to be decentralizing some aspect of natural resource management, including Nepal, the Philippines, and Mexico (Shrestha and Ojha, 2017). China has not been an exception to this trend.

Since the late 1970s, China initiated the Household Responsibility System (HRS) as part of the reform to land tenure: this reform is credited to having raised agricultural productivity and thus deemed a major success (Lin, 1988). Consequently, the reform was later extended to the forestry sector. There have been three major forest tenure reforms since the late 1970s: the 'Three Fixes' policy during 1979–1991; the forestry market reform during the 1990s, and the new round of forest reform that commenced in 2003. On the one hand, these three reforms have provided greater rights to the individual who is harvesting the resource, but on the other hand has retained the interest of the collective to avoid the tragedy of the commons. The reform targets the changing relationship between individual households and the collective, and the property rights devolved to individual households are elaborated in Table 1.

Following the success of the HRS, the Chinese government implemented a policy known as the 'Three Fixes', which aimed to distribute the forestland to individual households and fix three issues pertaining to forest tenure: clarifying rights to forests (family plots), delimiting the boundaries of private plots (responsibility hills), and establishing a forestry production responsibility system (collective management) (Holden *et al*., 2011; Delang and Wang, 2013; Xie *et al*., 2014). As a result, farmers were granted rights to decide which trees to plant, when to plant and fell, as well as the right to prevent other people from cutting down their trees. In return, they bore the responsibility for preventing forest fires, and were not permitted to convert forestland into farmland or to cut trees 'unreasonably' (Delang and Wang, 2013).

Although the 'Three Fixes' policy did provide rural households with some rights, the state retained the usufruct right and right of disposal. Farmers perceived a high degree of tenure insecurity under the uncertain policy environment, where there were frequent policy changes, restrictions on logging permits, control of the timber market, and high forest taxes and fees. This inhibited the planting of new trees in southern China and in some regions led to widespread deforestation in the 1980s (Yin and Xu, 2002; Holden *et al*., 2011; Delang and Wang, 2013; Xie *et al*., 2014).

Table 1. Forest tenure reforms, changing relationships, and devolving forestland rights in China

Stage	Reform target	Changing relationship between individual households and the collective	Bundle of forestland rights that were devolved to individual households
"Three-Fixes" reform in 1980s	• Stabilizing forestland ownership • Delineating private plots and responsibility plots • Establishing the production responsibility system • Strong emphasis on individual management of forest	• Decentralization • The collective holds the ownership of forests • Around 70% of the collectively-owned forestland had been transferred to individual household management • For fear of policy change and tenure insecurity, mass illegal and premature cutting of forests occurred, "he who strikes first gains the first advantage" • Brake of the reform	• Partial use rights of family and responsibility hills (e.g., rights to decide tree species) • Partial usufruct rights of family and responsibility hills (the timber harvesting from the family or responsibility plots needs the approval of the local government) • Partial disposal rights of family plots (e.g., incomplete land transfer rights, shareholder rights, and inherit rights), but no disposal rights of responsibility hills
Forestry market reform experiment (1992–1998)	• Establishing a forest market, optimizing allocation of forest resources by providing farmers with rights to transfer, lease, and mortgage • Promoting scale-operation of forest	• Centralization • The collective holds the ownership of forests • Most village collectives did not issue forest certificates to individual households, so that they could organize the forest rental activities to attract investment from outside enterprises • Interests of individual households were relegated to that of the collective	• Partial use and usufruct rights as listed above • Extended disposal rights to responsibility hills, such as:- The ownership of woods is allowed to be transferred/sold- The use rights of forestland are allowed to be transferred- Limited logging rights
New round of reform since 2003	• Further clarifying collective forest property rights via contract management • Further stabilizing the contractual relationship for collective contracted forest • Developing collective joint-stock business • Stronger emphasis on individual management of forests	• Deep decentralization • The collective holds the ownership of forests • Stronger emphasis on forest management by individual households • More decision-making power for individual households • Individual households begin to play a greater role	• Extended use rights (e.g., convert forestland to arable land, independently choose tree species, manage non-timber forest products, abandon forestland) • More complete usufruct rights (reduce wood and bamboo tax and fees, relax the limitation of harvesting timber) • More complete forestland disposal rights, e.g., subcontract, lease, transfer, and mortgage forestland use rights and tree ownership or, as a joint venture, cooperative conditions

Source: sorted by the authors based on the central government documents.

Following China's pronouncement to establish a market economy in 1992, the forestland use rights were granted to individual rural households, forestry cooperative organizations, and other investors. Due to a lack of investment capacity and limited access to credit, many farmers rented their contracted forestland to large holders with more capital (Li and Wen, 2009). However, the concentration of forestland among large holders did not achieve the anticipated benefits of economy of scale. A heavy tax burden imposed on forest operators and difficulties in obtaining harvest permits inhibited them from investing in forestland, adversely affecting productivity. Although forest operators were granted more complete rights to forestry during this period, the country faced a dilemma: importing huge quantities of timber while vast tracts of forest inland lay unused (Xie *et al*., 2014).

Against this background, a new round of forest tenure reform named "Resolutions on Forestry Development"[1] was introduced in 2003 to provide better incentives to farmers for the management of the resource. It was supported by a series of mechanisms, such as providing households with more secure forestland use rights, loosening commercial-forest logging restrictions, and reducing taxes and fees on harvesting (Yin *et al*., 2013). These reforms were made in the hope of enhancing rights that were legally stipulated (i.e., use rights, rental rights, mortgage rights) and other rights that had not been explicitly regulated (such as the right to abandon forestland). At the same time, the new round of reform has increased farmers' ability to mitigate against potential risks of losing forestland and indirectly increased their forest tenure security (Holden *et al*., 2011, Yi *et al*., 2014). In addition, the new round of reforms also involved issuing forestland certificates and made the contract period explicit (30–70 years),[2] both actions enhancing farmers' perceptions of tenure security. In sum, the new forest tenure reform has enhanced the integrity and security of forestland tenure.

With respect to forest property rights, forestland use rights were allocated to farmers in the first reform in the 1980s, and the use rights were permitted to be rented during the 1990s. However, the overall forest tenure, including ownership, usufruct rights, and disposal rights, were ambiguous due to excessive intervention by local governments and policy changes. Farmers, who ought to be at the center of the collectives, have few incentives to participate in forest management. In consequence, the reforms did not solve the problems of forest tenure insecurity and incompleteness. The new third round of reform sought to combine and improve the reform policies adopted in the 1980s and 1990s: long-term use rights of collectively owned forestland were granted to member households of the collectives, and the use rights of forestland were allowed to be rented in the open market.

3. Conceptual framework and propositions

To help explore forestry resources management, Ostrom and the International Forestry Resources and Institutions (IFRI) research programme draws on the Institutional Analysis and Development (IAD) framework (Ostrom, 2011). At the core of the IAD framework are individuals who hold different positions (e.g., members of a local forest user group, forest officials, landowners, elected local, regional, and/or national officials) who must decide upon actions (e.g., what to plant, protect, harvest, monitor, or sanction) that cumulatively affect outcomes in the world (e.g., forest conditions, the distribution of a forest's benefits and costs) (Gibson *et al*., 1998). In addition to providing mechanisms for governance, institutions generate incentives by virtue of those mechanisms (Ostrom, 2005). In this study, we focus on how forest tenure (i.e., institutional factors) affects human incentives and behaviour within the IAD framework, as this affects the governance and management of natural resource systems.

In addition, forestland rights share many similarities with farmland rights and existing studies of farmland market development may shed light on the mechanisms at work. Drawing on this literature, we argue that the changes in forest property rights integrity and tenure security brought about by the 2003-round of collective forest tenure reform could affect forestland rentals through two channels: a transaction-cost-reducing effect and a value-increasing effect. The mechanisms of how forest property rights integrity and tenure security affect forestland rentals via reducing transaction costs and increasing forestland value are shown in Figure 1.

3.1. Transaction-cost reducing effect

Programmes aimed at providing a higher level of tenure security and a wider range of land rights are often justified as having the beneficial impact of lowering transaction costs in land markets (Ali *et al*., 2015). Transaction costs approach has stated that transaction costs associated with governance structure are determined by characteristics of human decision makers (e.g., bounded rationality and opportunistic behaviour) and environmental characteristics of the transaction (e.g., asset specificity, the disturbances to which transactions are subject, and the frequency with which transactions recur) (Williamson, 2008). Property rights have been considered to be an important institutional arrangement affecting transaction costs of land rentals.[3] A large amount of research on land tenure has confirmed that transaction costs of land rentals can be reduced when farmers are provided with more integrated land rights including use, rental, and mortgage rights (Brasselle *et al*., 2002; Holden and Yohannes, 2002) and securer land rights (Lyne, 2009; Kimura *et al*., 2011).

Property rights integrity of forestland can reduce transaction costs by lowering the level of asset specificity,[4]

[1] See details in the central government documents issued in 2003: (http://www.forestry.gov.cn/portal/hdy/s/1773/content-273318.html)

[2] See details in the central government documents: 'The Decisions Concerning the Comprehensive Implementation of Reforming the Tenure System of Collective Forests' in 2008 (http://www.gov.cn/gongbao/content/2008/content_1057276.htm).

[3] It should be noted that property rights do not cover all the institutions that are involved in transaction costs of forestry policy and management. Some policies and management, such as the establishment of a forestland rental platform, the set-up of a dispute settlement body, the guidance of the application of formal rental contracts, etc., may have direct effects on transaction costs but do not directly link to property rights. In this study, we focus on the part of transaction costs that may be induced by property rights.

[4] According to Williamson (2008), asset specificity is a measure of non-redeployment, which takes a variety of forms including physical, human, site, dedicated, and brand name. Forestland has its asset specificity. For example, forestland could be used for tourism, production of a certain kind of wood, or ecological protection purposes, according to its physical, site or dedicate attributes.

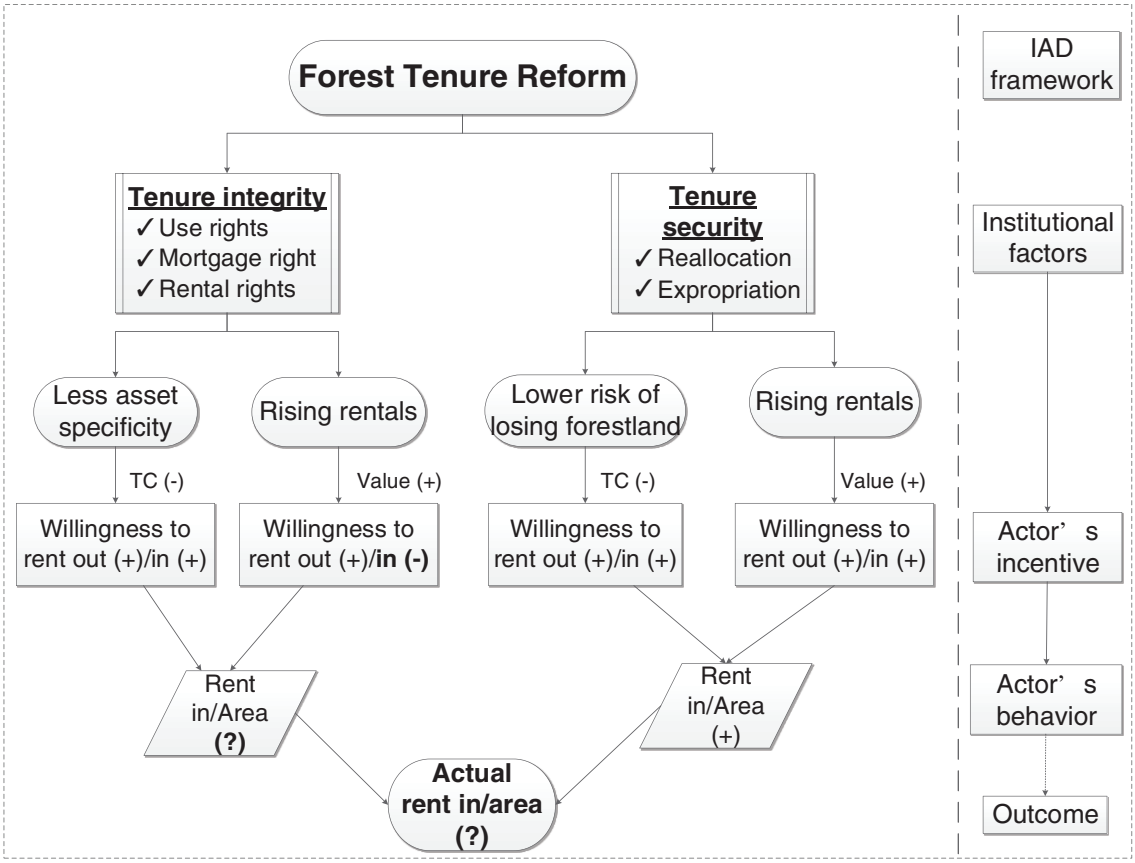

Figure 1. Property rights integrity, tenure security and forestland rental market development in current China.

reducing *ex post* opportunism, and strengthening households' negotiating abilities. More complete rights,[5] especially use rights (including the rights to convert forestland into farmland, to change forest type, to decide tree species, and to plant non-wood forest product), may all contribute to diversifying the management of forestland and reduce the degree of asset specificity. Transaction costs tend to decrease in line with a reduction in asset specificity (Williamson, 2008), which should boost both supply and demand for forestland rentals (Ma *et al*., 2015).

Tenure security can reduce transaction costs by lowering the risks of losing forestland and thus mitigating the uncertainty of the value of forestland transactions. A large amount of forestland has been expropriated at below 'market prices' for urbanization and/or ecological purposes. In some villages, forestland has been reallocated due to population trends, following the similar logic of farmland readjustment.[6] The informal forestland contracts and the uncertainties associated with expropriation and reallocation increased the risks of losing forestland and of claiming profits when renting out forestland (Deininger and Jin, 2005). These risks equally affect those who wish to rent in forestland as there is a risk of investment interruption; namely, the risk of losing the forestland before the expiry of the contracts. This increases the transaction costs on both the supply and the demand sides. The aim of the new forest tenure reform is to reduce expectations of forestland expropriation or reallocation and stimulate both the supply and demand for forestland rentals.

3.2. *Value-increasing effect*

In the collective forest areas in southern China, forestland plays a dual role as a productive resource and a form of social insurance (Xu and Tao, 2004). Entitling farmers with more complete and secure rights may strengthen both the economic and social security values of forestland, which amounts to a value-increasing effect.

Property rights integrity may affect both the supply and demand decisions in the forestland rental market through the value-increasing effect. Granting households more complete use rights (as listed in Section 4.2) raises the value of forestland and leads to an anticipation of a higher rental price. First, on the supply side, the increased value of forestland may provide higher income and social

[5] In our study, management (operation) rights are divided into six kinds of use rights and two kinds of disposal rights, see details in Section 4.2.

[6] In the late 1990s, as the first 15-year land contract was coming to an end, local governments in China were encouraged to organize village leaders to reallocate land among households in order to redress imbalances in access to cultivated land that had arisen from demographic and other factors (Kimura *et al*., 2011).

insurance for potential property owners either when they cultivate forestland by themselves or rent it to other households. Therefore, households may have better incentives to rent out forestland when they have such rights. Second, on the demand side, the anticipation of rising rental price might lower the potential tenants' motivation to rent in forestland. It might be an exception only if the entire 'bundle' of use rights can be rented to the potential tenants, and thus the tenants could enjoy the same level of forestland value increment as the owners. However, this is usually not the case in most regions in China. In reality, the integrity of forestland use rights that are rented to tenants is greatly reduced due to obscure regulations and non-standard rental contracts. In other words, granting households more complete use rights may reduce incentive to rent in forestland when specific bundle of forestland use rights (e.g., the right to cut down trees) cannot be transferred to the tenants. As a result, more complete use rights are expected to have a *negative* impact on forestland rentals in the current situation where insecure rights and informal rental contracts are prevailing in the forestland rental market.

Granting households mortgage rights has a similar effect to the granting of use rights. On the supply side, mortgage rights mean that farmers could use the ownership of woods and the corresponding use rights to forestland as collateral to obtain credit, which has been promoted by the government and formal financial institutions.[7] Therefore, if farmers require credit, they are more likely to use forestland as collateral rather than to rent out their forestland, which may reduce forestland supply (Zhu *et al*., 2014). On the demand side, tenants are expected to be able to use management rights as collateral to access credit from the formal sector. However, according to our field survey, due to the risk of losing the rented-out forestland, many households were not inclined to transfer mortgage rights to tenants by signing informal rental contracts. The incentives of tenants to rent in forestland by being provided with mortgage rights may thus be weakened. Hence, the impact of mortgage rights on forestland rentals is expected to be *negative* as well in the current situation.

Granting households more rental rights, for example, allowing households to rent forestland to partners outside of their villages, will facilitate potential landlords to find partners who are willing to pay higher rent, and thus raise the value of forestland. The value-increasing effect resulting from the improvement in rental rights will increase incentives to rent out forestland. Moreover, potential tenants will face better incentives to rent in forestland when they are granted more rental rights, i.e. potential tenants may sub-lease their rented land to other households within certain periods that is regulated by the original contracts. Hence, the impact of rental rights on forestland rental is expected to be *positive* in the current situation.

Tenure security also induces a value-increasing effect by stimulating forestland investment and enhancing the insurance function of forestland. Studies on farmland tenure have indicated that secure land rights may stimulate farmers to invest in land, thereby raising land values (Brasselle *et al*., 2002; Zikhali, 2010), and in the process create an expectation of a higher rental price (Ma *et al*., 2015). On the supply side, households have more incentives to rent out land management rights (i.e., use rights) to capture the increased rent resulting from increased tenure security. On the demand side, providing households with more secure land rights may improve security of use rights obtained by the potential tenants via land rental market, and thus increase their incentives to rent in forestland. In other words, the value-increasing effect resulting from improved tenure security is expected to have a positive impact on forestland rentals in the current situation.[8]

As Figure 1 shows, a household's decisions on whether to rent in forestland and the size of the rented-in land are dependent on the cumulative effects of property rights integrity and tenure security. In the current situation, the combination of the transaction-cost-reducing effect and the value-increasing effect that occur due to granting more integrated and secure property rights to forestland does not necessarily increase incentives to rent in forestland. Following the theoretical analysis above, we can put forward three testable propositions, as enumerated below.

Proposition 1: The improved property rights integrity of forestland by granting households more complete use rights and mortgage rights is expected to have an *indeterminate* impact on forestland rentals at the moment.

Proposition 2: The improved property rights integrity of forestland by granting more rental rights is expected to have a *positive* impact on forestland rentals in the current situation.

Proposition 3: The improved tenure security of forestland by restricting land reallocation and land expropriation is expected to have a *positive* impact on forestland rentals in the current situation.

[7] See details about forest rights mortgage loan in the central government documents: 'The opinions on implementing forest rights mortgage loan 'in 2013 (http://www.forestry.gov.cn/main/72/content-616486.html), and 'The opinions on improving the collective forest tenure reform' in 2016 (http://www.gov.cn/zhengce/content/2016-11/25/content_5137532.htm).

[8] One may argue that the rising the rental price may reduce potential tenant's demand for forestland. However, through the rental market, the potential tenants could enjoy an equal level of tenure security, which arose from the restriction of forestland reallocation and expropriation. Thus, the potential tenants would recognize that the forestland value is also rising. Therefore, they would still opt to rent-in forestland despite the rising rental price.

4. Study sites and data set

4.1. Study sites and data collection

As one of the provinces with the richest forestry resources in China, Jiangxi holds 158 million mu[9] of forestry. The forest cover rate is around 63%, which is much higher than the national average of 21.63%.[10] In order to stimulate collective forestry production, Jiangxi implemented the 'Three Fixes' policy in 1981 and the new round of forest reform to clarify property rights in 2004. It was a common practice for clarifying property rights to distribute forestland use rights to each household according to household size, but this led to severe fragmentation and abandonment of forestland. Furthermore, of all the nine sample provinces, Jiangxi province had the most even farmland allocation among households with the Gini coefficient below 0.5 (Collective Forest Land Tenure Reform Research Group, 2012).

The forestland rental market is growing in Jiangxi, although it is still small and regionally segmented. We selected two study areas, Suichuan and Fengcheng, which typify the management styles of collective forestland in southern China. The economic development status, geographical location, forestry development, and forest tenure reform status in the two areas were comprehensively considered.

According to economic development status, geographical location, and forestry development level, Suichuan county and Fengcheng city (county-level) of Jiangxi province were selected as the research area. As shown in Figure 2, Suichuan is in the southern part of Jiangxi province, while Fengcheng is in the northern part of Jiangxi province. Suichuan is a relatively poor and underdeveloped county (the GDP per capita was 11,894 RMB in 2011), while Fengcheng is a relatively wealthy and more developed county (the GDP per capita was 21,500 RMB in 2011).[11]

Both regions have a long history of forestry development. The forest cover rate is 78.5% in Suichuan and 41% in Fengcheng. Forestry production could have played a more important role in local economic development and farmers' livelihoods. However, the 'Three Fixes' policy implemented since 1981 did not achieve its goal to clarify rights to forests (family plots), delimit the boundaries of private plots (responsibility hills), and establish a forestry production responsibility system. As a result, few villagers felt any association with the collective forests or were prepared to take care of the forests which led to rampant illegal logging.[12] Against this backdrop, following the regulation of the 2003-national collective forest tenure reform, in 2004, Jiangxi province selected seven pilot areas to implement the reform, including Fengcheng and Suichuan counties. The pilot reform in Fengcheng and Suichuan focuses on: promoting the classified forestry management (ecological and commercial forest), clarifying and protecting forest property rights to the right-holders, issuing property rights certificates, and promoting the markets for forestland use rights and wood ownership.[13] These make the two regions ideal cases to examine the effects of the new round of forest tenure reform.

The village and household-level data used in this study were collected in 2011. Using a stratified random sampling method, we selected 14 villages from Suichuan county and 15 from Fengcheng city (county level). Around 10 households from each village were randomly selected, according to the village size[14] and a total of 289 households were surveyed. The structured questionnaire provided information on the characteristics of the villages, the interviewed households, the forestland, and the status of forestland tenure and rentals. To get an in-depth insight into the forestland rentals and forestry management, we conducted a follow-up survey in 2013 via in-depth interviews on some households and village leaders. However, we cannot exploit the panel nature of the data set for our analysis because the second survey did not collect all information as the first survey. Instead, the cross-section data set of 289 households was used for our empirical analysis.

4.2. Variables used in the analysis

4.2.1. Participation in the forestland rental market

The two dependent variables in our analysis consist of a forestland renting in dummy and the area of land that is leased. We focus our analysis on the demand side of the forestland rental market.[15] The supply side is usually under-enumerated in rural household surveys, including the survey that we used for this study, as households who rent out land may not be at home, or even reside in the village, at the time of survey and thus not interviewed. In our fieldwork, there was evidence that the forestland rental market had already developed to a certain extent: by 2011, 18% of households were renting in forestland, with an average of 66.30 mu of rented-in land. The share of households leasing additional land that we found was much higher than the average rent-in share for Guizhou and Ningxia (7%) found in 2004–2005 by Mullan *et al*. (2011)

[9] 1 hectare = 15 mu.

[10] Data source: The 8th National Forest Survey 2009–2013, http://www.forestry.gov.cn/main/65/content-659670.html.

[11] Data sources: Statistical Bulletin in Suichuan and Fengcheng, http://www.jxstj.gov.cn/News.shtml?p5=6474252, and http://www.suichuan.gov.cn/doc/2012/01/30/22564.shtml.

[12] See details at: http://jx.people.com.cn/n2/2017/0803/c186330-30566622.html.

[13] See details at: http://news.sina.com.cn/o/2004-02-20/07201848306s.shtml.

[14] In eight villages, more than 10 households were interviewed, and in five villages, less than 10 households.

[15] Due to lack of space, a table related to variable definition, descriptive statistics and expected signs can be obtained upon request from the corresponding author.

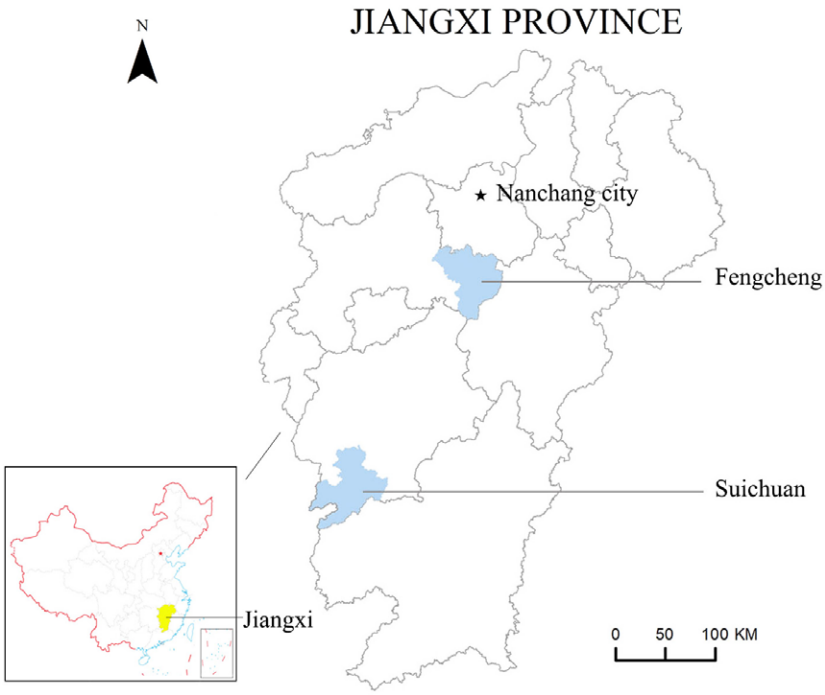

Figure 2. Geographical location of the study sites.

and the average level (12%) for Sichuan, Jiangxi, Fujian, and Hunan provinces during 2003–2009 found by the Collective Forest Land Tenure Reform Research Group. Hence, our limited evidence suggests that forestland rental transactions have continued to increase in rural China during the first decade of the 21st century.

4.2.2. Forest property rights integrity/degree of decentralization

In practice, property rights to land can be divided as 'a bundle of rights', which can be pictured as 'sticks in the bundle' (FAO, 2002), and form the basis of property rights integrity in this study. Agrawal and Ostrom (2001) categorize the bundle of rights into four types that are most relevant for the use of common-pool resources: withdrawal, management, exclusion, and alienation.[16] Based on 69 case studies worldwide, Pagdee *et al*. (2006) identified 43 variables with significant influence on the success of community forestry, including tenure security, clear ownership, the degree of decentralization, etc.

In this study, based on the definitions of property right integrity in the farmland studies (Brasselle *et al*., 2002;) and forestland studies (Holden *et al*., 2011; Yi *et al*., 2014), we defined property rights integrity to represent the degree of decentralization, in terms of the number of 'sticks' in the bundle that a household holds and the extent to which these sticks can be held by households. Specifically, the bundle has three categories and 11 specific rights:

1. Use rights—the rights to convert forestland into farmland, to change forest type, to decide which tree species to plant, to plant non-wood forest product, to abandon forestland, and to cut down the forest.
2. Mortgage rights—the right to use forestland as collateral to obtain credit from formal and informal lenders.
3. Rental rights—the rights to rent in forestland from the villagers, to rent out forestland to the villagers, to rent in forestland from non-villagers (outside the village), and to rent out forestland to non-villagers (outside the village).

Both mortgage rights and rental rights could affect the disposal of land, but they may have different effects on forestland rentals (see the detailed discussion in Section 6). Therefore, we differentiate between mortgage rights and rental rights, instead of talking of disposable rights as a homogenous whole.

Each kind of property right integrity as represented in the bundle is assigned a 0 (if a household considers itself not to hold such a right), 1 (if he/she is not sure of having such a right), 2 (if he/she holds the right with village committee's approval), or 3 (if he/she holds the right even without village committee's approval). The larger the score is, the higher the degree of decentralization of the right.

To mitigate the risks of multicollinearity, the use rights variable is calculated by the mean of the six related rights,

[16] *Withdrawal* is the right to enter a defined physical area and obtain resource units or products of a resource system (e.g., cutting firewood or timber, harvesting mushrooms, diverting water). *Management* is the right to regulate internal use patterns and transform the resource by making improvements (e.g., planting seedlings and thinning trees). *Exclusion* is the right to determine who will have right of withdrawal and how that right may be transferred. *Alienation* is the right to sell or lease withdrawal, management, and exclusion rights.

and the rental rights variable is calculated by the mean of the four related rights. In the end, following Holden *et al.* (2011),[17] we considered three categories of rights indexes in the models: (the average of) use rights, mortgage rights, and rental rights. Compared to the property right score of mortgage rights (scored 1.29), the scores of rental rights (2.36) and use rights (2.17) are larger, indicating higher degrees of decentralization. However, the holding of these two rights still needs the approval of the village committee, as the surveyed households perceived. This indicates that the collective action over past decades has continued to influence individual household's decision-making process.

It should be noted that forestland rental behaviour can also affect household perceptions of property rights integrity, and this could be a potential cause of endogeneity. To overcome this problem, we use a method similar to that employed by Mullan *et al.* (2011) and Ma *et al.* (2016). Village-level perceived property rights integrity is defined as the average property rights integrity perception of the other survey respondents living within the same village. This variable is used as a proxy for a household's perceived property rights integrity, which reduces the potential simultaneity bias. This assumes that property rights integrity perceptions will be very similar for households living within the same village, and that the renting-in decision of one household does not affect the property rights integrity perceptions of the other (surveyed) households in the village. On the other hand, the choice to rent in forestland will also partly depend on the supply decisions taken by other households living in the same village, and the factors affecting those supply decisions. The use of a village-level average of perceived property rights integrity is also expected to capture the supply-side effect of property rights integrity perception in the village.

4.2.3. Forest tenure security

Security of tenure is the certainty that a person's rights to land will be recognized by others and protected in cases of specific challenges. Tenure security cannot be measured directly and, to a large extent, it is what people perceive it to be (FAO, 2002). There are many risks and uncertainties that can influence the likelihood of future land dispossession. For example, evidence from many developing countries indicates that fear of losing land via land reallocation, expropriation by state agencies, or local elites is widespread and would result in forest tenure insecurity (Stickler *et al.*, 2017).

Rural China is no different from other parts of the world in this respect. Since the introduction of the HRS, farmers have faced wavering forest policies, and the possibility of land reallocation or expropriation over their forestland is relatively high (Holden *et al.*, 2011; Qin and Xu, 2013; Yin *et al.*, 2013). As pointed out by Liu and Ravenscroft (2016), the collective forests used to be distributed to each village group via 10-year contracts. All the available collective forests in a village were classified into good, medium, and poor ones. Then large parcels of forest were divided into smaller pieces, and a bundle of each in the good, the medium, and the poor categories was combined to make sure that the average value of each lot was the same. Therefore, reallocation is the key to ensure access to land by all members of collectives (Feng *et al.*, 2014).

In addition, collective action is also identified as an important factor that leads to tenure uncertainty. For example, in the process of reform, conflicts often occur among those households with current contracts and those granted new ones, those households with many forests, and those with few forests. Each group has its own claims and the collective action of each group will add complexity to the reform and generate tenure insecurity (Liu and Ravenscroft, 2016). Reallocation after the due date means that one household may not be able to continue holding the piece of land that he/she now holds. He/she may lose the land due to population change, having daughters who marry outside their villages, migration to urban areas, etc. Therefore, the perception of reallocation when contracts expire is often used as a proxy for tenure security in the literature, see Mullan *et al.* (2011), Holden *et al.* (2011), and Liu and Ravenscroft (2016) in forestland studies, and Ma *et al.* (2017) in farmland studies.

Owing to the strict policy of protecting cultivated land, forestland expropriation is rising each year and the converted forestland has become a major source of construction land. On the one hand, according to the sixth National Forest Resource Inventory (1999–2003), there were 562,000 hectares of forest area being converted to non-forestry land each year, most of which was expropriated for construction projects (Feng, 2003). The reason is that the local governments may either voluntarily or compulsorily acquire land for public interest and pay the owners compensation according to the laws. However, neither the current laws and regulations has defined the exact meaning of 'public interest' nor the entity having the right to affirm 'public interest'. Therefore, 'public interest' becomes a highly abstract concept. Thus, in practice, local governments may expropriate land either without taking public interest into account or with compensations far below market value or the standard stipulated by law, thereby depriving farmers' rights and interests (Yang, 2012).[18] Besides,

[17] Holden *et al.* (2011) defined a bundle of disaggregate rights (the right to convert forest land to cropland, the right to change forest type, the right to decide tree species, the right to intercrop trees and agricultural crops, the right to abandon forest, the right to rent the plot to other villagers, and the right to rent the plot to outsiders) and calculated a property rights index by summing all the rights scores from the disaggregate rights.

[18] In China, the compensation for land expropriation is based solely on the (short-term) production value of land and does not take into account the social security function of land for the peasants. While the land is expropriated, the peasants will lose both the production value of land and their basic means for survival. This problem is more serious when those peasants who lose their land are not treated similarly to real citizens in terms of social security, employment, and school entrance.

the process of expropriation often involves either threats of violence or actual violence, and attempts by expropriated farmers to protest against perceived injustice can be blocked in various ways (Pils, 2016). There are no independent courts for owners of rural land to appeal against unjust treatment (Hui *et al*., 2013).

On the other hand, according to the *Measures for the definition of national public welfare forest zoning*, which took effect in 2010, the proportion of public welfare forest out of total forest area should be stabilized at a level of 30–40% (SFA, 2009). Therefore, as the total forest area rises, the area of forest being converted to public welfare forest also rises. In some regions, the local governments pursue ecological benefits aggressively, sometimes ignoring the economic demands of the local farmers (Tang and Luo, 2008). Consequently, forestland expropriation has become another important source of tenure insecurity in China.

Therefore, we use two indices of perception to define tenure security: household expectations of forestland reallocations when the contract period expires, and household perceptions of forestland expropriation within 10 years.[19] Each kind of tenure security is assigned 0 (if a household perceives that forestland might possibly to be expropriated/reallocated), 1 (if he/she is unsure that forestland might be expropriated/reallocated), or 2 (if he/she perceives that it is impossible that forestland will be expropriated/reallocated). As with property rights integrity, the village-level perceived that tenure security is defined as the average tenure security perception of the other survey respondents living within the same village.

4.2.4. Control variables

The control variables are grouped to give the characteristics of the household, forestland, village, and region, which are selected on the basis of previous studies of land (both farmland and forestland) markets in China (e.g., Holden *et al*., 2011; Mullan *et al*., 2011; Xu *et al*., 2013; Yi *et al*., 2014; Ma *et al*., 2016).[20] Household characteristics include age, education level, political position (village leadership/-party membership), gender, occupation (specifically forestry management experience) of the household head, household size, share of labour aged between 16 and 65 years, ratio of female/male labour force, average education level of the family workforce, share of off-farm employment, family wealth, and subsidies received from the government. Forestland characteristics include the initial number of plots and total forestland area. The initial number of plots is a measure of the degree of fragmentation. Village characteristics are captured by the distance from town. A regional dummy (0—Suichuan, 1—Fengcheng) is also employed to control for the unobserved region-specific factors that affect forestland rentals.

5. Model specification and estimation strategy

5.1. Model specification

The basic model for examining the joint effect of the two tenure status variables on forestland market decisions is specified as:

$$M_i = \alpha_0 + \alpha_1 UR_i + \alpha_2 MR_i + \alpha_3 TR_i + \alpha_4 LR_i + \alpha_5 LE_i + \sum \alpha_{6j} X_{ij} + \mu_i, \quad (1)$$

where M_i denotes the forestland market participation variable for household i, i.e., either the participation decision (renting-in dummy), or the total area of forestland rented in; UR_i, MR_i, and TR_i denote the average village-level expectations for household i with regard to forestland use rights, mortgage rights and rental rights, respectively; LR_i and LE_i denote the average village-level perceptions for household i with regard to forestland reallocation and expropriation, respectively; X_{ij} is a set of control variables for household i, consisting of the village, household, land and regional characteristics (as presented in Section 4.2); and u_i *is* the random disturbance term.

5.2. Estimation strategy

We used a probit model to estimate the equation for the forestland market participation decision. A household will participate in the forestland market if the expected net utility from renting in forestland is positive. Otherwise, the household will not participate in the market for forestland.

Censored tobit models are used to estimate the equations for the area of land rented in by renting households because the variable is left censored. In our data set, 82% of households are left censored at 0. A censored tobit model is an appropriate estimation technique for dealing with corner solutions.

It should be noted that unobserved characteristics that influence the probability to participate in forestland market may also influence decisions on the area of land rented in. We used the Heckman selection model to test for possible selection bias. The test results did not show evidence of a significant selection bias for the data set.[21] Therefore, we used the censored tobit model instead of the Heckman selection model to estimate the equations for the area of land rented in.

[19] See details on how to measure the perception of land tenure security in the study of Ma *et al*. (2015).

[20] Due to the lack of space, the selection criteria of control variables and the expected signs can be obtained upon request from the corresponding author.

[21] The two-step estimates in STATA report an inverse Mills ratio of 59.20 (p-value = 0.43) in model (1), −51.31(p-value = 0.58) in model (2), and 12.42 (p-value = 0.87) in model (3). Thus, we cannot reject the null hypothesis that there is no selection bias for all these models.

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

	(1)	(2)[a]	(3)[b]
	Rent in dummy (probit)	Rented land area (tobit, cluster)	Rented land area (tobit, bootstrap)
	Coef. (Std. Err.)[a]	Coef. (Std. Err.)	Coef. (Std. Err.)
Property rights integrity/Degree of decentralization			
Village perception of use rights	−2.41*** (0.63)	−171.80** (74.51)	−171.80* (96.71)
Village perception of mortgage rights	−1.52*** (0.54)	−170.40* (98.91)	−170.40 (114.30)
Village perception of rental rights	−0.36 (0.44)	20.66 (54.01)	20.66 (80.04)
Forest tenure security			
Village perception of land reallocation	2.02*** (0.67)	152.70** (66.14)	152.70 (102.50)
Village perception of land expropriation	1.59* (0.83)	226.00* (131.30)	226.00 (200.02)
Household characteristics			
Head age	−0.34*** (0.05)	−28.70 (19.01)	−28.70 (24.13)
Head age square	0.003*** (0.0005)	0.27 (0.17)	0.27 (0.21)
Head education	0.04 (0.05)	11.56* (6.95)	11.56 (10.15)
Leader or party member	0.45 (0.29)	76.54* (40.62)	76.54 (58.20)
Head gender	−1.88*** (0.63)	−158.70** (79.04)	−158.70 (107.30)
Head occupation	0.63** (0.26)	47.66** (21.78)	47.66 (31.09)
Household size	−0.18 (0.12)	−12.42 (12.57)	−12.42 (15.79)
Labour share	−0.04 (1.00)	−88.12 (94.33)	−88.12 (135.10)
Female/male ratio	−0.27 (0.34)	−20.92 (49.55)	−20.92 (61.16)
Average education	0.11 (0.08)	8.11 (5.85)	8.11 (11.44)
Off-farm employment share	0.30 (0.51)	123.80* (73.60)	123.80 (104.30)
Ln(Family wealth)	0.14** (0.06)	16.05** (8.05)	16.05 (15.25)
Ln(subsidy)	0.07** (0.03)	6.52 (6.11)	6.52 (7.87)
Forestland characteristics			
Plot number	−0.77*** (0.13)	−79.09*** (27.43)	−79.09** (34.45)
Forestland area	0.0007 (0.007)	0.42 (0.63)	0.42 (1.01)
Village characteristics			
Distance to town	0.26*** (0.06)	26.02** (10.71)	26.02* (13.50)
Regional characteristics			
Region dummy	−1.48*** (0.53)	−192.50** (84.72)	−192.50* (103.00)
Constant	11.43*** (3.10)	627.30 (500.20)	627.30 (610.50)
Observations	289	289	289
Mean VIF[c]	9.05	9.05	9.05
Log pseudo likelihood	−53.81	−363.09	−363.09
% correct prediction	92.04	–	–

Notes: *,**, *** indicate statistical significance at the 10%, 5%, and 1% levels respectively.
[a] Standard errors are adjusted for 29 clusters (villages).
[b] Bootstrapped standard errors with 200 replications are reported.
[c] Mean VIF tests the degree of multicollinearity among the independent variables, including all interactions.

As explained in Section 4.1, a multi-level sample design was used for collecting the data, with 29 villages selected in the first stage and around 10 households per village selected in the second stage. To take this specific data structure into account, we applied cluster-adjusted standard errors, adjusted for the 29 villages, in all the regressions.

6. Results and discussion

6.1. Estimation results

Table 2 reports the regression results for the probit and tobit models. From the perspective of property rights integrity, providing farmers with more complete use rights and mortgage rights negatively affected the probability and intensity of households renting in forestland. This finding is consistent with Proposition 1, which indicates that the value-increasing effect is likely to be stronger than the transaction-cost-reducing effect in our sample areas. For many households, the holding of use rights still needs the approval of the village committee, especially the rights to convert forestland into farmland and to cut down trees. As a result, the transaction-cost-reducing effect on renting-in decision is, though positive, but possibly modest, confined by the incomplete degree of decentralization.

However, the value of forestland and anticipation of a higher rental price may increase significantly with more integrated use rights (i.e., the rights to change forest type,

to decide on which tree species to plant, to plant non-wood forest products) and as mortgage-rights are granted to households. In the absence of a reliable social security system, the value-increasing effect increases the willing-to-accept (reservation) price of the potential landlords, which is higher than the willingness-to-pay price of potential tenants. As discussed in Section 3.2, in the ideal context, all use rights and mortgage rights owned by potential landlords can be transferred to potential tenants via land rental contracts, which would not cause a significant gap between the willingness-to-accept price and the willingness-to-pay price. However, the absence of effective protection of land rights by governments and village committees means that most land-rental contracts are incomplete. This is due to several important rights (e.g., the right to plant non-wood forest products, the right to cut down trees, mortgage rights) are not easily transferred fully from potential landlords to potential tenants through rental contracts. Take our sample as an example, most surveyed households did not perceive their forestland rental contracts containing the rights to cut down trees to be completely secure. This makes the matching of tenants to owners difficult leading to a sclerotic market.

This can be further supported by the fact that, in our sample, none of the surveyed households have ever converted forestland into farmland. Therefore, the transaction-cost-reducing effect may be weakened. Moreover, in our follow-up field survey in Suichuan and Fengcheng in 2013, one of the primary reasons for those who did not have incentives to rent out forestland is that their expected rental prices were higher than the prices offered by potential tenants. With the rights to decide which tree species to plant, to plant non-wood forest products, and to cut down trees, they have planted more valuable trees such as redwoods and oil-tea camellia, which add value to their forestland and raise the expected rental prices. However, the in-depth interviews show that these households are not willing to transfer all rights to potential tenants even though they have higher incentives to rent out land, as illustrated by some households: "If I give all land rights to tenants, I will lose supervising the rented-out forestland so that the tenants can utilize my forestland in an unsustainable way. Moreover, I also have more chances of losing my forestland in the next round of land contracting period."

Rental rights are found to have an insignificant effect on rental decisions. This finding is not consistent with Proposition 2, but echoes the finding of Zhu *et al*. (2014). The possible reason may be that a well-functioning rental platform did not exist in our research area, which may restrict information exchange among villages, towns, or counties. This is evidenced by the fact that most forestland rental transactions in our sample took place within the same villages (only 2 out of 52 households rented in forestland from non-villagers). The relatively higher variances in the perceived rights to rent-in (out) from (to) *non*-villagers, which are two components of the combined variable 'rental rights', will not impact the household's decision to rent in forestland from the villagers. Therefore, granting more complete rental rights does not significantly induce households to participate in the forestland rental market in our research area.

Regarding tenure security, both forestland reallocation and expropriation variables had significant and positive impacts on renting-in activities. This finding is in line with Proposition 3, and also with the findings of Kimura *et al*. (2011), Zhou and Chand (2013), and Ma *et al*. (2015) in farmland rental market studies, and Liao *et al*. (2010) in forestland rental market studies. It means that, in our sample, tenure (in)security still plays an important role in shaping forestland rental market.

The control variables relating to household characteristics show that the partial derivative of the head of household's age is negative and significant, after taking the square of age into consideration. This implies that younger household heads are more likely to rent in forestland.

The head's political standing, as represented by being a cadre or a CPC member, facilitates rent-in activities, but the effect of education level is not significant at the 5% level. Contrary to our expectations, households with male heads tend to rent in less forestland. A reasonable explanation for this is that the returns on investment in forestry are relatively low in our survey areas. As the main labour force in the households, male heads may participate in other sectors that provide higher returns than forestry.

As expected, households' experience in engaging in the forestry sector and family wealth contributed both to their willingness to rent in and the rented forestland area, which means more experienced and capital-abundant households are more capable of renting in.

Lastly, forestland fragmentation significantly reduces the possibility and area of renting in, which supports the findings of Xu *et al*. (2013) in a forestland study and Ma *et al*. (2011) in a farmland study. Our results also reveal that households in more remote areas, further from the nearest town, tend to rent in more forestland. Location is also an important factor in renting in. Farmers in Suichuan are keener on forestland rentals than those in Fengcheng, which implies that some unobserved differences between the two regions, such as land quality or the institutional environment, may affect land renting decisions.

It should be noted that household's own tenure security perceptions may also affect its forestland renting in decision. To deal with this problem, as a robustness check, we use the village-average tenure security perceptions as instruments to calculate the predicted values of individual tenure security perceptions (see e.g., Ma *et al*., 2016, 2017). It turns out that, although there were some changes in the significance level of the coefficients of tenure variables, the results of the robustness check are still robust

within the context of the choice of the estimation technique.[22]

6.2. Integrated forestland management approach: decentralization of property rights and village governance

Through collective action, members of small local groups could create institutional arrangements that shape interactions among community members and the resources, which help them to protect their resources and allocate benefits among themselves equitably with a reasonable degree of efficiency (Gautam and Shivakoti, 2005; Liu and Ravenscroft, 2016). However, not all users of common pool resources (CPRs) are able to protect and manage their resources successfully via collective actions of small groups. The outcomes from local level collective action depend on state policies, demographic shifts, technology, market, etc. (Agrawal, 2001).

The structure of the population in villager groups (the most prevailing local group in rural China) has changed significantly since a majority of households have worked as migrants in urban areas, while some non-villagers (such as employers of enterprises) have moved to village groups (Su *et al*., 2018). Both changes give rise to a new and unstable social network in the rural area. The collective management of CPRs (which relies more on small and stable group) is facing high costs, such as regulating, monitoring, and maintaining, which make interactions among community members and the resource costlier. Therefore, the conditions for collective action have shifted in most areas of rural China and it becomes hard to successfully implement collective action in the larger and especially unstable villager groups (Gautam and Shivakoti, 2005).

In this situation, an integrated forestland management approach is proposed based on Agrawal and Ostrom's (2001) analysis,[23] which requires the coordination at the state, collective, and household levels. The forest tenure reform in 2003 (the 2003 reform) almost follows the integrated forestland governance framework. However, as Table 3 shows, it does not work effectively enough, which will be elaborated below.

6.2.1. State level

In the integrated forestland governance framework, the role of the state refers to whether and how to devolve forest property rights to individuals and to ensure forest tenure security. Decentralization has been implemented and the forest property rights have been devolved to individual households in the 2003 reform. However, the decentralization of the rights to date has been incomplete. First, since contractual and management rights are distributed to farmers as a whole, it does not solve the main conflicts between contractual rights of the landlords and the management rights of the tenants over rented forestland. Contractual management rights obstruct the full devolvement of forest property rights from the landlords to the tenants and constrain the decision-making power of the tenants. Second, the legal rules at the state level blur the ownership of forestland (Ho, 2001). Although land ownership was vested at the collective level, who represents the collective (i.e., the production team, the natural village committee, or the villagers' group) is unclear. Third, the state has not stopped expropriating forestland (either for construction projects or for ecological forest) despite the devolution of forestland property rights to individual households. Thus, the 2003 reform cannot achieve the goal of stimulating households' investment in forest production, development of forestland transfer market, and consequently leads to dilemma of forest resource governance at collective level.

6.2.2. Collective level

The role of the village collectives refers to whether the scope of collective governance complies with state regulations. As rule followers, the village collectives should implement the guidelines set at the state level. However, the collective governance faces a dilemma due to the unseparated contractual management rights and obscure ownership of collective forestland. On the one hand, to avoid negative externality of property rights decentralization (e.g., excessive deforestation based on the individual's objective of short-term profit maximization), the collective excessively intervenes in the process of granting forestland property rights, which undermines the degree of decentralization and violates the development of forestland market (as is shown by our empirical results). On the other hand, the collective lacks the requisite supervision and mediation capabilities to avert conflicts and minimize the risks of over-exploitation of a common resource.

6.2.3. Household level

The role of household versus that of the state and the collective is unclear regarding the renting of forestland and the management of the common forestry that provides ecological services to the community at large. The risk of the state expropriating forestland weakens the degrees of tenure integrity and security at household level, thus taxing forestland rental activities. The potential tenants have two concerns: (i) they may not enjoy the same level of rights as the owners do. Thus, they do not recognize the rise of forestland value and their willingness-to-pay price is lower than the willingness-to-accept price of their counterparts; and (ii) they may lose forestland via village-level redistribution or state-level expropriation for public interest (Liu

[22] The detailed analysis and results of robustness check can be obtained upon request from the corresponding author.

[23] They point out that forest property rights can be exercised at three distinct levels of analysis, i.e., constitutional level, collective level and operational level.

Table 3. The 2003 reform evaluation and future direction: an integrated forestland governance framework

Three levels	What the 2003 reform has and has not done	What needs to be addressed in the next step
State level	• Decentralization of management rights (e.g., use rights, mortgage right), but are affiliated to contractual management rights • Blur the ownership of forestland and does not recognize the role of village collective • Expropriate forestland despite the devolution of forestland property rights to individual households	• Decentralized management rights detached from the contractual management rights • Recognize and certify the village collective ownership • Enhance state-level protection of individual rights
Collective level	• Unsolved conflict between contractual right and management right • Excessive intervention in integrity and security of forestland property rights • Lacks necessary supervision and mediation on potential conflicts and negative externalities	• Avoid direct intervention in the integrity and security of specific forest rights • Strengthen supervision and protection of decentralized forestland rights, and focus on conflict resolution
Household level	• Low degree of perceived forestland property rights integrity • Risks of losing forestland via reallocation and expropriation remained • Weak decision-making power	Given the integration of decentralization of rights and village governance, household may: • Be more inclined to expand forestland operation scale • Increase forestland market efficiency

Source: Sorted by the authors based on the performance of the 2003 reform.

and Ravenscroft, 2016). These reasons dampen the incentives to rent-in forestland. Thus, the 2003 reform did not achieve the goal of stimulating the rental market for forestland in our study sites.

In summary, the 2003 reform fell short at three levels and may need to be addressed in the future: (i) at the state level, the central government may further devolve forest property rights to individual households, making sure that decentralized management rights are detached from contractual management rights. It may certify and strengthen the role of the collective governance based on the ownership status, and enhance the protection of individual rights at the state-level; (ii) at the collective level, governance may shift from direct intervention in the integrity and security of forestland rights to supervision and protection of decentralized forestland rights. This shift will increase the efficiency of the decentralization of property rights and avoid negative externality of individual behaviour based on decentralized forestland rights, so as to achieve a balance between top-down governance and bottom-up autonomy (Li, 2017); and (iii) at the household level, the integration of individual rights with village governance could increase forest market efficiency.

To supplement the 2003 reform, in 2016, the so-called 'Three Rights Separation' policy for forestland was implemented. Although many issues, i.e., detailed rights and obligations of different rights holders, are still under discussion, the policy is a significant step forward in the integrated forestland governance framework. At the state level, the policy further separates farmer's contractual management rights into contractual rights and management rights (i.e., use rights and disposable rights).[24] It also stipulates that management rights may be rented while contractual rights (as well as its ownership) cannot (Wang and Zhang, 2017). The village collectives may issue new certificates of forestland and woods to individual households, strengthen the management of transfer contracts, and loosen management rights by granting the operating entities more decision-making power. Most importantly, the village collectives could also strengthen their roles in monitoring the sustainable use of forestland and in conflict resolution. The implementation of the "Three Rights Separation" policy demarcates the roles of the state, the collective, and the individual. This could facilitate sustainable management of forests through improved coordination between the state, the collective, and the individual.

7. Conclusion and policy implications

Using household-level data collected over 289 households from Suichuan and Fengcheng in Jiangxi province in southern China, this study examines the impacts of

[24] The detailed rights and obligations at the law-level are still under discussion.

property rights integrity and security on households' decisions to rent in forestland. Our results show that granting farmers more secure rights (by reducing forestland reallocation and forestland expropriation without appropriate compensation) contributes to the development of the forestland market; while granting farmers more use rights and mortgage rights hinders the development of the forestland market. We argue that the insecure forest rights and informal rental contracts prevalent in our research area made it difficult to transfer use rights and mortgage rights of forestland to the tenants. Furthermore, the increased value of forestland resulting from improved property rights integrity is captured by only the owner and not by the potential tenants, thus shortchanging the development of a market.

The policy implications of our findings are for an integrated forestland management approach, which consists of state-level decentralization and village-level governance of forestland property rights. First, it is important and urgent to explore effective paths to decentralize property rights of forestry. The decentralization during the 2003 reform in Jiangxi is insufficient at the state, collective, and household levels. The 'Three Rights Separation' policy in the field of forest tenure reform in 2016 further decentralized forest rights by separating management rights from contractual management rights. However, more measures are still required to specify the relationship of rights and obligations among three parties: village collectives (ownership), renting-out households (contractual right), and renting-in entities (management right). Compared to farmland, forestland has a larger bundle of management rights, as is specified as six kinds of use rights and two kinds of disposal rights in our study. In the context of 'Three Rights Separation' system, only management rights can be rented, and how to guarantee the transfer of these rights to tenants is the core of the implementation of 'Three Rights Separation' policy. The policymakers could refer to effective paths in the field of farmland tenure reform and learn from the local bottom-up innovations in implementing the 'Three Rights Separation' policy.

Second, forest tenure reforms may put more emphasis on village-level enforcement mechanisms and increase household perceptions of property rights integrity and security. Households' perceptions of decentralization and tenure security are far below the level regulated for by legal provisions. The incomplete and insecure bundle of rights would discourage households to rent-in forestland and enlarge the scale of their operation. As a result, an effective management of forestry resource requires an integrated forestland management approach, which coordinates the full execution of decentralization of forestland property rights at the state level and proper intervention at the collective level. This framework gives a new meaning to the 2003 reform and the "Three Rights Separation" policy in 2016 by repositioning the role of village collective to an intermediary and regulator, leaving the decision to invest and produce to individuals granted the secure rights to property.

These findings obtained from the analysis could have relevance for reforms to tenure of forestland in the rest of China and in several developing countries wresting with similar land tenure systems. A word of caution is in order here. The results in this must be interpreted with some caution given that the data used for the analysis has been collected from two relatively small regions in rural China. Consequently, the insights gained may not be relevant to other parts of China, and to developing countries in general. In addition, more empirical analysis in the future will need to be carried out to quantify the transaction costs and increased value associated to changed property rights integrity and security. Therefore, more surveys or interviews are needed for the empirical study.

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