



# Perceived land tenure security in rural Xinjiang, China: The role of official land documents and trust

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## ABSTRACT

The role of formal tenure institutions in reducing land tenure insecurity has been long debated in the development economics literature. This study examines and compares the key determinants of perceptions of security of tenure over contract land and wasteland, two types of land that are characterized by tenure being formally and informally ascribed. The material is drawn from the Chinese region of Xinjiang, an ethnically heterogeneous region which has more complex tenure systems than elsewhere in China. Empirical estimations based on a survey of 352 households, complemented by interviews with key informants, demonstrate that formal institutions (measured by official land documents) do not significantly contribute to households' perceptions of tenure security on either type of land, and that both interpersonal trust and political trust significantly enhance perceived tenure security on either land type in our research area. The empirical evidence further shows that perceptions of tenure security on both types of land are more sensitive to trust towards village cadres than trust in villagers.

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## 1. Introduction

Given its growing scarcity, access to agricultural land has gained global political and social importance. Within this context, small farmers, particularly in developing countries, are confronted by multiple threats, partly caused by tenure insecurity. Policies aimed at enhancing tenure security, mainly by granting formalized private property rights, have been widely implemented in many developing countries (Deininger & Jin, 2003; Feder & Nishio, 1998). It is often argued that the level of tenure security under community ownership is lower than that under a private property regime (Kung, 2000), and this has led neoclassical and neoinstitutional economists to be supportive of land privatization (De Soto, 2003), and in the evolutionary theory of property rights (Platteau, 1996). Some Chinese literature argues that general economic reforms may soon be leading in the direction of the full privatization of agricultural land (Ho, 2001; Zhang, 2012; Zhu & Prosterman, 2007). This raises a pertinent question: do legal formalized property rights contribute to increased tenure security in China, particularly in regions where cultural traditions strongly influence the implementation and outcome of economic and policy reforms? This study seeks to answer this question by looking in detail at the case of small cotton farmers in rural Xinjiang, China.

There is evidence to show that land-titling campaigns can enhance tenure security (Bouquet, 2009; Deininger & Chamorro, 2004; Reerink & van Gelder, 2010). However, this approach can also be criticized since, in practice, land titling often fails to improve the tenure of security of poor and small-scale farmers (Broegaard, 2005; Jansen & Roquas, 1998; Roquas, 2002). Moreover,

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the provision of tenure security through the legal formalization of property rights is often time-consuming and costly, and usually caters primarily to rural elites (Baye, 2007; Jansen & Roquas, 1998; Palmer, 1998).

Several studies have demonstrated that land tenure security can be high in informal tenure settings, without formally established property rights (Rakodi & Leduka, 2004; Stanfield, 1990). Informal institutional arrangements play an important role in this as they are cost-effective and involve a degree of social acknowledgment in the process of land occupation and access to land rights (Benjaminsen, Holden, Lund, & Sjaastad, 2009; Berry, 1989; Bouquet, 2009; Broegaard, 2005). Available empirical evidence also shows that land related investment activities can strengthen landholders' land tenure security (Brasselle, Gaspard, & Platteau, 2002; Ma, Heerink, Van Ierland, Van den Berg, & Shi, 2013a; Rao, Spoor, Ma, & Shi, 2016). However, these arrangements may also be a source of insecurity (Ho & Spoor, 2006), as informal institutional frameworks lack the legal protection of state agencies (Baye, 2007; Benjaminsen, 2002; Payne, 2001; Peters, 2004). In addition, community-based titles may encounter difficulties in land transfer when faced with growing land market demands (Bouquet, 2009). As such, De Soto (2003) has argued that under informal settings without full usufruct rights, it is difficult for landholdings to be used as a marketable (and bankable) asset.

Thus, opinions about the effects of 'informal (or customary)' and 'formal' institutional arrangements on land tenure security vary considerably (Jansen & Roquas, 1998).<sup>1</sup> Despite the large body of work on the impact of the two approaches there is still no consensus on the role of institutional forms in shaping land tenure security (Broegaard, 2005; Sjaastad & Cousins, 2009). This leads us to examine the factors that influence land tenure security under specific tenure regimes.

We analyze tenure security in China by examining the extent to which formal (legal) tenure institutions enhance small scale farmers' perceptions of tenure security. The study has both theoretical and practical significance, the latter because it provides a fascinating perspective on the outcomes of tenure reforms in the period following the household responsibility system (HRS) era of the early 1980s. Several rounds of tenure reforms aimed at enhancing tenure security have been carried out since then, and rural land in China is described as 'quasi-private' (Kung, 2002). Farmers are granted long-term use rights, albeit with substantially variations between villages (Mullan, Grosjean, & Kontoleon, 2011). However, the threat of land eviction and disputes over ambiguous ownership are still widespread (Ho, 2001; Liu, Carter, & Yao, 1998; Zhu & Prosterman, 2007), since households' tenure status is insufficiently protected (Brandt, Rozelle, & Turner, 2004). To date there has been very little empirical analysis of the role of formal and informal institutions in shaping farmers' perceptions of their tenure security in rural China,<sup>2</sup> and particularly whether formalizing land tenure security has any significant effect.

Our study focuses on rural Xinjiang, which has China's largest population of Uyghurs and other Muslim minorities, and is one of the poorest regions in China (Hao & Liu, 2012). This region is characterized by two different tenure regimes with that apply to contract land and wasteland.<sup>3</sup> In rural Xinjiang it is often problematic to maintain access to land as local governments retain control over land due to concerns about local and regional food security and social stability. Rural Xinjiang's combination of ethnic heterogeneity and relatively complex tenure regimes provides an interesting context for exploring the role of institutional factors in shaping land tenure security - a topic which, to the best of our knowledge, has not been previously analyzed.

This paper investigates and compares the key determinants of perceptions of tenure security on both contract land and wasteland within a context of multi-ethnic community. It particularly focuses on the role of land certificates, formal contracts and (interpersonal and political) trust. Such an analysis can contribute to a broader theoretical understanding of land tenure security under different land tenure regimes. It can also contribute to a better understanding of how contract land and wasteland are claimed and 'secured' within coexisting formal and informal settings in rural China - a country where agriculture is in a crucial stage of transition, in which relatively weak legal structures occur alongside the rapidly expanding influence of markets. As such we intend that our analysis of this case study in Xinjiang should make a worthwhile empirical contribution to the debate on perceptions of land tenure security and the mechanisms that shape these.

The rest of the paper is organized as follows. Section 2 portrays the key land tenure reforms in the post-HRS era in rural China and includes a summary of the results of a qualitative study undertaken in rural Xinjiang, that looks at how small farmers' perceptions of tenure security (on contract land and wasteland) is shaped within contemporary, differentiated, land tenure regimes. This section also lays out a general framework for understanding the effect of land documents and trust on tenure security within formal and informal institutional environments. Section 3 briefly introduces the research site and dataset, while Section 4 describes the model specification, estimation strategy and descriptive statistics. The estimation results are interpreted in Section 5 and Section 6 presents our conclusions.

## 2. Land tenure security: the role of formal institutions and trust

### 2.1. Land tenure reforms and tenure security in China

To give the reader a clear understanding of the tenure security of contract land and wasteland, we first describe the recent reforms to these two land tenure arrangements, paying particular attention to the role of informal arrangements in shaping perceptions of tenure security over wasteland in rural Xinjiang.

<sup>1</sup> Land tenure institutions include the legal and/or customary norms for the control and use of land (Baye, 2007).

<sup>2</sup> A notable exception is the study by Ma et al. (2013a), which illustrates that investments in irrigation canals contribute positively to farmers' perceived tenure security in Minle County, Gangsu Province.

<sup>3</sup> Wasteland refers to poor-rate quality and/or unused land, and sometimes to development land. It is usually converted from arid or semi-arid lands, which are almost desert-like (Spoor et al., 2010).

### 2.1.1. Contract land tenure reform and tenure security

Property and use rights of arable land have been a concern in rural China since the introduction of the HRS. While it is widely recognized that 'the collective' is the owner of arable land, there is sometimes a lack of clarity about the precise meaning of 'the collective' (Ho, 2010; Rosato-Stevens, 2008).<sup>4</sup> It is often unclear which entity actually represents 'the collective' i.e. the natural village, the administrative village, or the township government – and which of these is the de facto controller of land (Ho & Spoor, 2006; Wang, Tong, Su, Wei, & Tao, 2011). This ambiguity is partly 'deliberately' maintained by the central government, as it leaves space for institutional change, while also being broadly accepted (Ho, 2001; Lin & Ho, 2005).

Under the HRS, arable land was leased out to individual farm households, usually by either the township government or the village committee, through auction or other (often non-transparent) ways (Lohmar, 2006). In the early stages of the HRS, farmers were granted incomplete usufruct rights, with three limitations: the limited duration of land possession, the lack of official documentation and the absence of appeal mechanisms (Deininger & Jin, 2003; Ma, Wesseler, Heerink, & Qu, 2013b). To improve tenure security, three rounds of land lease reforms, aimed at extending the duration of contracts were carried out. Farmers were initially granted a 5-year period of cultivation (Spoor, Shi, & Pu, 2010). This was then extended to 15 years in 1984 and to 30 years in 1993. In 2002, the Rural Land Contract Law mandated that arable land tenure security should be maintained for at least 30 years from the last nationwide land reallocation in 1998 (Deininger & Jin, 2009; Zhu & Prosterman, 2007). The 2007 Property Law granted farmers the right to retain and pass on their land rights to their children when the 30-year period ends, implying perpetual land possession in the future (Deininger & Jin, 2009). In 2008, the central government further extended the land contract period from thirty years to an unspecified 'long-term' period (Wang et al., 2011).

In 1997 it was also decreed that land certificates should be issued to farmers (Deininger & Jin, 2003). Likewise, the 1999 revision of the 1986 Land Management Law also stipulated that a written 30-year land use contract should be issued to all farmers to legally protect their land use rights and prohibited further land readjustments, whether partial or full-scale (Deininger & Jin, 2003; Ma et al., 2013b). In addition, the Property Law defined farmers' land use rights as usufruct rights, implying that this would offer greater protection for land rights (Ho, 2005; Rosato-Stevens, 2008; Zhu & Prosterman, 2007). Other policy changes occurred in this era: the quota responsibility and land tax were abolished in most regions throughout China, and nationwide agricultural subsidies were introduced (Lohmar, 2006).

Although these legal reforms have improved small farmers' land tenure security, there are several reasons why many rural households in China still perceive the possibility of land eviction as a real threat. First, the state has not clarified the procedures for implementing legal tenure arrangements (Lohmar, 2006; Ma et al., 2013a). As a result, these rules have not been strongly enforced, nor translated into effective tenure security (Deininger & Jin, 2009; Rosato-Stevens, 2008). This has led to unintended outcomes (Lin & Ho, 2005; Zhu & Prosterman, 2007). For example, despite the widespread efforts to issue land certificates in many rural areas, local governments are often unwilling to comply due to the high transaction costs involved (Zhu & Prosterman, 2007). Moreover, holding a land certificate does not in practice reduce illegal reallocations, as formal documents are only useful when there is a proper institutional environment to enforce them (Deininger & Jin, 2009). In rural China the land registration systems are inefficient and the legal system is ineffective (Zhu & Prosterman, 2007). For instance when land is expropriated, the procedures followed often lack transparency and there is often no clear definition of 'public use'. As a result, many farmers face the threat of losing 'their' land, and/or receiving no, or inadequate, compensation (Deininger & Jin, 2009; Rosato-Stevens, 2008).

Secondly, local authorities still have much power over the distribution of land (Lohmar, 2006; Rosato-Stevens, 2008; Wang et al., 2011). The local collectives still conduct land readjustments whenever they deem it necessary (Ho & Spoor, 2006; Lohmar, 2006), implying a continued threat of land eviction to small farmers. A survey of 118 villages covering 6 provinces throughout China carried out in 2008 by Wang et al. (2011), reports that despite a decline in the proportion of villages where reallocation occurred, it still affected more than a third (37.8%) of villages. In addition the collectives also sometimes intervene in decisions about which crops to plant. This is particularly the case in some regions of rural Xinjiang (Spoor et al., 2010).

Finally, small farmers' trust in each other and towards public policies (or government officials) is often limited and sometimes completely absent. The literature shows that farmers have different attitudes to, and preferences for, legal tenure arrangements. The survey by Wang et al. (2011) reports that 62.8% of sampled households ( $n = 2212$ ) had a negative attitude towards the central government's efforts to stabilize farmland tenure. Ma et al. (2013a) found that 68% of sampled households ( $n = 526$ ) from 11 villages in Jiangxi province distrusted the central government's policy for enhancing land tenure security. Similarly Ma et al. (2013a) found that around 47% ( $n = 256$ ) of sampled households in Minle County, Gansu province, were distrustful of these changes.

### 2.1.2. Wasteland tenure reform and tenure security

It is estimated that over 11 million hectares of arid wasteland were converted to arable land in China between 1979 and 1995 (Arsel & Dasgupta, 2013). Under the Property Law the ownership of wasteland rests with the village community (as does arable land). During the decentralization process in the 1980s, a very small proportion of wasteland was allocated to individuals by 'collective' organizations. There has only been limited analysis of wasteland tenure reforms in China, mainly because the central government does not consider the development of wasteland to be a priority (Hanstad & Li, 1996).

<sup>4</sup> The Chinese Constitution stipulates that land in urban regions belongs to the state and land in rural and suburban regions belongs to collectives, except for land legally specified as being state-owned (Lin & Ho, 2005).

One important mechanism for acquiring wasteland is the Four Wastelands Auction Policy, which was initiated in Luliang Prefecture (Shanxi Province) in the early 1980s and later widely implemented all over the country (Ho, 2003).<sup>5</sup> The auctioned land is granted for a fixed period of lease-right and use-right. The initial lease period was 5 years in 1984, and this was later extended to around 10 years. The extension of the use-period is based on the previous auction contract, although involves the land-user paying additional fees to the village committee. The auction policy also stipulates that the county-level government should issue a land certificate to users. However, this policy has not been effectively implemented and a large proportion of farmers have received neither a land certificate nor a written contract (Ho, 2005).

In 1996 the central government stated that the *de facto* rights over wasteland could be allocated either to the village, the household, or the individual (Ho, 2003). The general principles of this policy are similar across China, except for some differences in the lease period and, sometimes, the contractual terms. Cultivators of wasteland are free to transfer, sell or inherit the land subject to prior approval from village officials. Interestingly, wasteland is the only category of land that can be used as collateral for a bank loan or mortgage under Chinese law (Ho, 2003).

### 2.1.3. Arable land reclamation and tenure security in rural Xinjiang

Contract land and wasteland are the two main components of arable land in rural Xinjiang. Due to the improved availability of technology and subsidies, the construction of irrigation facilities and population growth (partly due to an influx of migrants) in Xinjiang, large areas of wasteland have been converted for agricultural production (Spoor, Arsel, & Jiang, 2012). The HRS was implemented in 1984 and since then, contract land has been assigned to households to improve livelihoods and reduce poverty. Unlike elsewhere in China, regular land reallocation has not taken place since, but there have been changes in the length of contracts, specifically on newly exploited wasteland or when the soil has become saline (Spoor et al., 2010). Given that this region has experienced similar contract land tenure reforms as China's other regions, and that the system of wasteland tenure is more location-specific, we focus in more detail on the reclamation of wasteland.

Wasteland is exploited and used either by individuals or by the local government (the township government and the village committee) although it is legally 'collectively owned'. Our fieldwork observations from January 2014 show that some contract land was formerly categorized as wasteland in the 2010 land use census in the region, which also showed that there was more contract-land than was officially registered.<sup>6</sup> This indicates the power of local bureaucrats over wasteland and the absence of effective legal institutional arrangements to oversee land management.

Informal institutional arrangements or frameworks play an essential role in providing land tenure security for wasteland (Ho & Spoor, 2006). Wasteland use is usually allocated by signing a wasteland cultivation contract with the village committee, although no land certificate is issued. This contract is usually signed in public, and witnessed by a village cadre and another farmer. Its status is comparable to contract land, but the tenure arrangements are often very different, with the rental period varying. The original duration varies, often ranging between 3 and 5 years, although the lease can often be easily extended upon further payments. To reclaim or use wasteland, farmers have to pay a fee to the village committee, which is widely acknowledged as a way of 'formalizing' its use (Rao et al., 2016). This fee needs to be paid up front; if not, the current holder may lose the land in the next round of signing wasteland contracts. One way of extending the duration of wasteland contracts in Xinjiang is to participate in the governmental crop-tree intercropping program. In Awati County, the contracts on intercropped wasteland have a duration of 30 years, as opposed to 5 years without intercropping.<sup>7</sup>

Farmers are informally endowed with limited water rights for wasteland, and wasteland users are themselves responsible for constructing and maintaining irrigation facilities.<sup>8</sup> Farmers can also transfer wasteland to others through the use of subcontracts, leases or exchanges within and/or outside the village. The right to sell requires prior permission from the local authorities. It is worth pointing out that the local government intervenes much less in the management or allocation of wasteland than with contract land. In rural Xinjiang, production on contract land often has to follow certain governmental directives in order to reach village (and township) production goals (Spoor et al., 2010). Each village is allocated grain and cotton production quotas which are then subdivided among contract land users. Contract land users are also under obligation to sell (at least part of) their production to markets specified by the government.<sup>9</sup> By contrast, wasteland users are usually free to decide what to plant and to whom to sell.

Villagers tend to recognize wasteland holders' usufruct rights which are essentially based on moral grounds and seen as a way of providing protection against infringements by third parties. When asked if their current wasteland would be reallocated by village cadres in the next round of contract signing, many farmers said that 'this rarely happens'. This is because they have cultivated their lands for many years (sometimes even inheriting it from their parents). As one respondent from Awati County stated, 'I pay the fees on time; almost every villager is aware of this; it would be illegal and immoral for anyone else to occupy this land'.

We undertook a survey of the tenure security of contract land and wasteland in 2008 which showed that around 40% of 352 households in Awati County (Aksu Prefecture) were worried about losing contract land in the future and around 50% about losing wasteland. This shows that a very high proportion of farmers perceive themselves as having insecure tenure over their land, even

<sup>5</sup> The Chinese Ministry of Agriculture divides wasteland into four categories: wasteland, waste mountain, waste gully and sandy waste (Ho, 2003).

<sup>6</sup> This resulted from years of land leveling or other forms of land management by cultivators. The local governments then categorized these lands as wasteland.

<sup>7</sup> Fieldwork notes from Aksu, January 2014.

<sup>8</sup> In contrast, irrigation investments on contract land are shared by the government and the farmers under the 'one-case, one-meeting' (*Yishiyiyi*) system, in which the government (usually the state or provincial government) provides financial support and the farmers provide their labor.

<sup>9</sup> Farmers are 'pushed' to sell the cotton and grain at administrative prices, which are decided by government agencies quite arbitrarily under the quota system (Interview with Farmer, January 2014, Awati County).

though there has been very little land reallocation locally. Zhou and Li (2011) have found that soil salinization caused by water shortages around the Tarim Basin in southern Xinjiang is extremely severe, and that land reallocation may well occur in future to compensate households with saline land. Another reason for land reallocation is to resolve or pre-empt any conflicts caused by demographic change and ensure egalitarian landholding patterns (Ma, Heerink, Feng, & Shi, 2015a; Wang et al., 2011). This is particularly the case in rural Xinjiang, where social stability is a major political priority for the authorities.

Land expropriation by public agencies is another potential threat to tenure security. Land expropriation often occurs in rural Xinjiang, due to the absence of transparent implementation procedures and an unclear definition of 'public use'. Inadequate compensation means that this often gives rise to conflicts. This is particularly the case in the southern part of rural Xinjiang, where the limited availability of off-farm opportunities means that farmers who have their land expropriated need land compensation in order to be able to continue meeting their basic livelihood needs. Farmers are rarely invited to participate in the negotiations around land expropriation, which is often driven by urbanization. Farmers close to urban areas are especially concerned about the possibility of losing land in the future.

We can draw three tentative observations from this analysis. First, the determinants (and the individual importance) of land tenure security on contract land and wasteland may differ, because these two types of land are occupied and reclaimed in different ways. Second, formal tenure arrangements might only make a modest contribution to enhancing the perceived tenure status. And, third, farmers' perceptions of tenure security may be more influenced by factors, particularly trust, outside the formal (legal) tenure institutions.

## 2.2. Land documents and tenure security

Kung (1995) argues that land tenure is secure when land titles are explicitly defined and ownership and exchange are both enforced with low transaction costs. However, in reality, there are many risks and uncertainties that can influence the likelihood of future land dispossession. These are usually identified as tenure insecurities (Ho, 2003; Liu et al., 1998; Palmer, 1998). Ambiguity about ownership can cause conflicts and increase insecurity of tenure: this might be due to a lack of clarity of the conditions under which land users can claim to be owners, exclude any third party infringement, or enter into land transactions (De Souza, 2001; Ho, 2001). In addition to ownership issues, other insecurities, such as fear of land eviction or expropriation by state agencies, are also widespread in many developing countries (Feder & Nishio, 1998; Jacoby, Li, & Rozelle, 2002; Rakodi & Leduc, 2004). Rural China is no different from other parts of the world in this respect and since the introduction of the HRS, farmers have faced the possibility of eviction and ambiguities over their land tenure status.

Possession of official land documents can reduce tenure insecurities. It is argued that formal land institutions help reduce transaction costs and uncertainties in three ways: by making information available, by demarcating land boundaries and, by enabling enforcement by state agencies. Land titling and the issuing of land use certificates are considered to be particularly effective in countering insecure property rights. Such procedures collect and record information about property rights, fix the boundaries of parcels, identify the holder of a specified parcel and connect the holder with the relevant state agencies, providing a basis for legal protection and a structure for dispute solution (Alston & Libecap, 1996; Broegaard, 2005; Jansen & Roquas, 1998; Stanfield, 1990). Such mechanisms can reduce tenure insecurities (Feder & Nishio, 1998; Stanfield, 1990). In addition, these formal tenure arrangements provide security to buyers and sellers in formal credit and land markets by reducing information asymmetry (Alston & Libecap, 1996; Feder & Nishio, 1998; Palmer, 1998).

However, the process of land titling and registration can often prevent poor and small landholders from obtaining rights over and access to land (Platteau, 1996). This may occur through rent-seeking by those involved in the formalization procedures, corruption, and/or through 'land grabbing' by those who are more informed about the titling and registration procedures (Feder & Nishio, 1998; Palmer, 1998). In addition there needs to be a trustworthy and efficient implementation system in place: if not, formal contract registration through issuing cultivation contracts or a certificate to households becomes no more than a 'paper agreement' (Ho and Spoor (2006). In a similar vein, Brandt et al. (2004) argue that the lack of a well developed legal system makes a land document or certificate a nominal land use guideline and nothing more.

As discussed in Section 2.1.1, in rural China, the state does not clarify the implementation procedures of legal tenure arrangements (Lohmar, 2006; Ma et al., 2013a). Most of the power over land rests in the hands of local governments (Hsing, 2006). Local government bodies often sacrifice households' tenure security for the purpose of equity and/or efficiency, or the interests of urban development. Thus the rules are often not properly enforced, and do not translate into effective tenure security (Deininger & Jin, 2009; Rosato-Stevens, 2008). The possession of a land certificate provides little protection to holders against illegal reallocations because of poor registration systems and a legal system that only partly functions (Deininger & Jin, 2009; Zhu & Prosterman, 2007).

In rural Xinjiang, local authorities distribute and allocate land with the main objective of maintaining overall social stability, and security of tenure is often sacrificed in favor of this objective. During field work conducted in Awati in 2014, some township officials stated that they are seeking to block the development of a land market (i.e., land rental activities) in order to ensure that each household maintains at least one piece of land. This makes it easy for them to convince small farmers to follow government instructions as they can always threaten that the land, which belongs to the collective, will be taken away if they do not adhere to these instructions. We also observed that land certificates are often kept in the archives of village committees. This suggests, as stated by Ho and Spoor (2006), that land registration that is recognized solely by providing households with cultivation contracts is just a 'paper agreement'.

### 2.3. Trust and land tenure security

Trust includes general interpersonal (or social) trust and political trust (You, 2012; You & Khagram, 2005). Interpersonal trust has been identified as being closely entwined with aspects of morality, culture and religion, especially within the context of specific informal institutions. Interpersonal trust plays a crucial role in securing land tenure. It is recognized that without a trustworthy enforcement system, formalization will have a negligible impact on enhancing security of tenure (Ho & Spoor, 2006; Ma, Heerink, Ierland, & Shi, 2016; Pagiola, 1999). Trust also functions quite well within informal settings in that it provides a moral basis for tenure security (Feder & Nishio, 1998; Roquas, 2002). There are several potential benefits to this approach: it enhances mutual recognition, flexibility and negotiability in accessing tenure rights, mediating land conflicts and reducing tenure insecurities.

Individual and social interactions are based on various contracts, which help to define people's rights and responsibilities (Bezabih, Kohlin, & Mannberg, 2011). As such, the securing of land rights requires trust because trust fosters cooperation and reduces transaction costs, thereby contributing to the realization of the required contracts (regardless of the degree of their formality) (Teraji, 2008; Uslaner, 2006). Claims to land rights are often based on informal grounds, which can include history, custom or culture, religion, de facto use and local norms (Ho, 2003; Ho & Spoor, 2006). The duration that the land has been occupied or the investments made in improving its quality may also create customary rights (Jansen & Roquas, 1998). These rights are generally recognized through a local informal contract.<sup>10</sup>

Such customary rights are generated by local social networks and with respect to local norms. They may have been transmitted over several generations, and lead fellow villagers or neighbors to respect the property rights of landholders (Jansen & Roquas, 1998). Furthermore, the landholders recognize themselves, or are to a large extent recognized by their neighbors, as owners and enjoy nearly the same land benefits as those with private titles (Razzaz, 1993; Stanfield, 1990). Social recognition and moral respect provide landholders, with protection against third party infringements, particularly when the community has a strong level of solidarity (Ho & Spoor, 2006; Palmer, 1998). These arguments indicate that local innovations in procedures, and the patterns of documentation that apply to land occupation and reclamation, are usually based on foundations of trust and are seen as socially acceptable, flexible and appropriate for resolving land disputes (Grischow, 2008; Jansen & Roquas, 1998; Rakodi & Leduka, 2004; Stanfield, 1990).

Political trust can be seen as people's responses to government and public policies (Bezabih et al., 2011; Bjornskov, 2007). It is an important indicator of the credibility that individuals attach to public politics because it measures the extent to which they feel the government authority to be legitimate (Maxwell, 2010). Responses to public policies are directly influenced by peoples' perception of politicians' trustworthiness. Thus, political trust can also be defined as individuals' trust towards political actors (Levi & Stoker, 2003). Political trust is a crucial factor in shaping land tenure security. Trust in government is deemed to be a critical precondition for the credibility of tenure institution arrangements (Ho, 2001). Failure to create socially trusted tenure institutions can put tenure reforms in risk, and make institutions 'empty', with little, no or even influence in securing land tenure (Ho, 2004). Rights-holders view their rights as secure when they perceive that various government institutions are a credible force in protecting their land rights (Acemoglu, Johnson, & Robinson, 2001).

Trust towards politicians also fosters secure property rights as it partially determines the extent to which tenure institutions can be effectively exercised. Political actors often have to make great efforts to convince individuals to follow government policies that inflict costs in the short run but will strengthen property rights in the long run (Diermeier, Ericson, Frye, & Lewis, 1997). From this sense, dense trust-based social networks and widespread norms of reciprocity between political actors and ordinary individuals can help to lower the transaction costs of enforcing the relevant land tenure institutions (Frye, 2004).

In sum, official land documents and trust both play a role in securing land tenure, particularly in a context where formal and informal modes of tenure co-exist and are in transition, and when informal norms and trust are crucial for land possession and provide the required protections. China is no exception. Due to the long-term influence of Confucian culture, rural society is strongly based on social networks, and people pay particular attention to blood ties and geographically-based relationships between individuals and grass-root politicians (Fei, 1994; Tu, Mol, Zhang, & Ruben, 2011). Legal tenure reform by itself cannot necessarily ensure that farmers perceive that they have land tenure security and rural Chinese households with more trust in government display a higher level of perceived land tenure security (Tu et al., 2011). Inquiries into land tenure security issues should always pay attention to the social and political institutional contexts (Rosato-Stevens, 2008).

In rural southern Xinjiang, the Islamic religion (rather than the state) has remained the primary authority. Equally many Uyghurs consider that land reforms enforce responsibilities on them rather than providing them with rights (Bellér-Hann, 1997). There are long-term identity conflicts and inequalities between the Han Chinese and the Uyghurs, and these have triggered widespread opposition and resistance on public affairs among Uighur minorities (Andrijauskas, 2014; Kilgour, 2006). For these reasons, the Uyghurs may have less trust in the political system (Becquelin, 2000; Chaudhuri, 2010). Similarly, it has been argued that religions' acceptance of the legitimacy of states is conditional, as the former has far older origins and entails a wider memberships than the latter (Daniel, 2007; Meer & Dekker, 2011). Field observations in Xinjiang showed that many Uyghurs complain about the increasing scarcity of land and water and ascribe these problems to the central government's policy of encouraging an influx of Han farmers (Becquelin, 2000). These features indicate that it may be more difficult to implement official land policies

<sup>10</sup> The local contract in informal settings is often made either orally or privately in writing (with respected people as public witnesses – local leaders, chiefs, elders – who often oversee that local norms are respected).

among Uyghur farmers due to their low level of political trust. We hypothesize that issuing a land document will play a less important role in securing tenure security among Uyghurs than that among Han Chinese.

This paper examines the effects of the possession of a land certificate and/or a written land contract and trust, on land tenure security. Rural Xinjiang offers an excellent opportunity for such a study, since, as discussed before, relevant institutional arrangements for contract land and wasteland are relatively comprehensively in place, and the security of these two land types have proceeded at different paces (Rao et al., 2016). This case offers important insights to understanding the varied effects of land documentation and trust from a comparative perspective. In addition, the co-existence of Han Chinese and ethnic Uyghur in the same place creates a multicultural rural community, with diversified religions, traditions and social norms that surround, and are deeply embedded in land use activities and this allows us to examine the effect of informal norms (and trust).

Taken together, we hypothesize that land certificates and land contracts only make a modest contribution to enhancing tenure security over contract land and wasteland, and that trust, based on moral and cultural grounds, plays a more important role in shaping farmers' perceived security of tenure, particularly on wasteland in rural Xinjiang.

### 3. Research site and data set

Our research site is located in Awati County in the southwest of Xinjiang Uyghur Autonomous Region, where >90% of the rural population is of Uyghur descent. It is a typical arid and semi-arid region, with an average of <150 mm annual precipitation, and <100 mm in the southern parts (Li, Chen, Shen, Li, & Xu, 2011). In consequence, agricultural production relies heavily on the availability of irrigation water. For a long time cotton production has been the central pillar of small farmers' livelihood strategies. However, it has proven to only be a partial solution to improving incomes and reducing poverty (Spoor & Shi, 2009).

Local factor markets are still not well developed. There are very few off-farm opportunities for rural migrants (entering or leaving) the province, due to language barriers, lack of demand for their skills, and, possibly, a traditional mentality which is very much attached to the land-based rural economy. Although a rural land market is emerging (Spoor et al., 2010), it is still embryonic. According to a survey we carried out in 2008, very few farmers were involved in land rental activities, with only 34 out of 352 households renting contract land, covering 8.2% of the land area. Over 90% of the land rental activities took place between family members or members of the same village.

The dataset used is from a rural household survey, carried out in three townships of Awati County in 2008.<sup>11</sup> Farming households were selected randomly from a household list provided by the local village committees of nine villages, covering six irrigation districts. The main purpose of the survey was to detect the factors that affect farmers' perceptions of tenure security at a time of institutional transformation and the emergence of open factor markets. Detailed information was collected from households on their perceptions of their tenure security, demographic characteristics, land endowments, possession of a land document, interpersonal trust and their trust in politicians. This was complemented by village-level data obtained from the village committees. Our sample consisted of 352 households,<sup>12</sup> of whom 276 only use contract land and 76 who use both contract land and wasteland.

### 4. Empirical evidence

#### 4.1. Model specification

To investigate the determinants of tenure security on two different types of land, we distinguished between households who only had access to wasteland and those had access to both types of land. We specified the following basic contract land and wasteland tenure security models:

$$P_{c,i} = \alpha_{c,0} + \alpha_{c,1}D_{c,i} + \alpha_{c,2}T_{c,i}^{vi} + \alpha_{c,3}T_{c,i}^{ca} + \sum \alpha_{c,j}X_{j,i} + \varepsilon_{1,i} \quad (1)$$

$$P_{w,i} = \alpha_{w,0} + \alpha_{w,1}D_{w,i} + \alpha_{w,2}T_{w,i}^{vi} + \alpha_{w,3}T_{w,i}^{ca} + \sum \alpha_{w,j}X_{j,i} + \varepsilon_{2,i} \quad (2)$$

$P_{c,i}$  and  $P_{w,i}$  denote the tenure security status of household  $i$  on contract land and wasteland respectively. Following Broegaard (2005), who defines land tenure security as a farmer's subjective assessment of the tenure situation and his/her worries about future risks to property rights, we use a farmer's fear of losing contract land and/or wasteland in the future to measure tenure security. This is equal to 1 if respondents do not worry about losing land and 0 if they do worry about this.  $D_{c,i}$  and  $D_{w,i}$  are dummies for holding a land document, which have a value of 1 if a household possesses an official land document, and 0 if not.  $T^{vi}$  and  $T^{ca}$  represent the trust that household  $i$ , has in individuals and village cadres respectively.  $X_{j,i}$  is the value of control variable  $j$  for household  $i$ , including village, household, land and regional characteristics.  $\varepsilon_c$  and  $\varepsilon_w$  are the residuals in the two respective equations.

<sup>11</sup> The three townships are Bex'erik (Baishairike), Horiqol (Wuluquele) and Yengi'erik (Ying'airike).

<sup>12</sup> The original sample size was 361, from which 9 households were excluded due to incomplete information.

#### 4.2. Estimation strategy

In the study we pay special attention to the potential endogeneity of land tenure institutions and trust. Available studies have demonstrated that tenure institutions are endogenous (Besley, 2000; Brasselle et al., 2002). In our study area, the official land documents were issued around 1998, a predetermined factor in influencing households' perceptions of their tenure security. However, some unobserved characteristics and past actions of individual household might determine whether or not they hold a land document, and this may affect the household's perception of its tenure security, implying the potential existence of endogeneity-correlated omitted variable. Without knowing the unobserved factors that determined the possession of official land documents, it is hard to draw conclusions about the impact of possessing official land documents on households' perceptions of their tenure security.

Second, a household that feels well socially-connected or is more powerful is more likely to exhibit higher levels of trust and feel its tenure security is relatively secure. There may also be a reverse causality relationship between perceived security of tenure and trust. That is to say, households that report not worrying about losing land in future are more likely to display a higher level of social trust, particularly political trust. Therefore, trust may also be endogenous.

The two-step instrumental variable estimation is usually an appropriate technique for minimizing this potential endogeneity bias. However, given that the dependent variable, namely, the perceived tenure security, is discrete, this technique may yield biased and inconsistent results due to the non-linearity of the endogenous variables (in our case the land document and trust) (Brasselle et al., 2002; Wooldridge, 2010). The innovative two-step conditional maximum likelihood (2SCML) technique proposed by Rivers and Vuong (1984) provides us with a sound solution to this problem.

There are two principal stages in estimation using the 2SCML technique: the first is to perform a linear probability regression for the discrete endogenous variable by using instrumental variables to obtain the predicted residual value. The second is to perform a probit regression by incorporating the predicted residual and the original endogenous variable. The significance test for the coefficient of the residual can be used to verify the presence of endogeneity (Wooldridge, 2010).

This approach has been widely applied, for instance by Brasselle et al. (2002) and Ma et al. (2013a) in dealing with similar endogeneity issues. Findings demonstrate that estimations obtained from the 2SCML are consistent and unbiased when the residual of the second stage satisfies a conditionally (on the endogenous independent variable) normal distribution. The 2SCML technique is used in this study to address the potential endogeneity of land document and trust by supposing that the residual from the second-stage satisfies a conditionally normal distribution. We will later specifically show how the instrumental variable issues for both land document and trust were handled in performing the 2SCML.

It is not easy to find appropriate instrumental variables to represent the possession of a land document because this is mainly historically determined. In traditional instrumental variable regression this would make it difficult to add at least one restriction on its coefficient for identification. To overcome this we used a recently proposed heteroskedasticity-based instrumental technique (Lewbel, 2012) (hereafter the 'Lewbel's'). This method is able to identify structural parameters in estimations with endogeneity induced by unobserved omitted variable or mismeasured regressors in either cross-sectional or panel data. Identification is achieved by restricting correlations of error terms with exogenous variables ( $Cov(Z, \varepsilon^2) \neq 0$ , where  $X_{j,i}$  denotes a set of exogenous variables and  $Z$  being the full set or a subset of  $X_{j,i}$ ) (Lewbel, 2012). In other words, identification is achieved in the presence of heteroskedasticity related to at least some elements of  $X_{j,i}$  (Sabia, 2007). A Sargan-Hansen test can be conducted to verify the reliability of identification.

The estimation of the Lewbel's is performed in four stages. In the first stage, a linear probability regression is conducted for the endogenous variable on a full set (or subset) of exogenous variables, to obtain the predicted residual value. In the second stage, the same set of variables is standardized. In the third stage, a (sub)set of generated instrumental variables are obtained through multiplying the predicted residual with each standardized exogenous variable. The traditional instrumental technique is applied in the last stage by using all the generated instruments for endogenous variable(s).

This method is regularly applied in estimations when instruments are either weak or unavailable (see Shahe & Hou, 2008; and Sabia, 2007). The results of these studies confirm that estimations obtained by using the Lewbel's are close to those from conventional instrumental methods.

This study uses the Lewbel's, by performing first three stages based on a subset of exogenous variables of  $X_{j,i}$ . Given that the dependent variable is discrete, the traditional instrumental technique may produce an inconsistent estimation in the fourth stage (Wooldridge, 2010). To overcome this, we use an alternative 2SCML technique, i.e. using all the generated instruments for endogenous variable to generate the predicted residual value in the first stage of the 2SCML technique.

To establish the endogeneity of trust in villagers and towards village cadres, we introduced average level of trust in each of the villages as an instrument for gauging individual levels of trust. They are defined as the mean of the other respondents' trust in villagers ( $T_{c,i}^{v-vi}$  and  $T_{w,i}^{v-vi}$ ) and towards village cadres ( $T_{c,i}^{v-ca}$  and  $T_{w,i}^{v-ca}$ ), respectively in the same village. We assumed that village-level trust is correlated with individuals' trust, but not directly correlated with households' perception of land tenure security. One's trust (or distrust) is usually built upon fellow villagers through learning about the intentions and behaviors of others (Fischer, 2008; Tu & Bulte, 2010). A similar method has been applied by Ma, Heerink, Ierland, Lang, and Shi (2015b), who used the average kinship trust of the other villagers in the same village as an instrument for assessing individual farmer kinship trust level. There is no direct evidence to demonstrate that the average village-level trust affects farmers' perception of land tenure security.

Before proceeding to the 2SCML, the Lewbel's is applied to obtain the instrumental variable for land document. Following Lewbel (2012), we first ran linear probability regression, respectively for contract land and wasteland document models (3)

and (4) on a subset of exogenous variables ( $X_{c,i}^{sub}$  and  $X_{w,i}^{sub}$ )<sup>13</sup> to obtain the predicted residuals ( $\hat{D}_{c,i}^{re0}$  and  $\hat{D}_{w,i}^{re0}$ ). Then the same subset of exogenous variables was standardized, and multiplied by  $\hat{D}_{c,i}^{re0}$  and  $\hat{D}_{w,i}^{re0}$ , respectively, to obtain the instrumental variables for land document ( $GIV_{c,i}$  and  $GIV_{w,i}$ ).

$$D_{c,i} = \beta_{c,0} + \sum \beta_{c,i} X_{c,i}^{sub} + \varepsilon_{3,i} \quad (3)$$

$$D_{w,i} = \beta_{w,0} + \sum \beta_{w,i} X_{w,i}^{sub} + \varepsilon_{4,i} \quad (4)$$

We then turned to perform the two stages of the 2SCLM. In the first stage, we ran a linear probability regression for each of the following land document and trust Eqs. (5)–(10) by introducing instrumental variables ( $GIV_{c,i}$ ,  $GIV_{w,i}$ ,  $T_{c,i}^{v-vi}$ ,  $T_{w,i}^{v-vi}$ ,  $T_{c,i}^{v-ca}$  and  $T_{w,i}^{v-ca}$ ), and obtaining the respective residuals ( $\hat{D}_{c,i}^{re1}$ ,  $\hat{D}_{w,i}^{re1}$ ,  $\hat{T}_{c,i}^{revi}$ ,  $\hat{T}_{w,i}^{revi}$ ,  $\hat{T}_{c,i}^{reca}$  and  $\hat{T}_{w,i}^{reca}$ ).

$$D_{c,i} = \gamma_{c,0} + \gamma_{c,1} GIV_{c,i} + \sum \gamma_{c,i} X_{c,i} + \varepsilon_{5,i} \quad (5)$$

$$D_{w,i} = \gamma_{w,0} + \gamma_{w,1} GIV_{w,i} + \sum \gamma_{w,i} X_{w,i} + \varepsilon_{6,i} \quad (6)$$

$$T_{c,i}^{vi} = \eta_{c,0} + \eta_{c,1} T_{c,i}^{v-vi} + \sum \eta_{c,i} X_{c,i} + \varepsilon_{7,i} \quad (7)$$

$$T_{w,i}^{vi} = \eta_{w,0} + \eta_{w,1} T_{w,i}^{v-vi} + \sum \eta_{w,i} X_{w,i} + \varepsilon_{8,i} \quad (8)$$

$$T_{c,i}^{ca} = \pi_{c,0} + \pi_{c,1} T_{c,i}^{v-ca} + \sum \pi_{c,i} X_{c,i} + \varepsilon_{9,i} \quad (9)$$

$$T_{w,i}^{ca} = \pi_{w,0} + \pi_{w,1} T_{w,i}^{v-ca} + \sum \pi_{w,i} X_{w,i} + \varepsilon_{10,i} \quad (10)$$

In the second stage of the 2SCLM, the obtained residuals, together with their original variables were simultaneously introduced into the contract land and wasteland tenure security models (11) and (12).

$$P_{c,i} = \delta_{c,0} + \delta_{c,1} D_{c,i} + \delta_{c,2} \hat{D}_{c,i}^{re1} + \delta_{c,3} T_{c,i}^{vi} + \delta_{c,4} \hat{T}_{c,i}^{revi} + \delta_{c,5} T_{c,i}^{ca} + \delta_{c,6} \hat{T}_{c,i}^{reca} + \sum \delta_{c,j} X_{j,i} + \varepsilon_{11,i} \quad (11)$$

$$P_{w,i} = \delta_{w,0} + \delta_{w,1} D_{w,i} + \delta_{w,2} \hat{D}_{w,i}^{re1} + \delta_{w,3} T_{w,i}^{vi} + \delta_{w,4} \hat{T}_{w,i}^{revi} + \delta_{w,5} T_{w,i}^{ca} + \delta_{w,6} \hat{T}_{w,i}^{reca} + \sum \delta_{w,j} X_{j,i} + \varepsilon_{12,i} \quad (12)$$

As mentioned in Section 3, the 352 household samples were collected based on a multi-level strategy from six irrigation districts. Hence we used cluster-adjusted standard errors to adjust for the six irrigation districts in our estimation procedures.

#### 4.3. Variable definition and descriptive statistics

##### 4.3.1. Land document

We use the existence of officially issued land document to capture the effect of formal tenure institutions, following Reerink and van Gelder (2010). For contract land, this variable is obtained by asking whether the user holds a land certificate (= 1 if yes; = 0 otherwise). For wasteland, the question is whether the user holds a formal written cultivation contract (signed with the local authorities) (= 1 if yes; = 0 otherwise). As discussed in Sections 2.1 and 2.2, a land document provides paper proof of land use (Alston & Libecap, 1996; Broegaard, 2005; Jansen & Roquas, 1998), and some protection against eviction (Ma et al., 2016), but such proof is of limited value without efficient and trustworthy enforcement systems (Ho & Spoor, 2006; Pagiola, 1999). Given the weak legal enforcement in China (Zhu & Prosterman, 2007), we predict the effect of possessing a land document to be negligible.

##### 4.3.2. Trust

The World Values Survey uses a question about trust – “Generally speaking, would you say that most people can be trusted, or that you can’t be too careful in dealing with people?” (WVS, 2014). This is widely used in the literature on trust, but has been recently criticized as lacking a specific context. Bauer (2015) argues that trust should be measured against different and specifically-contextualized real life situations otherwise it is merely an abstraction. The trust variables we introduce include

<sup>13</sup> The subset of control variables were chosen according to the correlation index with land document.

trust between villagers and their trust towards village cadres (*cun ganbu*) which were assessed by asking the contextualized question: 'Who are the most trustworthy people (except for parents and other relatives) whom you would ask for assistance if you got involved in a land conflict?' Positive response of 'farmers' and/or 'village cadres' are given a dummy variable of 1, and 0 otherwise. These variables are used to capture the general social trust between individuals and the political trust towards politicians.

Rural China is characterized by strong kinship networks and cultural identity, which underpin trust in people's daily social life and individual interactions and reduce social conflicts. For political trust, we lack any straightforward data that gives relevant insights into people's trust in institutions or the government. However, as discussed in Section 2.3, people's judgments about government or institutions is often driven by their perception of specific political actors, hence it using trust in specific politicians can be a useful proxy for measuring political trust (Levi & Stoker, 2003). We specify political trust as to trust towards village cadres who are the representatives of state at the grass-roots level. Village cadres are in important political positions (Jin, Fan, Cheng, & Shi, 2014), and often exercise much power in administering village affairs and have the ability to determine land ownership and a bundle of management rights (Rosato-Stevens, 2008). Households with a lower level of political trust would not go to the village cadres, particularly within our study area, where corruption and rent seeking behavior over water and arable land are widespread.<sup>14</sup>

As argued in Section 2.3, trust provides a moral perspective to the process of accessing and protecting land rights (Bezabih et al., 2011; Teraji, 2008; You, 2012). At the same time households with more political trust display a higher level of perceived land tenure security (Tu et al., 2011). Hence the two trust variables are predicted to have a positive correlation with perceptions of security of land tenure.

#### 4.3.3. Village characteristics and township dummies

The distance from the village to the township center is used to indicate the effect of expanding urbanization and is predicted to be positive. Past village level land readjustment experiences since 1998 have made farmers' suspicious of central government's commitment to helping them secure tenure (Ma et al., 2016). On the other hand, a recent land adjustment lowers the possibility of land readjustment in next round. Hence past land readjustment experience is expected to have a mixed impact. To capture the heterogeneity and unobserved effects outside the village, two township dummies for the 352-household sample and one dummy for the 76 sub-sample of those who only have access to wasteland (these households mainly come from two townships) are introduced.

#### 4.3.4. Household characteristics

The household head's age, education (number of years) and ethnicity (=1 if Uyghur; =0 if Han Chinese), the share of agricultural laborers in the household laborer force, wealth (the monetary value of livestock), past experience in investing in tree-planting (=1 if the respondent had tree planting experience before 2008; =0 otherwise), and governmental intervention in agricultural product sales (=1 if there is no intervention; =0 otherwise) are all introduced.

An older farmer may be more likely to worry about losing land than a younger one because of past land reallocation experiences. On the other hand, younger farmers are less risk-averse and may be more confident about future land tenure, thus the effect of age is expected to be mixed. While the wealthier and better-educated households may have more chance of accessing relevant information on public policy, they may also display less interest in obtaining them due to a low level of political trust. Hence, these two variables are predicted to be negative. The ethnicity of the household head is introduced to investigate whether the perceptions of land tenure security differs fundamentally between the Uyghur and Han Chinese. The expected sign for the ethnicity variable is positive because the Uyghur farmers' traditional linkages to the land might increase their belief that their lands will not be taken away in the future. A household with more agricultural laborers has more chance of acquiring more land due to readjustment under the equity principle. Therefore, this is predicted to be positive. Tree planting can be considered as a strategy to reduce tenure insecurity (Rao et al., 2016), and is predicted to be positive. Conversely, governmental intervention constrains farmers' land use rights, consequently lowering the level of security of tenure and is therefore predicted to be negative.

#### 4.3.5. Land characteristics

This group of variables investigates irrigation, number of land plots, past land readjustment experience and land endowment. Irrigation is measured by whether or not a respondent judges the irrigation to his or her contract land and/or wasteland irrigation to be adequate (=1 if so and =0 otherwise). Irrigation is the main bottleneck in agricultural production in rural Xinjiang. The number of plots captures the degree of land fragmentation (Tan, Heerink, & Qu, 2006) and is an important factor influencing the application of mechanization in cotton growing. Both the number of plots and irrigation are good proxies of land quality. Land quality is used as a key criterion for reallocation, and losing or benefiting from land readjustment depends largely on the average distribution of land quality between farmers. Hence the impacts of irrigation and plot numbers are likely to be ambiguous. The effect of past land readjustment experience (=1 if experienced demographic or land quality change induced readjustment since 1998; =0 otherwise) is also likely to be mixed because past land readjustment experience implies a possible

<sup>14</sup> During the interviews we conducted in January 2014, some local farmers complained that irrigation water was unequally distributed by the local government. For example, they claimed that farmers with a better connection to local government usually had more access to water.

threat of future land eviction. On the other hand, a household that has recently experienced land readjustment faces less chance of having their lands readjusted in next round. Land endowment measured by per capita area is introduced because it is the most important property in this farming prevailing area, and also a sign of the distribution of land among households. A household with more land is more likely to lose land under any future land readjustments (under equalitarian principles), and this dummy is thus predicted to be negative.

Paying the wasteland use fee (= 1 if the respondent pays the use fee; = 0 otherwise) is introduced into the wasteland tenure security equation, because it is widely recognized as an unofficial rule of land occupation by local authorities and farmers in rural Xinjiang (Rao et al., 2016). We predict it to be positive. The variable definitions and descriptive statistics are shown in Table 1.

**Table 1**  
Definition of variables and descriptive statistics.<sup>a–d</sup>

| Variable                                       | Definition                                                                                                                                | Contract land model |           | Wasteland model |           |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------|-----------------|-----------|
|                                                |                                                                                                                                           | Mean                | Std. dev. | Mean            | Std. dev. |
| Land tenure security perception variable       |                                                                                                                                           |                     |           |                 |           |
| Perception of Land Tenure Security             | 1 = not worried about losing land in future; 0 = otherwise                                                                                | 0.60                | 0.49      | 0.50            | 0.50      |
| Documentation variables                        |                                                                                                                                           |                     |           |                 |           |
| Possession of Land Document                    | 1 = holds a land certificate or official land contract; 0 = otherwise                                                                     | 0.89                | 0.31      | 0.63            | 0.49      |
| Trust variables                                |                                                                                                                                           |                     |           |                 |           |
| Trust in Villagers                             | 1 = the most trustworthy persons for assistance are farmers; 0 = others                                                                   | 0.72                | 0.45      | 0.70            | 0.46      |
| Trust in Village Cadres                        | 1 = the most trustworthy persons for assistance are village cadres; 0 = others                                                            | 0.38                | 0.49      | 0.21            | 0.41      |
| Average Village-level Trust in Villagers*      | Average trust in villagers in the village based on the other sampled households living in the same village as the surveyed household      | 0.72                | 0.11      | 0.70            | 0.19      |
| Average Village-level Trust in Village Cadres* | Average trust in village cadres in the village based on the other sampled households living in the same village as the surveyed household | 0.38                | 0.20      | 0.22            | 0.16      |
| Village characteristics and township dummies   |                                                                                                                                           |                     |           |                 |           |
| Distance to Township                           | Distance from village to township center (Km)                                                                                             | 9.20                | 7.07      | 9.16            | 7.80      |
| Past Village Land Reallocation Experience      | 1 = experienced demographic or land quality change induced land readjustment in village since 1998; 0 = no                                | 0.43                | 0.50      | 0.42            | 0.50      |
| Bex'erik Township                              | 1 = respondent resides in Bex'erik; 0 = no                                                                                                | 0.28                | 0.45      | 0.32            | 0.47      |
| Horiqol Township                               | 1 = respondent resides in Horiqol; 0 = no                                                                                                 | 0.23                | 0.42      | –               | –         |
| Way of Village Leader Election                 | 1 = the village leader is democratically elected; 0 = otherwise                                                                           | 0.75                | 0.43      | 0.76            | 0.43      |
| Share of Household Managed Land                | The share of land in a village managed by households                                                                                      | 0.76                | 0.43      | 0.87            | 0.18      |
| Household characteristics                      |                                                                                                                                           |                     |           |                 |           |
| Household Head Age                             | Age of household head (years)                                                                                                             | 47.81               | 14.43     | 48.96           | 13.54     |
| Household Head Education                       | Level of household head education (years)                                                                                                 | 5.75                | 3.14      | 5.13            | 3.18      |
| Uyghur Ethnicity                               | 1 = household head is of Uyghur ethnicity; 0 = Han Chinese                                                                                | 0.88                | 0.33      | 0.80            | 0.40      |
| Agricultural Laborer Share                     | Share of agricultural laborers as total laborers in the household (%)                                                                     | 0.65                | 0.23      | 0.66            | 0.20      |
| Wealth                                         | Monetary value of livestock (10 thousand Yuan)                                                                                            | 0.68                | 1.19      | 1.01            | 1.21      |
| Past Tree Planting Experience                  | 1 = past tree planting investment experience; 0 = no                                                                                      | 0.80                | 0.40      | 0.64            | 0.48      |
| Governmental Intervention                      | 1 = government intervention in product sales; 0 = no                                                                                      | 0.30                | 0.46      | 0.41            | 0.49      |
| Land characteristics                           |                                                                                                                                           |                     |           |                 |           |
| Land Irrigation                                | 1 = enough irrigation on land; 0 = no                                                                                                     | 0.27                | 0.44      | 0.18            | 0.39      |
| Number of Land Plot                            | Number of land plots allocated to household                                                                                               | 3.63                | 2.42      | 1.51            | 0.97      |
| Past Land Reallocation Experience              | 1 = experienced demographic or land quality change induced land readjustment since 1998; 0 = no                                           | 0.26                | 0.44      | 0.16            | 0.37      |
| Contract Land Area #                           | Per capita contract land area (Mu)                                                                                                        | 3.29                | 2.72      | –               | –         |
| Wasteland Area                                 | Per capita wasteland area (Mu)                                                                                                            | –                   | –         | 4.25            | 10.62     |
| Wasteland Use Fee                              | 1 = paid wasteland usage fee; 0 = no                                                                                                      | –                   | –         | 0.82            | 0.39      |
| Obs.                                           |                                                                                                                                           | 352                 |           | 76              |           |

<sup>a</sup> Source: own survey.

<sup>b</sup> '–' stands for 'non-applicable' (hereafter the same).

<sup>c</sup> Variables marked \* are used as instrumental variables for model identification.

<sup>d</sup> Variables marked # are used to investigate the potential existence of selection bias among farmers with and without wasteland holdings. Besides the remaining defined control variables, they are later introduced in the second selection equation in the Heckman selection model (based on 352 sample size).

**Table 2**Regression results with the Lewbel's and the 2SCML for the two basic models.<sup>a–j</sup>

| Dependent variable: perception of land tenure security | Basic model I    |                  | Basic model II   |                 |
|--------------------------------------------------------|------------------|------------------|------------------|-----------------|
|                                                        | Contract land    | Wasteland        | Contract land    | Wasteland       |
| Possession of Land Document                            | 0.11 (0.24)      | 0.62 (0.61)      | 0.13 (0.28)      | 0.86 (0.76)     |
| Trust in Villagers                                     | 2.76*** (2.89)   | 30.82** (2.26)   | 5.05*** (8.47)   | 37.74* (1.87)   |
| Trust in Village Cadres                                | 9.42*** (7.33)   | 39.29** (2.24)   | 10.12*** (11.63) | 47.02* (1.85)   |
| Way of Village Leader Election                         | –                | –                | 0.44*** (5.86)   | 0.50 (0.41)     |
| Share of Household Managed Land                        | –                | –                | 1.95** (1.98)    | –7.79 (–1.47)   |
| log (Distance to Township)                             | 0.64*** (5.72)   | 0.77 (1.25)      | 0.56*** (4.33)   | 0.41 (0.58)     |
| Past Village Land Reallocation Experience              | –1.37*** (–4.17) | –0.63 (–1.22)    | –1.06** (–2.35)  | –0.64 (–0.71)   |
| Bex'erik Township                                      | 1.11*** (4.72)   | 0.34 (0.33)      | 0.64** (2.57)    | 1.57 (1.58)     |
| Horiqol Township                                       | 1.31*** (9.72)   | –                | 1.76*** (3.97)   | –               |
| Household Head Age                                     | –0.01*** (–2.97) | –0.01 (–0.13)    | –0.01*** (–3.37) | –0.01 (–0.43)   |
| Household Head Education                               | 0.04* (1.89)     | –0.14** (–2.04)  | 0.04* (1.95)     | –0.20* (–1.90)  |
| Uyghur Ethnicity                                       | 0.40** (2.18)    | 1.52* (1.72)     | 0.39** (2.44)    | 1.72* (1.77)    |
| log (Agricultural Laborer Share)                       | 0.86** (2.49)    | 2.31 (0.95)      | 0.89** (2.44)    | 4.10 (1.30)     |
| log (Wealth)                                           | –0.13 (–0.44)    | –1.26** (–1.96)  | –0.14 (–0.46)    | –1.52** (–2.16) |
| Past Tree Planting Experience                          | –0.17 (–0.67)    | 0.91 (1.55)      | –0.22 (–0.80)    | 0.92 (1.57)     |
| Governmental Intervention                              | 0.14 (0.93)      | –0.22 (–0.49)    | 0.13 (0.88)      | –0.23 (–0.55)   |
| Land Irrigation                                        | 0.04 (0.26)      | –0.55 (–0.69)    | 0.04 (0.31)      | –0.43 (–0.53)   |
| Number of Land Plot                                    | –0.02 (–0.73)    | 0.27 (1.47)      | –0.03 (–0.93)    | 0.37 (1.33)     |
| Past Land Reallocation Experience                      | 0.03 (0.23)      | –1.58 (–1.06)    | 0.05 (0.42)      | –1.52 (–0.98)   |
| Log (Land Area)                                        | 0.15 (1.06)      | –0.49 (–0.93)    | 0.24* (1.83)     | –0.69 (–1.14)   |
| Wasteland Use Fee                                      | –                | 2.25*** (3.77)   | –                | 2.32*** (3.37)  |
| Intercept                                              | –3.26** (–2.39)  | –29.63** (–2.10) | –7.62*** (–7.67) | –29.98 (–1.61)  |
| N                                                      | 352              | 76               | 352              | 76              |
| Log pseudo likelihood                                  | –220.153         | –18.193          | –219.168         | –17.494         |
| Pseudo R square                                        | 0.0694           | 0.3852           | 0.0736           | 0.4088          |

<sup>a</sup> Source: own survey.<sup>b</sup> \*P < 0.1 \*\*P < 0.05 \*\*\*P < 0.01.<sup>c</sup> Z values in parentheses (hereafter the same).<sup>d</sup> The F-statistics for the joint significance of zero of instrument variables for contract land document and wasteland document in the first-stage of the 2SCML are: 10.36 (P = 0.000) and 6.58 (P = 0.037), respectively.<sup>e</sup> The F-statistic for the significance of instrument variables for trust in villagers and trust in village cadres in the first-stage of the 2SCML are: 7.710 (P = 0.039) and 5.760 (P = 0.062) on contract land; 22.060 (P = 0.009) and 11.73 (P = 0.027) on wasteland, respectively.<sup>f</sup> The Kleibergen-Paap LM statistic (for under identification test) for land document in the second-stage of the 2SCML are: 23.195 (P = 0.057) on contract land; and 18.740 (P = 0.144) on wasteland. The test result derived from wasteland model is not statistically significant, which is mainly limited by the small wasteland sample size. The Hansen-J statistics for over identification test are 21.637 (P = 0.1177) and 14.040 (P = 0.3220), respectively, meaning that identification is reliable.<sup>g</sup> Only one instrumental variable is introduced for each trust variable, hence it is not necessary to perform the under-identification test and over-identification test in the second-stage of the 2SCML.<sup>h</sup> The F-statistic for the significance of zero residual for land document, trust in villagers, and trust in village cadres in the second-stage of the 2SCML are: 0.08 (P = 0.7797); 5.73 (P = 0.0167); 47.86 (P = 0.0000) on contract land; and 0.25 (P = 0.6174); 6.11 (P = 0.0134); 5.32 (P = 0.0211) on wasteland. These findings verify the exogeneity of land document and the endogeneity of trust.<sup>i</sup> The test results mentioned above are all for basic model I. The results for basic model II are similar. We do not present them here for brevity.<sup>j</sup> Standard errors are clustered-robust at the irrigation district level.

## 5. Estimation results and discussions

### 5.1. Results

The econometric results estimated by probit based on the Lewbel's and the 2SCML for the perceived land tenure security models on contract land and wasteland are displayed in [Tables 2–4](#), which report our attempts to measure the diversified effects of possession of a land document and of trust.

Columns 2 and 3 of [Table 2](#) are the estimation results for the basic model I (for Eqs. (11) and (12), respectively). We find that the coefficients for the residual of contract and wasteland document are not statistically significant. Following to [Brasselle et al. \(2002\)](#) and [Wooldridge \(2010\)](#), this finding demonstrates the absence of endogeneity of the land document, meaning that controlling for the endogeneity or not does not give different estimation coefficients. This finding indicates that holding official land documents does not pose a significant problem of endogeneity within our research sample.<sup>15</sup> In contrast, the significance of the coefficients of the residuals for trust verifies the existence of its endogeneity.

<sup>15</sup> Given that the Lewbel's is performed based on a set of exogenous variables, it is hard to capture the effect of historical factors on land document. Future research in this field could be conducted by using panel data and other approaches on the endogeneity of the variable land document and/or contract choice to systemically examine its specific effect. For instance, one can refer to [Akerberg and Botticini \(1999\)](#), [Macours \(2014\)](#) and [Wang, Riedinger, and Jin \(2015\)](#). [Akerberg and Botticini \(1999\)](#) who have developed an endogenous matching technique to identify the endogenous matching problem between contract choice and risk preference, and using geographical-based market dummy variables as instruments. [Macours \(2014\)](#) modifies Akerberg's instrumental logit method by using a nested log that addresses the endogenous matching problem. In the work by [Wang et al. \(2015\)](#), the endogeneity of the variable land document is addressed by applying a correlated random effect model based on household panel data covering two periods.

**Table 3**Average marginal effects for land document and trust.<sup>a-c</sup>

| Variables                   | Basic model I  |              | Basic model II  |              |
|-----------------------------|----------------|--------------|-----------------|--------------|
|                             | Contract land  | Wasteland    | Contract land   | Wasteland    |
| Possession of Land Document | 0.04 (0.24)    | 0.08 (0.60)  | 0.05 (0.28)     | 0.11 (0.76)  |
| Trust in Villagers          | 0.98*** (2.89) | 4.07* (1.91) | 1.79*** (7.65)  | 4.78* (1.72) |
| Trust in Village Cadres     | 3.36*** (6.80) | 5.19* (1.90) | 3.58*** (10.16) | 5.96* (1.70) |

<sup>a</sup> Source: own survey.<sup>b</sup> \*P < 0.1 \*\*P < 0.05 \*\*\*P < 0.01.<sup>c</sup> The calculated marginal effects for these control variables are not reported for brevity.

The coefficients for the land certificate and/or written contract in the two models are not statistically significant. This means that farmers with land documents do not display a higher level of tenure security than those without land documents, indicating that issuing official land documents has only a modest effect. This result is inconsistent with the argument by [Alston and Libecap \(1996\)](#) and [Jansen and Roquas \(1998\)](#), who note that possession of land documents contributes to a higher level of tenure security. This finding can be interpreted in two ways.

First, one can argue that formalization by issuing cultivation contracts or certificates provides only limited legal protection to households in the context of rural China because of the inefficient land registration systems and the incomplete legal system ([Deininger & Jin, 2009](#); [Zhu & Prosterman, 2007](#)). A land document is more like a nominal land use guideline: a 'paper agreement' that is not sufficiently backed up by the existing tenure institutions ([Brandt et al., 2004](#); [Ho & Spoor, 2006](#)). As such, possession of a land document does not diminish the chance of illegal land reallocation or expropriation.

Second, it can be claimed that past negative experiences in land eviction and ongoing governmental interventions lead farmers to consider that a land document is of limited value in protecting their land rights. For instance a survey in Jiangxi province by [Ma \(2013\)](#) shows that 82% (n = 526) of households perceive the possibility of land reallocation occurring in the future, and that 65% are not confident that the land document will protect their land use rights. In rural Xinjiang, farmers are obliged to grow cotton and are obliged to fulfill grain quota obligations, and thus have limited rights in their choice of crops or control over harvesting ([Bellér-Hann, 1997](#); [Spoor et al., 2010](#)). Such governmental interventions constrain households' land use rights and reduce their tenure security ([Lohmar, 2006](#)).

Possession of an official land document and policy implementation in rural China often may depend on village-level management decisions that are usually influenced by the village leader and the village's characteristics, rather than individual household's characteristics. This might lead us to suspect that some additional village-level factors might have hindered the effect of having a land document. Thus, it is useful to further explore the effect of possession of a land document. We performed basic model II, by introducing two village variables: the way that the village leader was elected (= 1 if the village leader is democratically elected; = 0 otherwise), and the share of land area managed by households in a village into Eqs. (11) and (12).<sup>16</sup>

Estimation results (columns 4 and 5 respectively of [Table 2](#)) are generally consistent with those from basic model I. It demonstrates that residuals of land document on two land types are not statistically significant. This finding further confirms the statement that land document variables are exogenous. Therefore, it seems that the generated instrumental variables obtained from the use of the Lewbel's for land document are not necessary.

The estimates of the effect of possession of a land document on households' perceived tenure security are consistent with those obtained from basic model I: their coefficients are not statistically significant in two types of tenure security models. These findings indicate, to a certain extent, a low possibility that village-level characteristics would hinder the effect of possession of a land document.

The trust variables in the two groups of basic models have significantly positive effects on both contract land and wasteland, as predicted. These results imply that farmers with higher interpersonal trust and political trust are more likely to perceive their tenure status as being secure, because such trust helps shape farmers' perceived tenure security.

The average marginal effects of trust and land document are displayed in [Table 3](#). The results show that tenure security perceptions on both types of land are more sensitive to trust towards village cadres than trust between villagers. This can be explained by the fact that village cadres in rural China hold an important political position, usually with a lot of influence and power over natural resource distribution, as mentioned in [Section 2.3](#). As such trust in village cadres is related to villagers' confidence in their access to land. We also find that perceptions of tenure security are more sensitive to trust between villagers and trust towards village cadres on wasteland than on contract land. A plausible explanation for this is that formal tenure institutional arrangements are generally less developed for wasteland, the users of which tend to seek protection of their rights through informal institutions.

As expected, the distance between the village and the township center is positive in all of the basic models, but is only significant on contract land, indicating that remote villagers are likely to perceive their land as more secure than those close to townships. One important reason may be that they are less affected by the processes of expanding urbanization, which often leads to the confiscation of land. The impact of past land readjustment experience at the village level is negatively significant in contract

<sup>16</sup> Some arable land in rural China is usually kept under the control of the village community as 'flexible land' (*jidong di*) in order to adjust demographic change in a village; the rest is managed by households under HRS.

land models, but not significant in wasteland models, which may due to readjustment occurring less frequently on wasteland than on contract land in this region.

The coefficients of the dummies for the Bex'erik and Horiqol Townships in the two contract land models are positively significant, suggesting that farmers located in these villages are more likely to display a higher level of land tenure security than those in Yengi'erik. Similarly, farmers in the township also perceive a higher level of tenure security on wasteland than farmers in Yengi'erik. A possible reason is that land in Yengi'erik, is more unevenly distributed than in the other villages in the survey, giving rise to a greater possibility of land reallocation in the future. Our survey from 2008, which included three villages in Yengi'erik, showed that 90% of land in one village is suffering from salinization, while the remaining two villages suffer only slightly.

When it comes to household characteristics, the age of the household head shows a negative impact in both models, but is significant only on contract land. This shows that older household heads on contract land are less likely to feel secure about their tenure than younger ones, possibly due to having more past experiences of contract land reallocation than younger farmers. The education level of the household head shows significant effects on both contract land and wasteland. Unexpectedly, it is positive for the former and negative for the latter, showing that better educated farmers display a higher level of tenure security on contract land, but a lower level on wasteland. A plausible reason for this may be that they have better access to information about contract land policy. As there is a relative lack of information about wasteland tenure reform, and wasteland is informally allocated and managed by local governmental officials, more educated households are more likely to be less confident about keeping their wasteland in future. Thus, education is negatively correlated with wasteland tenure security. Being of Uyghur ethnic descent increases the perception of tenure security, which might be due to Uyghur communities generally displaying higher levels of trust in land occupation within informal tenure settings. According to the 352 household survey dataset in 2008, trust in villagers and towards village cadres among Uyghur households is higher than among Han households (73.46 compared to 62.79 for villagers and 58.14 compared to 34.95 for village cadres). This difference may well be ascribed to the achievements obtained from the 'Open Up the West' campaign.<sup>17</sup>

The share of agricultural labor in a family is positive in both models, but is only significant in contract land model. A possible reason is that agricultural labor is one of the factors that influences land readjustment, and families with more agricultural workers are more likely to obtain land. The lack of statistical significance of this variable on wasteland is probably because land readjustment mostly takes place on contract land – and even with more agricultural workers, the possibility of gaining wasteland through land readjustment is still limited. Wealth has negative impact, as expected, but is only significant on wasteland, possibly because wealthier households have lower level of trust in government in protecting their land rights, particularly for wasteland. The area of contract land has positive effect, meaning that households with larger size of land endowment are more likely to feel they have secure land tenure. As expected, the parameter of the use fee in the wasteland model is significantly positive, showing that farmers who pay for their wasteland have a greater sense of security than those who do not, because paying the fee is a recognized strategy for legitimizing the occupation of wasteland.

Other explanatory variables that are found to be not significant in either model include: past tree planting investment, governmental interventions in product sales, irrigation, number of plots, past land readjustment experience, and wasteland area. As such household characteristics are the main determining factors for land tenure security perceptions. The lack of significance of past tree planting investment may be ascribed to the dominance of cotton growing in local farmers' livelihoods. This means that investments beyond cotton production account only for a small proportion of total investments, and are insufficient to shape tenure security. Because of the increasingly liberalized factor markets, the influence of governmental intervention is decreasing and is not significant. That land quality indicator variables (irrigation, plot numbers, wasteland area) and land readjustment experience are not significant might be because land readjustment in this region occurs relatively less frequently than in inner China.

We were further interested in testing whether there is different effect of official land document between households with different land endowments, and between Uyghur and Han Chinese households. We explored this by regressing three groups of interactive effect models. Land documentation and its interactions with trust, land area and ethnicity are introduced on a step-by-step basis into Eqs. (11) and (12) for contract land and wasteland, respectively.<sup>18</sup>

The estimation results are reported in Appendix Table A.1. They show that the coefficients of the interaction terms between land document and trust towards village cadres, and land area, are negatively significant, but only on contract land. The coefficients of the interaction terms between land document and being Uyghur are significant both on contract land and wasteland. The average marginal effect of the variable land document and its associated interactive effects are presented in Table 4.

We found that the effects of the two types of trust on perceptions of land tenure security on either land type are stronger among households holding a land document than among those without a land document (rows 6 and 8). This finding indicates that a land document strengthens the effects of trust in enhancing households' perceptions of land tenure security. Interestingly, possession of land document has a significantly positive effect in interactive models II and III (rows 10–11), but only on wasteland tenure security. This demonstrates the conditional effect of wasteland document. A plausible explanation for the significance on wasteland is that wasteland is the largest part of the land property used by households in rural Xinjiang,<sup>19</sup> and is a major income

<sup>17</sup> See below on page 21 for detailed discussions on the achievements of this campaign.

<sup>18</sup> In estimations for three groups of interactive effect models, only the endogeneity of trust is considered as the findings obtained from basic models I and II showed that possession of a land document is exogenous. This also avoids complicating the regressions and only needing to apply the 2SML (and not the Lewbel's), in these models.

<sup>19</sup> According to our survey, the average wasteland area in Awati County is 4.25 mu per capita, 39% more than the average contract land size (1 ha = 15 mu).

**Table 4**Average marginal effects for land document and trust.<sup>a–c</sup>

| Variables                                                 | Interactive effect model I |                  | Interactive effect model II |                  | Interactive effect model III |                    |
|-----------------------------------------------------------|----------------------------|------------------|-----------------------------|------------------|------------------------------|--------------------|
|                                                           | Contract land              | Wasteland        | Contract land               | Wasteland        | Contract land                | Wasteland          |
| Possession of Land Document                               | –0.07<br>(–0.38)           | –0.33<br>(–1.53) | 0.40 (0.77)                 | 0.02* (1.65)     | 0.03 (0.53)                  | 0.45***<br>(15.63) |
| Trust in Villagers                                        | 0.48*** (2.82)             | 0.36*** (15.54)  | 0.81** (2.13)               | 5.19* (1.65)     | 0.88** (2.44)                | 5.35* (1.65)       |
| Trust in Village Cadres                                   | 0.52*** (63.69)            | 0.71*** (30.65)  | 3.04***<br>(4.74)           | 6.60* (1.69)     | 3.04*** (5.32)               | 6.82* (1.72)       |
| Trust in Villagers (Possession of Land Document = 1)      | 0.48** (2.43)              | 0.38*** (8.18)   | –                           | –                | –                            | –                  |
| Trust in Villagers (Possession of Land Document = 0)      | 0.41** (2.21)              | 0.29*** (16.76)  | –                           | –                | –                            | –                  |
| Trust in Village Cadres (Possession of Land Document = 1) | 0.50*** (29.77)            | 0.71*** (15.52)  | –                           | –                | –                            | –                  |
| Trust in Village Cadres (Possession of Land Document = 0) | 0.65*** (3.57)             | 0.47*** (5.71)   | –                           | –                | –                            | –                  |
| Possession of Land Document (log (Land Area) = mean)      | –                          | –                | 0.39 (1.13)                 | 0.03**<br>(2.13) | –                            | –                  |
| Possession of Land Document (Uyghur Ethnicity = 1)        | –                          | –                | –                           | –                | 0.05* (1.89)                 | 0.46*** (7.98)     |
| Possession of Land Document (Uyghur Ethnicity = 0)        | –                          | –                | –                           | –                | –0.14<br>(–1.23)             | 0.06** (2.30)      |

<sup>a</sup> Source: own survey.<sup>b</sup> \*P < 0.1 \*\*P < 0.05 \*\*\*P < 0.01.<sup>c</sup> The calculated marginal effects for these control variables are not reported for brevity.

resource (Rao et al., 2016). Thus, households with more wasteland endowment may value the importance of the land document more in maintaining their tenure of wasteland.

A striking finding is that the perception of wasteland tenure security is sensitive to households being Uyghur, but not Han Chinese. Albeit we expect that public policy in rural Xinjiang may be relatively more difficult to be implemented among the mostly religious Uyghur minority, and may consequently weaken the advantage of having a land document in securing land tenure as discussed in Section 2.3. Such counteractive effect was not observed in our empirical results. This evidence further confirms previous findings that Uyghur ethnic descent is more likely to perceive their land tenure as security than Han Chinese due to higher levels of trust. This may also be ascribed to some successful achievements of the “Open Up the West” campaign carried out throughout Xinjiang since 1990s onward. The embraced policies in this campaign on ethnic minorities include supporting to celebrate multi-cultural difference and traditional festivals, developing “local minority characteristic” tourism, and allowing some sort of religious practices (Anthony, 2012; Sautman, 1998). These policies have facilitated to create a favorable situation to lift the degree of acceptance of Han-style development, to narrow the division, and to promote greater integration between minority cultures (Mackerras, 2001; Moeller, 2007).

## 5.2. Checks for robustness

We did two crosschecks on the robustness of our regression outcomes.<sup>20</sup> First, the general results obtained from the 2SCML were checked by performing the traditional two-stage instrumental variable probit (TIP) technique, building on the work by Wooldridge (2010) and Brasselle et al. (2002). In the first stage, the probit model was estimated for Eqs. (5)–(10) to obtain their predicted values ( $\hat{D}_{c,i}^{pre}$ ,  $\hat{D}_{w,i}^{pre}$ ,  $\hat{T}_{c,i}^{pre}$ ,  $\hat{T}_{w,i}^{pre}$ ,  $\hat{T}_{c,i}^{preca}$  and  $\hat{T}_{w,i}^{preca}$ ). In the second stage, the predicted values for wasteland and contract land were introduced into Eqs. (11) and (12), excluding the original endogenous variables from the probit regression.

Second, the effects of possession of a land document and trust were examined separately by performing the Lewbel's and the TIP for two main reasons: because we lack suitable instrument variables for land document, and because performing Lewbel's with a subset of exogenous variables may not provide robust estimations. Furthermore, possession of a land document may be correlated with trust since it may be more likely that individuals, who display high level of trust to others, and particularly to village cadres, will receive a land document. Thus it is useful to check these variables separately.

Technically, the Lewbel's is performed for Eqs. (5) and (6) respectively, but this time based on a full set of exogenous variables of  $X_{c,i}$  and  $X_{w,i}$ , and with the two trust variables excluded. By doing this, the predicted values ( $\bar{D}_{c,i}^{pre}$  and  $\bar{D}_{w,i}^{pre}$ ) for land documentation are obtained. These predicted values are then introduced into Eqs. (11) and (12), but excluding the original land document variable and trust variables.

The TIP method for the check of trust is also a two stage procedure: in first stage, the probit model is performed for Eqs. (7)–(10), based on instrumental variables of average village-level trust, which gives four predicted values ( $\bar{T}_{c,i}^{pre}$ ,  $\bar{T}_{w,i}^{pre}$ ,  $\bar{T}_{c,i}^{preca}$

<sup>20</sup> Only the robustness of results derived from basic model I is presented for brevity.

and  $T_{w,i}^{-preca}$ ). In the second stage, the probit is performed for Eqs. (11) and (12), introducing the previously obtained predicted values and excluding the original trust variables and the land documentation variable.

The estimation results are displayed in Appendix Tables A.2–A.4, respectively. We found that the significance of key variables is basically consistent with the findings from estimations obtained by using the 2SCML, suggesting that these estimation results are relatively reliable. In regard to the control variables, the coefficients in the contract land model are basically consistent. Those in the wasteland model are partially inconsistent, although this may be mainly due to the small size of wasteland samples.

## 6. Conclusions

This paper examines the roles of official land documents and trust in shaping household perceptions of land tenure security in rural Xinjiang, an area mostly inhabited by Muslim Uyghur farmers and where the land tenure regime is complicated by the co-existence of contract land and wasteland. Our results contribute to the debates about the effects of formal institutions on tenure security.

We find that official land documents do not substantially enhance perceptions of tenure security, and that the official legal tenure institutions do not effectively provide perceived security of tenure. Trust plays an important role in enhancing perceived tenure security and, on both types of land. A higher level of trust in village cadres plays a more important role in contributing to perceived tenure security than trust between villagers. We further find that both types of trust are more likely to increase land tenure security perceived by households in possession of a land document. This indicates that a land document is a useful instrument that government can use for strengthening the positive effect of trust in promoting tenure security. Additionally, Uyghurs with larger land holdings attached more significance to holding a wasteland document than Han Chinese with less land. These observations verify the presence that land documents do have a conditional effect.

The above findings highlight the discrepancy between the state's institutional intention (to enhance the tenure security of farmers) and the actual outcomes in rural China. This is a consequence of the complex power relations between the state, the collectives, and individual households, which influence control of the land as well as the levels of trust between individuals and in public policies and officials. This latter factor is particularly important in the context of the unique and complex ethnic composition of rural Xinjiang. While the state has considerable power in formulating rules, it is less effective at enforcement, at least partly because the rules have been contested and manipulated by state agencies at various administrative levels (Lin & Ho, 2005), and have been contested by farmers. The Chinese state is a combination of institutions with complex dynamics that sometimes conflict with each other. The power that local governments acquired under the HRS has fragmented the power of the central state over the issues of land use and allocation (Zhang, 2012).

Most power over land rests in the hands of local governments, which not only represent the interests of the state, but also their own (economic) interests (Hsing, 2006). They often sacrifice households' tenure security for equity and/or efficiency (Brandt et al., 2004), or in order to secure urban development. Establishing a contract relationship between households and the collective is therefore complex (Zhang, 2012) and, not surprisingly, a large number of small farmers in possession of an official land document perceive their land tenure as being insecure. They have been coping with this insecurity independent of the state through local informal tenure arrangements.

This implies that the question of how to effectively enforce formal tenure institutions on ground would seem to be more important than the current emphasis on land registration itself. From this sense, it would seem more useful to focus on establishing interpersonal trust between villagers and political trust in public policy and politicians, particularly village cadres. This is because trust fosters peoples' perception of having security of tenure. More importantly, given that village self-governance rules in rural China are usually embedded in local-specific cultural traditions (Ma et al., 2015a), legal tenure institutions need to take into account the local and informal norms of tenure that have already proved themselves to be useful in coping with land tenure insecurities. Land registration might be more complex in the multi-ethnic context of Xinjiang, where many Uyghurs consider religion to have more authority than the state (Bellér-Hann, 1997), but this study will certainly also have relevance for other regions of China. Any governmental interventions aimed at integrating formal institutions within local cultures should be carefully designed so that they complement rather than contradict the aims of securing tenure, and perceptions thereof. This raises a significant research question for future research: 'How can land tenure security be improved in the context of interacting formal and informal tenure institutions in rural areas in developing countries'.

The empirical estimations in this research are based on small cross-sectional household dataset. The use of larger-scale panel datasets would enable us to more confidently affirm these conclusions.

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## Appendix A

Table A.1

Regression results with the 2SCML for varied interactive effect models.<sup>a-c</sup>

| Dependent variable: perception of land tenure security | Interactive effect model I |                  | Interactive effect model II |                  | Interactive effect model III |                  |
|--------------------------------------------------------|----------------------------|------------------|-----------------------------|------------------|------------------------------|------------------|
|                                                        | Contract land              | Wasteland        | Contract land               | Wasteland        | Contract land                | Wasteland        |
| Possession of Land Document                            | 0.41 (1.51)                | 6.03 (1.19)      | 1.12 (0.63)                 | 0.19* (1.95)     | −0.39 (−1.17)                | 3.58*** (5.00)   |
| Trust in Villagers                                     | 2.00** (2.01)              | 37.39** (1.96)   | 2.28** (2.13)               | 41.41** (2.06)   | 2.47** (2.44)                | 42.58* (1.90)    |
| Trust in Village Cadres                                | 11.66*** (9.77)            | 57.45** (2.05)   | 8.58*** (5.02)              | 52.64** (2.02)   | 8.56*** (5.60)               | 54.31* (1.86)    |
| Trust in Villagers* Possession of Land Document        | −0.30 (−0.26)              | −9.52 (−1.39)    | −                           | −                | −                            | −                |
| Trust in Village Cadres* Possession of Land Document   | −1.78*** (−2.65)           | −19.13 (−1.16)   | −                           | −                | −                            | −                |
| Possession of Land Document *log (Land Area)           | −                          | −                | −0.76* (−1.93)              | 0.21 (0.70)      | −                            | −                |
| Possession of Land Document * Uyghur Ethnicity         | −                          | −                | −                           | −                | 0.54*** (3.79)               | −3.21*** (−3.86) |
| log (Distance to Township)                             | −0.68*** (−4.27)           | −2.59 (−1.48)    | −0.57*** (−3.97)            | −0.66** (−2.00)  | −0.56*** (−4.42)             | −0.70* (−1.86)   |
| Past Village Land Reallocation Experience              | −1.77*** (−6.40)           | −6.82*** (−3.68) | −1.27*** (−3.47)            | −3.12** (−2.25)  | −1.27*** (−3.65)             | 3.01** (2.06)    |
| Bex'erik Township                                      | −0.85*** (−2.60)           | −10.25** (−2.10) | −0.98*** (−3.33)            | −2.17** (−2.57)  | −0.94*** (−3.73)             | −2.15** (−2.19)  |
| Horiqol Township                                       | −1.22*** (−5.21)           | −                | −1.22*** (−7.42)            | −                | −1.17*** (−8.80)             | −                |
| Household Head Age                                     | −0.01*** (−3.14)           | −0.03 (−0.89)    | −0.01*** (−2.65)            | −0.01 (−0.60)    | −0.01*** (−2.87)             | −0.01 (−0.61)    |
| Household Head Education                               | 0.04* (1.76)               | −0.33 (−1.50)    | 0.04* (1.71)                | −0.21** (−1.98)  | 0.04* (1.81)                 | −0.21* (−1.94)   |
| Uyghur Ethnicity                                       | 0.37 (1.60)                | 5.58** (2.11)    | 0.44** (2.31)               | 1.51** (2.33)    | −0.05 (−0.20)                | 4.66*** (11.94)  |
| log (Agricultural Laborer Share)                       | 0.94*** (3.31)             | 9.91 (1.71)      | 0.88*** (2.51)              | 4.13 (1.60)      | 0.90*** (2.68)               | 3.89 (1.49)      |
| log (Wealth)                                           | −0.09 (−0.25)              | −2.76*** (−3.19) | −0.14 (−0.45)               | −1.49*** (−3.06) | −0.14 (−0.46)                | −1.52*** (−2.96) |
| Past Tree Planting Experience                          | −0.14 (−0.50)              | 1.75 (1.31)      | −0.18 (−0.71)               | 1.08 (1.55)      | −0.16 (−0.66)                | 1.15 (1.54)      |
| Governmental Intervention                              | 0.18 (1.36)                | −0.33 (−0.69)    | 0.15 (1.05)                 | −0.32 (−1.34)    | 0.15 (0.98)                  | −0.30 (−1.22)    |
| Land Irrigation                                        | 0.01 (0.03)                | −0.95 (−1.10)    | 0.03 (0.21)                 | −0.42 (−0.90)    | 0.03 (0.22)                  | −0.43 (−0.91)    |
| Number of Land Plot                                    | −0.03 (−0.81)              | 0.87** (2.22)    | −0.02 (−0.59)               | 0.48 (1.56)      | −0.02 (−0.67)                | 0.45 (1.49)      |
| Past Land Reallocation Experience                      | 0.01 (0.05)                | −1.10 (−0.47)    | 0.01 (0.11)                 | −1.35 (−1.07)    | 0.02 (0.13)                  | −1.42 (−1.12)    |
| log (Land Area)                                        | 0.12 (0.80)                | −1.51 (−1.56)    | 0.84** (2.10)               | −0.89*** (−5.69) | 0.15 (1.05)                  | −0.70*** (−3.29) |
| Wasteland Use Fee                                      | −                          | 3.11** (2.17)    | −                           | 2.34*** (4.82)   | −                            | 2.35*** (5.00)   |
| Intercept                                              | −3.00** (−2.15)            | −29.98** (−2.00) | −3.99*** (−3.89)            | −40.05* (−1.90)  | −2.83** (−2.51)              | −44.28* (−1.94)  |
| N                                                      | 352                        | 76               | 352                         | 76               | 352                          | 76               |
| Log pseudo likelihood                                  | −216.841                   | −14.434          | −218.976                    | −17.290          | −219.817                     | −17.277          |
| Pseudo R square                                        | 0.0834                     | 0.5122           | 0.0744                      | 0.4157           | 0.0708                       | 0.4162           |

<sup>a</sup> Source: own survey.<sup>b</sup> \*P < 0.1 \*\*P < 0.05 \*\*\*P < 0.01.<sup>c</sup> Standard errors are clustered-robust at the irrigation district level.

Table A.2

Regression results with the TIP for basic model I on two land types.<sup>a-h</sup>

| Dependent variable: perception of land tenure security | Contract land    | Wasteland       |
|--------------------------------------------------------|------------------|-----------------|
| Possession of Land Document                            | −0.10 (−1.09)    | −0.48 (−1.55)   |
| Trust in Villagers                                     | 0.24* (1.92)     | 0.39* (1.82)    |
| Trust in Village Cadres                                | 1.73** (2.03)    | 5.02* (1.83)    |
| log (Distance to Township)                             | 0.37 (1.17)      | 0.12 (0.22)     |
| Past Village Land Reallocation Experience              | −0.78** (−2.03)  | −1.10 (−1.63)   |
| Bex'erik Township                                      | −0.36 (−0.51)    | −1.48 (−0.93)   |
| Horiqol Township                                       | −0.60 (−0.94)    | −               |
| Household Head Age                                     | −0.01*** (−3.16) | 0.01 (0.24)     |
| Household Head Education                               | 0.04* (1.78)     | 0.07 (1.21)     |
| Uyghur Ethnicity                                       | 0.21 (1.25)      | −1.90** (−2.38) |
| log (Agricultural Laborer Share)                       | 0.89* (1.78)     | −2.01 (−1.12)   |
| log (Wealth)                                           | −0.13 (−0.44)    | 1.24* (1.85)    |
| Past Tree Planting Experience                          | −0.28 (−1.23)    | −0.65 (−1.12)   |
| Governmental Intervention                              | 0.10 (0.64)      | 0.15 (0.44)     |
| Land Irrigation                                        | 0.08 (0.52)      | −0.07 (−0.10)   |
| Number of Land Plot                                    | −0.02 (−0.64)    | −0.28 (−1.45)   |

(continued on next page)

**Table A.2** (continued)

| Dependent variable: perception of land tenure security | Contract land | Wasteland      |
|--------------------------------------------------------|---------------|----------------|
| Past Land Reallocation Experience                      | 0.04 (0.33)   | 0.90 (0.64)    |
| Log (Land Area)                                        | 0.11 (0.74)   | 0.44 (0.91)    |
| Wasteland Use Fee                                      | –             | 1.78*** (2.84) |
| Intercept                                              | 1.89 (1.16)   | 8.38 (1.55)    |
| N                                                      | 352           | 76             |
| Log pseudo likelihood                                  | –224.280      | –19.535        |
| Pseudo R square                                        | 0.0520        | 0.3399         |

<sup>a</sup> Source: own survey.

<sup>b</sup> \*P < 0.1 \*\*P < 0.05 \*\*\*P < 0.01.

<sup>c</sup> The F-statistic for the joint significance of zero of instrument variables in the first-stage of the 2SCML are: 10.36 (P = 0.000) on contract land; and 6.58 (P = 0.037) on wasteland.

<sup>d</sup> The F-statistic for the significance of instrument variables for trust in villagers and trust in village cadres in the first-stage of the 2SCML are: 7.710 (P = 0.039) and 5.760 (P = 0.062) on contract land; and 22.060 (P = 0.009), 11.73 (P = 0.027) on wasteland, respectively.

<sup>e</sup> The Kleibergen-Paap rk LM statistic (for under identification test) for land document in the second-stage of the 2SCML are: 23.195 (P = 0.057) on contract land; and 18.740 (P = 0.144) on wasteland. The test result derived from the wasteland model is not statistically significant, which is mainly limited by the small wasteland sample size. The Hansen-J statistics for the over-identification test are 21.637 (P = 0.1177) and 14.040 (P = 0.3220), respectively, meaning that identification is reliable.

<sup>f</sup> Only one instrumental variable is introduced for each trust variable, hence it is not necessary to perform the under-identification test and over-identification test in the second-stage of the 2SCML.

<sup>g</sup> The F-statistic for the significance of zero predicted value for land document, trust in villagers, and trust in village cadres in the second-stage of the 2SCML are: 1.19 (P = 0.2756); 1.03 (P = 0.3094); 3.00 (P = 0.0833) on contract land; and 2.39 (P = 0.1223); 3.32 (P = 0.0685); 3.36 (P = 0.0669) on wasteland.

<sup>h</sup> Standard errors are clustered and robust at the irrigation district level.

**Table A.3**

Estimation results for the effect of land document with the Lewbel's.<sup>a–e</sup>

| Dependent variable: perception of land tenure security | Contract land  | Wasteland      |
|--------------------------------------------------------|----------------|----------------|
| Possession of Land Document                            | 0.01 (0.04)    | –0.10 (–0.60)  |
| Z_log (Distance to Township)                           | 0.05 (1.17)    | –0.13 (–0.75)  |
| Z_Past Village Land Reallocation Experience            | –0.09 (–0.85)  | –0.09 (–0.58)  |
| Z_Bex'erik Township                                    | 0.27*** (2.96) | –0.11 (–0.53)  |
| Z_Horiqol Township                                     | 0.16 (1.27)    | –              |
| Z_Household Head Age                                   | –0.01 (–1.27)  | –0.01 (–1.10)  |
| Z_Household Head Education                             | 0.01 (1.41)    | 0.01 (0.20)    |
| Z_Uyghur ethnicity                                     | 0.05 (0.47)    | –0.09 (–0.43)  |
| Z_log (Agricultural Laborer Share)                     | 0.30 (1.52)    | –0.53 (–1.05)  |
| Z_log (Wealth)                                         | –0.05 (–0.63)  | –0.02 (–0.23)  |
| Z_Past Tree Planting Experience                        | –0.10 (–1.57)  | 0.09 (0.98)    |
| Z_Governmental Intervention                            | 0.04 (0.78)    | –0.08 (–1.05)  |
| Z_Land Irrigation                                      | 0.03 (0.50)    | 0.22* (1.77)   |
| Z_Number of Land Plot                                  | –0.01 (–0.36)  | –0.04 (–0.88)  |
| Z_Past Land Reallocation Experience                    | 0.01 (0.10)    | –0.15 (–0.78)  |
| Z_Log (Land Area)                                      | 0.05 (0.62)    | 0.13 (1.44)    |
| Z_Wasteland Fee                                        | –              | 0.47*** (3.22) |
| Intercept                                              | 0.60*** (4.80) | 0.93*** (8.54) |
| N                                                      | 352            | 76             |
| Centered R Square                                      | 0.061          | 0.281          |
| Adjusted R Square                                      | 0.016          | 0.086          |

<sup>a</sup> Source: own survey.

<sup>b</sup> Variable marked with prefix “Z\_” means it is included in Z to identify the Lewbel IV model.

<sup>c</sup> \*P < 0.1 \*\*P < 0.05 \*\*\*P < 0.01.

<sup>d</sup> Kleibergen-Paap rk LM statistic (for under-identification test) statistics for land document in contract land and wasteland models are: 23.045 (P = 0.0832) and 23.301 (p = 0.0780) respectively. Likewise, the Hansen J statistics for over-identification test are: 18.343 (P = 0.1449) and 17.670 (P = 0.2222) respectively, meaning that identification is reliable.

<sup>e</sup> Standard errors in the models are robust for heteroskedasticity.

**Table A.4**

Estimation results for the effect of trust with the TIP.<sup>a–e</sup>

| Dependent variable: perception of land tenure security | Contract land | Wasteland     |
|--------------------------------------------------------|---------------|---------------|
| Trust in Villagers                                     | 0.78 (1.08)   | 4.98* (1.82)  |
| Trust in Village Cadres                                | 5.23* (1.75)  | 6.26** (2.01) |
| log (Distance to Township)                             | –0.37 (–1.17) | 0.12 (0.32)   |

Table A.4 (continued)

| Dependent variable: perception of land tenure security | Contract land    | Wasteland        |
|--------------------------------------------------------|------------------|------------------|
| Past Village Land Reallocation Experience              | −0.91** (−2.06)  | −0.95** (−2.08)  |
| Bex'erik Township                                      | −0.35 (−0.50)    | 1.08** (2.24)    |
| Horiqol Township                                       | −0.57 (−0.92)    | –                |
| Household Head Age                                     | −0.01*** (−3.22) | 0.01 (0.24)      |
| Household Head Education                               | 0.04* (1.70)     | 0.09 (1.03)      |
| Uyghur ethnicity                                       | 0.23 (1.26)      | −1.41*** (−4.84) |
| log (Agricultural Laborer Share)                       | 0.86** (2.40)    | −2.14 (−0.93)    |
| log (Wealth)                                           | −0.12 (−0.44)    | 1.25** (2.25)    |
| Past Tree Planting Experience                          | −0.28 (−1.24)    | −0.63* (−1.83)   |
| Governmental Intervention                              | 0.10 (0.66)      | 0.12 (1.08)      |
| Land Irrigation                                        | 0.08 (0.53)      | 0.18 (0.42)      |
| Number of Land Plot                                    | −0.02 (−0.52)    | −0.25 (−1.06)    |
| Past Land Reallocation Experience                      | 0.05 (0.39)      | 0.41 (0.42)      |
| Log (Land Area)                                        | 0.11 (0.79)      | 0.49* (1.91)     |
| Wasteland Fee                                          | –                | 1.54*** (3.23)   |
| Intercept                                              | −1.23** (−2.05)  | 6.54 (1.28)      |
| N                                                      | 352              | 76               |
| Pseudo R Square                                        | 0.051            | 0.324            |
| Log pseudo likelihood                                  | −224.419         | −19.994          |

<sup>a</sup> Source: own survey.

<sup>b</sup> \* $P < 0.1$  \*\* $P < 0.05$  \*\*\* $P < 0.01$ .

<sup>c</sup> The F-statistic for the significance of trust in the first-stage of the IVP model: 7.710 ( $P = 0.039$ ) for trust in villagers, 5.760 ( $P = 0.062$ ) for trust in cadres on contract land; and 22.060 ( $P = 0.009$ ) for trust in villagers, 11.73 ( $P = 0.027$ ) for trust in cadres on wasteland.

<sup>d</sup> Only one instrumental variable (village-level trust) is introduced for each trust variable, hence it is unnecessary to perform the over-identification test.

<sup>e</sup> Standard errors are clustered-robust at irrigation district level.

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