

An economic-psychological perspective on perceived land tenure security: Evidence from rural eastern China

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ABSTRACT

Land tenure security perceived by farmers is generally considered an important precondition for rural development. In this paper, we first propose a holistic framework of land tenure security that integrates Van Gelder's tripartite view of tenure security with Ho's credibility thesis. Following this framework, we empirically investigate the interrelation between the cognitive and the affective components of tenure security perceptions, and analyze how these perceptions are influenced by psychological factors, such as personality traits and economic preferences. We apply the generalized structural equation modeling to a dataset collected in 2019 among 1359 rice farmers in three provinces in eastern China. We found that the cognitive component shows an inverse "U-shape" relationship with the affective component, indicating farmers are not necessarily worried about the possible future land reallocation even if they think it is very likely to take place and that the widely used indicator, i.e., estimated probability of land reallocation, is thereby not sufficient to reflect a farmer's overall perceived tenure security. We also found that individual differences in personality traits (e.g., neuroticism) can help explain observed variations in perceived tenure security. The results showing perceived land tenure security of rural farmers also comprises nonequivalent "feeling" and "thinking" components and their influencing psychological factors have important implications for future research and policy making on rural institutional development.

1. Introduction

Secure property rights to land have been widely recognized as an important precondition for farmers to invest in land and therefore boost agricultural productivity (Besley, 1995; De Soto, 2000). Over the past few decades, issuing rural land documents by governments continues to be the prevailing way to improve tenure security in many developing countries as land titles are expected to reduce or eliminate landowners' uncertainty about their land ownership (Broegaard, 2005; Feder and Feeny, 1991). Despite the acknowledged importance of land tenure security, empirical studies on economic outcomes of land titling programs, such as investments or agricultural productivity, show rather inconsistent results (Abdulai et al., 2011; Brasselle et al., 2002; Fenske, 2011; Gao et al., 2017). Some empirical studies find evidence that secure land rights contribute to soil improvement investments (Abdulai et al., 2011;

Gao et al., 2017), but other studies do not find evidence for such a relationship. For example, Holden and Yohannes (2002) find that tenure security does not affect farmers' purchase of inputs or planting of perennials, while Brasselle et al. (2002) and Fenske (2011) find insignificant correlations between land ownership held by farmers and their land investments in West Africa.

One possible explanation for this empirical discrepancy is the lack of consensus about what tenure security means from the perspective of the landowner. Arnot et al. (2011) show that legal title is commonly used as a proxy for tenure security in the available literature. However, whether legal title can guarantee secure rights is a debated question in other authors' opinions (Deacon, 1999; Place and Otsuka, 2000). Recent studies propose to focus on perceived tenure security and suggest it could be one of the factors that directly affects farmers' land-related decision making and behavior (Broegaard, 2005; Linkow, 2016).

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Nevertheless, perceived tenure security is not an unequivocal concept and lacks a consistent way of measurement in the literature. By definition, it is an individual perception, referring not only to the sense of security that tenure holders associate with their current tenure situation but also with their emotional fears towards future conflicts regarding their property rights (Broegaard, 2005). Despite this dual nature of tenure security, most existing research on the rural land tenure tends to see perceived tenure security as either a purely cognitive or a purely affective state. For instance, some scholars consider perceived tenure security from a cognitive perspective, using landholders' perceived risk of conflicts and expropriation as an indicator, and find it to be strongly associated with gender, migrant status, political connectedness, literacy, and wealth in Africa (Ghebru and Lambrecht, 2017; Linkow, 2016). Ren et al. (2019) find that the possession of land certificates may positively affect farmers' cognitive expectations of future land reallocation in China. Alternatively, a handful of studies use affective worry to indicate perceived land tenure security, finding that formal land documents do not contribute to households' worry of losing land in the future (Rao et al., 2020).

A twofold framework of perceived tenure security proposed by Van Gelder (2007), albeit for analyzing land tenure security of urban dwellers, may illuminate a more inclusive way of measurement regarding perceived land tenure security in rural areas. Under this framework, land tenure security perceived by urban dwellers can be psychologically decomposed into a cognitive "thinking" component (i.e., perceived probability of risk) and an affective "feeling" component (i.e., fear of risk) (Van Gelder, 2007, 2013). Subsequent studies further empirically show that both components were related to urban housing investment (Van Gelder, 2009, 2013; Van Gelder and Luciano, 2015). In fact, a similar cognition–emotion system may also be attached by rural people to perceive rural environment, especially land. Rural people's understanding of land can involve emotional and psychological factors, as rural land often has rich historic, cultural, and symbolic meanings (Chigbu, 2013; Mujere, 2011). Having said this, little is known about whether such a framework of perceived tenure security applies to the rural context and what the underlying relationship between the two components of perceived tenure security is.

Moreover, although the perception of tenure security in some of the literature has been considered a psychological process under risk and uncertainty (see Van Gelder, 2007), it has not been linked to a common taxonomy of individual psychological differences, including personality traits, locus of control, and economic preferences. In fact, obtaining a better understanding of the role of personality traits in perceived tenure security is worthwhile for three reasons. First, these personality factors may directly affect perceived tenure security as they account for major individual differences in terms of feeling, thinking, and behavior (Borghans et al., 2008). Second, previous studies on the driving factors of perceived land tenure security often paid little attention to the differences in human factors (Ghebru and Lambrecht, 2017). However, since perceived land tenure security may comprise nonequivalent (feeling and thinking) components, it would be important to understand how human factors may influence these components. Furthermore, given that land tenure security perceptions may serve as an important potential bottleneck for investing in new opportunities and risky technologies (Bandiera, 2007; Fenske, 2011; Ma et al., 2013), there is a need to obtain deeper insights into perceived land tenure security and its psychological determinants.

This study provides another angle to the ongoing debate in the literature about what constitutes the perceived land tenure security. We first extend the earlier literature by proposing a holistic conceptual framework of tenure security, which integrates the tripartite view of tenure security with the credibility thesis for future research to examine the impact of land tenure reforms on (perceived) tenure security as well as subsequent economic behavior of households. Following this framework, we distinguish the relationship between cognition and affect regarding tenure security perception suggested by Van Gelder (2007),

and investigate the influence of psychological factors, i.e., personality traits and economic preferences, on farmers' perceived land tenure security. Empirical analysis is based on the structural equation modeling that is applied to a dataset collected among 1359 rice farmers in 120 villages in Jiangsu, Jiangxi, and Liaoning provinces, P.R. China in 2019. China provides an interesting case to investigate the perceptions of farmland tenure security at the household level, where land tenure security could be threatened by periodical land reallocations in response to demographic changes in villages or by other factors such as land expropriations without a fair compensation (Ma et al., 2020).¹ However, this study focuses on land tenure security associated with land reallocations rather than land expropriations mainly for the following two reasons. First, farmland expropriations were not common within our sampling areas, as most of them occurred in sub-urban areas instead of rural villages. Second, even if minor cases of expropriations took place in the past, farm households tend to be protected against inappropriate compensation in the future given the nationwide distribution of land certificates (Ma et al., 2016) and the newly revised Land Management Law (LML).²

The paper is structured as follows. Section 2 presents the theoretical background of this study by establishing a holistic conceptual framework for analyzing land tenure security through a review of the pertinent literature, which we believe can be a valuable contribution to the literature. Following this framework, Section 3 delves into the composition of perceived land tenure security through a case study of farmland reform in rural China. Section 4 describes the data set and empirical strategy. The estimation results are reported in Section 5. We end with a conclusion in Section 6.

2. Theoretical background: Discourse on land tenure security

2.1. The paradox between formalization and tenure security

The formalization of land property rights has been advocated by neo-liberal economists to be the underpinning to improve tenure security, which in turn can contribute to land investments, participation in land rental market, and higher agricultural efficiency (Besley, 1995; Holden et al., 2011; Place, 2009). Paradoxically, empirical studies examining these effects have failed to provide consistent results (Goldstein and Udry, 2008; Place, 2009; Sjaastad and Cousins, 2009).

The lack of consensus on how land tenure security should be defined and measured might be a crucial reason (Arnot et al., 2011; Ghebru and Lambrecht, 2017). The principles of the neo-liberal and neo-classical school on property rights claim that it is the institutional structure that matters to the economic activities the most and it is the privatized ownership that is the most efficient and secure institutional arrangement (North, 1990). By following the property rights approach, a large number of studies define tenure security according to the substance of rights, and measure it by *de jure* indicators of land tenure (e.g., legal title to land) (Abdulai et al., 2011; Michler and Shively, 2015; Nguyen et al., 2016). However, critics argue that the equation of the possession of land title with the secure tenure ignores the fact that a lack of land title does not necessarily mean land tenure is insecure in practice on the one hand (Van Gelder, 2010), and that land title may instead cause unexpected conflict-ridden and non-credible tenure arrangement on the other hand (Krul et al., 2021). Considering this deficiency, other studies thus define tenure security as an assurance concept and measure it using either the *de facto* probability or the perceived probability of losing some or all rights held through, e.g., eviction or expropriation (Ali et al., 2014;

¹ Land expropriations by governments for public purposes (e.g., infrastructure, urban expansion) without reasonable compensation may also undermine farmland tenure security in addition to land reallocations (Ma et al., 2015).

² The revised LML (2019) stipulated any farmland expropriation has to be approved by central government (Article 35).

Deininger and Jin, 2006; Linkow, 2016). Even though, a wide range of different indicators have been used in the measurement of perceived probability as subjective information are often unavailable in many cases (Arnot et al., 2011).

Stemming from no clear consensus on how tenure security should be conceptualized, Van Gelder (2010) proposes a tripartite model of urban land tenure security to illustrate how the three constitutive elements of tenure security (legal, *de facto* (actual), and perceptual) referred in previous literature are interrelated. The legal view rests on the neo-classical conception of property rights, referring to the legal status of property rights and the legal protection in case of infringement; the *de facto* view emphasizes the actual control of property, regardless of its legal status; the perceived one refers to tenure security perceived by dwellers (Van Gelder, 2010). This tripartite concept of tenure security has further been extended to the context of rural farmland by Ma et al. (2015).

Considering the three different forms of tenure security, the tripartite model manifests the pitfalls of the doctrine that conceptualizes tenure security according to the dichotomous classification of land rights (e.g., ‘formal’ versus ‘informal’, ‘common’ versus ‘private’, and ‘titled’ versus ‘untitled’). Although the neo-classical standard believes that a high level of legal tenure security as a result of the formalization of tenure rights via land titling should theoretically imply effective *de facto* assignment of rights and duties, this is always not the case when effective enforcement is lacking as happens in many developing countries (Ma et al., 2015). Also, perceived tenure security may depend on both legal and *de facto* tenure security, and may vary regarding “who perceives it, how much tenure is gained, which actors have been involved” (De Souza, 2001: p.179). Put differently, individuals facing similar legal and/or *de facto* tenure security may still differ in their perceived tenure security due to differences in their subjective understanding of laws and tenure situations (Broegaard, 2005; Van Gelder, 2010). Therefore, the legal, *de facto*, and perceived aspects often diverge and can only converge in an ideal situation, making any dichotomous assumption of institutional form rather futile in association with tenure security.

On the basis that attention should be moved beyond the dichotomous form of institution (e.g., private versus common and *de jure* versus *de facto*), recent scholars emphasize the importance of institutional function in development (Dixon, 2012), with a special focus on the “credibility thesis” put forward by Ho (2014, 2016a). As an alternative perspective challenging the notion of the neo-liberal property rights school, the credibility thesis posits that it is not the form of institutions in terms of formality, privatization, or security that determines the institutional performance, but their function or the so-called “credibility”, which is defined as the “aggregated levels of perceived social support at a given time and space” (Ho, 2014, p.14). In essence, the credibility thesis’s calling for attention to the continuum between the dichotomous state of institutions as well as how they are perceived by social actors to some extent coincides with the conceptualization of the perceived tenure security in previous studies by Van Gelder (2010, 2013). In practice, the credibility thesis has been applied to explain the institutional function of a variety of sectors in many countries, ranging from land institutions (Chen, 2020; Pils, 2016; You et al., 2022), to natural resources management (Fan et al., 2019; Krul et al., 2021; Zhao and Rokpelnis, 2016), informal housing (Sun and Ho, 2020; Zhou and Yau, 2021), and urban development (Zeković et al., 2020; Zhang, 2018).

Similar to the tripartite model, Ho (2016a,b) proposes the Formal, Actual, and Targeted (FAT) institutional framework to assess the institutional credibility, in which social actors’ perceptions of institutions are often analyzed and compared among the three aspects of FAT. Other indicators for evaluating the degree to which institutions may be positioned on the continuum of credibility include the social actors’ aggregate perceptions of engendered conflict through the Conflict Analysis Model (Ho, 2016b; Yang and Ho, 2020) as well as the calculation of the endogenous transaction costs (Fan et al., 2019). Nevertheless, although the above-mentioned approaches can measure the extent to which an

institution is credible or functioning well, puzzles remain around the questions of what constitutes perceived tenure security and how it, as a continuum, can be quantitatively gauged, especially at the micro-individual level.

2.2. Perceived land tenure security as a psychological complex

Perceived land tenure security has been increasingly viewed as the closest proxy of tenure security as farmers themselves are believed to make land-related decisions based on their subjective perceptions of tenure security (Ma et al., 2015; Sjaastad and Bromley, 2000). Given this subjectivity, perceived tenure security may be a rather complex concept combining both the general expectation of eviction and the fear of future conflicts from the perspective of the landholder (Broegaard, 2005). Nevertheless, most empirical studies merely use landholders’ subjective estimates of the likelihood of future land eviction in some cases and land reallocation in other cases to conceptualize perceived land tenure security (Ghebru and Lambrecht, 2017; Holden and Yohannes, 2002; Ma et al., 2013; Ren et al., 2019). A few exceptions are a series of studies by Van Gelder (2007, 2009), which operationalize perceived tenure security of urban dwellers as both a cognitive-based “thinking” state (i.e., the perceived probability of eviction) and an affective-based “feeling” state (i.e., the insecure feeling to tenure situation).

The underlying reason for why most studies on tenure security only focus on cognitive factors is the “consequentialism” or economic perspective of decision making (Rick and Loewenstein, 2008). It presumes that a farmer’s utility of his/her tenure situation arises from an expectation-based calculus of land eviction that is associated with his/her emotional feeling in a linear-like way. In other words, cognitive evaluation of a risk, such as its perceived probability and magnitude, is expected to generate corresponding negative feeling states such as worry, fear and insecurity.

Psychologists have long considered the cognitive and affective aspects of mental operation as different determinants of the human decision-making process (Baron, 1994; Schwarz, 2000). The cognitive aspect involves conscious analysis of sensory information, while the affective aspect refers to the unconscious psychophysiological arousal people experience, associated with, for example, positive or negative affect (Duncan and Barrett, 2007). The “risk-as-feelings” approach, opposing the “consequentialist’s” viewpoint, considers risk more as a feeling state than a purely thinking state, arguing that both cognitive assessments and affective feelings may work in concert to guide people’s actions, especially under uncertainty (Loewenstein et al., 2001; Slovic et al., 2005). Though cognitive evaluation of risk intuitively seems to be linearly correlated with affective feelings,³ emerging behavioral studies showing the importance of affect-based mental operations in decision making suggest that they may diverge or even run in opposite directions from each other (Loewenstein et al., 2001; Slovic et al., 2002). In other words, cognitive risk perception may not always be tantamount to affective risk feelings. Instead, they are interrelated but distinct concepts that together constitute a psychological complex of perceived tenure security.

2.3. A holistic framework of land tenure security

Unfortunately, the extensive discussion of literature on tenure security above overlooks a few important things. First, despite that the seminal studies by Van Gelder (2007, 2009) have operationalized perceived tenure security into different states of thinking and feeling, an explicit analytical framework for the interactions between the two aspects of perceived land tenure security remains missing. Second, it’s known that perceived tenure security can be affected by actual tenure

³ Relevant feelings may include negative effects such as stress, worry, anxiety and fear regarding the tenure situation (Van Gelder, 2007).

security and other external factors such as age, gender, and resources endowment (Ren et al., 2019; Rao et al., 2020), but how different aspects of perceived land tenure security would be affected by internal or psychological factors of social actors is still unknown. This is important because institutional performance can differ depending on internal factors of social actors (Koroso et al., 2019), and people's ability to learn facts on institutional function depend on their subjective or psychological components (Zhou and Yau, 2021). Third, although the conceptualization of credibility as the perceived social support in the credibility thesis follows Van Gelder's work on perceptions of property rights, the credibility thesis and the tripartite model have not been integrated within a unified framework for analyzing land tenure security.

Therefore, we establish a conceptual framework that extends the tripartite model of tenure security by explicitly disentangling cognitive and affective perceived land tenure security and integrates it with the credibility thesis to analyze the land tenure security in a holistic way. The holistic conceptual framework is graphically illustrated in Fig. 1.

In this framework, the function of an institutional change is conceptually affected by institutional environment and actor's characteristics along the tripartite dimensions (i.e., legal, *de facto*, perceived) of tenure security following Van Gelder (2010). The effect of land tenure reform on the legal tenure security will be guaranteed by the formal institutional environment at the national level (i.e., laws and regulations), which will also shape *de facto* tenure security together with informal institutional environment at the local level (i.e., village self-governance and social norms). To what extent the *de facto* tenure security is transformed into a person's perceived tenure security depends on actor's characteristics, which not only include external factors such as age, gender, or other household characteristics, but more importantly also internal factors such as individual psychology. We further explicitly conceptualize perceived tenure security as a composite of cognitive perception and affective perception. Both of the two distinct components are thought to affect household economic behavior directly but they can be correlated with each other.

This holistic framework also demonstrates how the tripartite theory of tenure security can be compatible with Ho's (2014) credibility theory, especially from the methodological perspective. According to the credibility thesis, institutional credibility can be assessed by Formal (i.e., the officially accorded rights), Actual (i.e., the rights enjoyed in practice), and Targeted (i.e., the rights perceived as necessary) security, which essentially corresponds to legal, *de facto*, and perceived tenure security, respectively. A notable difference between these two approaches is that

the tripartite model is conducive to assess tenure security perceived at the individual level, but ignores the aggregated perception at the community level; while the credibility theory and its associated FAT framework can assess the perceived support of an institution by various social actors at the community level, but lacks a comprehensive approach to quantify the perceptions using individual-level data. This holistic framework thus also builds the bridge over the methodological gap between these two approaches, through which not only data with rich individual-level information can be used to evaluate the individual perception of tenure security, but also data aggregated to the community level to reflect the institutional credibility of a specific group of actors.

In the following section, we apply this framework to delve into the composition of perceived tenure security, by taking farmland reform in rural China as a case study. We in particular pay attention to the internal factors affecting the perceived tenure security and the interrelation between its cognitive and affective aspects. The relationships to be tested in our empirical analysis are indicated as the dashed arrows in Fig. 1 and will be discussed in more detail in the next section.

3. Twofold perceived tenure security: The case of farmland in China

3.1. Land tenure reforms in rural China

Land property rights in China have been seen as “quasi-private” since the introduction of the Household Responsibility System (HRS), under which farmland ownership rights reside with the village collective and use rights are leased out to individual farm households (Deininger and Jin, 2003). The initial distribution of farmland was on the basis of household and/or labor force sizes, land reallocations within a village thus took place periodically to ensure the egalitarian principle in access to farmland for village members when there were demographic changes (Qu et al., 1995). Since 1998, multiple rounds of land reforms were implemented to prevent from farmland fragmentation and stabilize tenure security. The 1998 Land Management Law (LML) extended the land contract period from originally 15 years to 30 years and specified that farmers should receive a written 30-year land use contract from local collectives (Zhu and Prosterman, 2009). The Rural Land Contract Law (RLCL) of 2002 further stipulated that any major land reallocations at village level should be prohibited (Deininger and Jin, 2003; Wang et al., 2015). The land tenure reform of 2013 mandated the issuing of

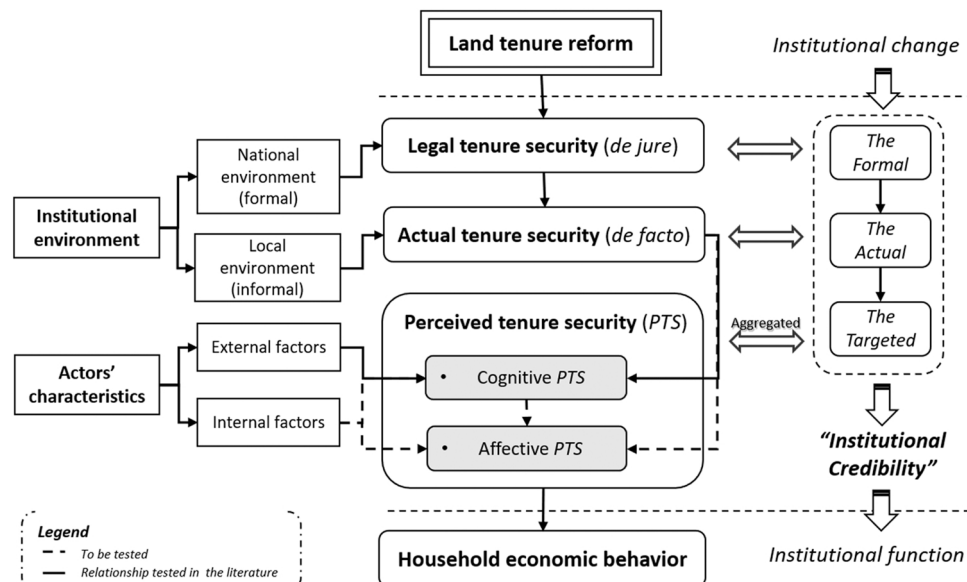


Fig. 1. A holistic framework of land tenure security based on Van Gelder (2007, 2010) and Ho (2014, 2016a).

land certificates nationwide (Wang and Zhang, 2017). Each rural household should receive a land certificate specifying the boundaries and areas of contracted land, which postulates that the current contracted land should remain unchanged for a long term (Ren et al., 2022). Despite this, land reallocation continues to occur in many provinces and thereby constantly weakens land tenure security in rural China (Feng et al., 2014; Hong et al., 2020).

3.2. Dual attitudes towards land reallocations

An important effort made in rural land reforms in China so far was to quell farmers' estimated probability of future land reallocation via both issuing the land title and stabilizing the current land contracting. However, such attempts of the central government to improve legal rural land tenure security through institutional land reforms may not necessarily be equated with effective increment in perceived tenure security at the farm household level, as a major flaw of this policy might be its "consequentialist's" presumption on farmers' perceived land tenure security. Hence, the confounding enigma is whether the farmers' perceived tenure security really conform to the "consequentialist's" view expected by the government. Or, to put it differently, would farmers perceiving a higher likelihood of future land reallocation necessarily perceive a lower level of tenure security?

The key to this enigma may lie in farmers' attitudes toward land reallocation. As explained in the previous section, major land reallocation has been nominally prohibited for at least 20 years in rural China since 1998, resulting in the egalitarian principle of farmland reallocation to be compromised when demographic or employment situation changes within the village. Without reallocating land accordingly, issues of inequality in farmland endowment, and thus in farm income, arise inevitably (Ye, 2015). Zhang and Kant (2022) find that farmers with strong altruism and inequality-aversion are more likely to support the land reallocation scheme. In this sense, one could expect that land reallocation, regardless of its perceived probability of occurrence in the future, may suit personal interests (financially or psychologically) of at least some farm households. Therefore, a farmer perceiving a high probability that land reallocation will take place may merely attach a low degree of worry to it.

Such a hypothesized divergence between cognitive and affective perceptions could be glimpsed by a little empirical evidence. Ho (2014) argues that the seemingly-insecure land tenure in rural China is actually a "socially supported insecure tenure" in which land reallocation is deemed both credible and desirable by the majority of the Chinese rural population. Based on a nationwide survey, Ho (2014) presents the empirical evidence showing that more than 70 % of the interviewed farmers believe that the village committee should reallocate contracted land in an egalitarian way when there are demographic changes in families. Moreover, farmers in Southeast China have been found to have a high preference for farmland reallocation over secured farmland tenure (Zhang and Kant, 2022). These findings reflect a relatively high level of perceived support (i.e., credibility) for insecure land tenure. As credibility is defined as the degree to which a particular institution is perceived to be acceptable by people (Ho, 2014), it is to some extent similar to the concept of emotional acceptance, the opposite of affective worry defined in our study. Hence, this evidence provides an important clue to our claim that the land tenure security perception of a farm household in rural China might be disentangled into two interrelated but divergent components (i.e., cognitive and affective).

In addition to the subjective attitude of farmers towards land reallocation, the uncertainty of land reallocation itself, resulting from ambiguous formulation of central laws and the prevailing self-governance rules (Ho, 2015), may make farmers worried, while the certainty of land reallocation – either favorable or unfavorable – may diminish their worries.

To sum up, we expect that farmers' cognitive expectation on future land reallocation is not equivalent to their affective worry about it,

whereas the relationship between these two components, will be interesting to be explored in the empirical analysis.

3.3. Psychological composition of perceived land tenure security

3.3.1. Personality and preferences

We believe that personality traits are the basic psychological factors underlying perceived land tenure security, as they are defined as the most fundamental psychological constructs that shape people's feeling, thinking, and behavior (Borghans et al., 2008).

The Big Five personality model has become the most comprehensive and widely accepted taxonomy for personality traits (John and Srivastava, 1999; Rustichini et al., 2016). In this model, personality traits are grouped into five factors: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (Costa and McCrae, 1992). Openness to experience captures the tendency of an individual of being creative and imaginative (Costa and McCrae, 1992). Conscientiousness describes the extent to which a person is hardworking, persistent, and self-controlled (Zhao and Seibert, 2006). Extraversion is associated with positive affect, enthusiasm, and sociability (Ashton et al., 2002; John et al., 2008). Agreeableness measures how friendly, altruistic, and cooperative a person is (Costa and McCrae, 1992). Neuroticism is basically a negative emotion associated with anxiety, depression, and negative affect (Zhao and Seibert, 2006).

Locus of control (LoC) is a separate personality concept that has widely been used in explaining beliefs and decision making of farmers (Abay et al., 2017; Qian et al., 2020). It is defined as a generalized belief about the extent to which people attribute control over their situation to themselves or to the environment (Rotter, 1966). In other words, people with an internal LoC tend to credit achievements to their own efforts, whereas people with an external LoC are more likely to believe these were caused by the environment.

While psychologists depict individual differences using personality frameworks, economists typically utilize preferences, such as risk preference and time preference, in combination with expectations of future events to explain economic decision making. Some literature considers preferences as facets or aspects of personality (Costa and McCrae, 1988), others argue that preferences and personality traits are rather complementary to each other, and thus preferences are deemed as mediators of personality constructs in determining human behavior (Becker et al., 2012; Borghans et al., 2008; Ferguson et al., 2011).

The risk preference parameter, also referred to as risk aversion, is an important concept representing the curvature of the utility function in the expected-utility framework (Gollier, 2001). It basically describes to what extent people are prone to taking risk in an uncertain situation. Time preference, or the so-called individual rate of discounting or impatience, refers to the extent to which an individual prefers immediate utility over delayed utility (Frederick et al., 2002). In reality, risk and time preferences are inevitably confounded as postponed rewards always carry a certain extent of risk (Borghans et al., 2008).

3.3.2. Personality, preferences, and cognitive perceived tenure security

Cognitive perceived tenure security, or the perceived probability of future land reallocation in the Chinese context, refers to how people perceive risks related to the land tenure situation. Within the Big Five personality traits, openness includes facets such as curiosity, intellectuality, and open-mindedness, which are associated with flexible and inclusive cognition (Kaufman et al., 2016). People high in openness tend to cognitively explore abstract information (ideas and arguments) through reasoning (Antinori et al., 2017). However, there are no a priori reasons to expect a relationship between openness and cognitive perceived tenure security. Conscientiousness is closely related to rationality and caution (Goldberg, 1999), thus farmers having greater conscientiousness may be more likely to anticipate land reallocation to occur in the future given the continuous demographic changes taking place within their villages. Extraversion is closely associated with

interpersonal and social behavior. Farmers scoring higher on extraversion may be more sensitive to the real land tenure situation within their villages because of much up-to-date information received through their greater social networks. Whether they are more likely or less likely to expect a land reallocation depends on the situation in their villages. Neuroticism is related to instability and impulsivity (Goldberg, 1999). Neurotic farmers are expected to anticipate a high likelihood of land reallocation as they tend to perceive their surroundings to be risky or insecure. Agreeableness is a personality trait which seems less relevant in this context.

Locus of control (LoC) is expected to play an important role in farmers' expectations regarding the future land reallocation. People with a higher level of internal LoC believe that their future is determined more by their own actions, whereas people with a higher level of external LoC attribute the occurrence of future events to the external environment (Antonides, 1996). We envisage that people with more internal LoC perceive more personal control over their contracted land and are therefore less likely to expect a land reallocation in the future.

Economic preferences are not expected to affect farmers' perceived likelihood of land reallocation occurrence, which is equivalent to the concept of risk perception (Slovic, 1987). Sitkin and Pablo (1992) consider risk perception and risk preference as two distinctive notions. Risk perception could be determined by situational factors, while risk preference is a stable and innate factor, not influenced by the environment. No evidence in the literature suggests a priori expectations of time preference on the risk perception.

3.3.3. Personality, preferences, and affective perceived tenure security

Psychological studies frequently explain negative affect (e.g., worry, fear and anxiety) from personality traits (Clark and Watson, 1991; Gomez and Francis, 2003). Both anxiety and fear are defined by high levels of negative affect and/or low levels of positive affect (Clark and Watson, 1991); worry can be defined as anxious apprehension or concern about the uncertain outcome of future events (MacLeod et al., 1991). Among the Big Five personality traits, neuroticism and extraversion are known to be associated with anxiety because of their effects on negative and positive affect respectively (Middelorp et al., 2008). There is a general consensus that individuals scoring high on neuroticism exhibit negative affect whereas high extraversion is likely to protect against negative affect (Gomez and Francis, 2003; Gramstad et al., 2013).

On the one hand, individuals with greater neuroticism are likely to experience negative mood and to develop more maladaptive reactions to the environment following stressful life events than others (Costa and McCrae, 1992). Land reallocation in rural China, in essence, could be a stressor for some farmers as it is likely to be perceived as a serious threat to tenure security and may discourage farmland investment (Jacoby et al., 2002). Thus, neurotic farmers are expected to be more sensitive to land reallocation as a stressor, which may trigger dread reactions toward its future occurrence. Extraversion, on the other hand, is essentially related to the idea of being pro-social and optimistic (Costa and McCrae, 1992). As a result, extravert people appear to pay more attention to positive than negative information compared to introverts (Noguchi et al., 2006). Extravert farmers are expected to be more social and communicative and thus tend to receive a sense of support and relief from others in case of uncertain and worrisome land reallocation situations, preventing them from dread feelings. Therefore, they may weigh positive consequences of land reallocation (i.e., compensation) more than negative ones (i.e., land loss or disputes) as compared with introvert farmers.

We found no studies examining relationships between the other dimensions of the Big Five personality traits and negative or positive affect. Nor did we find a priori reasons to expect a relationship between LoC and negative or positive affect. Hence, we expect neuroticism to be positively and extraversion to be negatively related to the farmer's level of worry regarding future land reallocation respectively. We have no

expectations about the impact of openness, conscientiousness, agreeableness, and locus of control in this respect.

People's affective responses to tenure situations may also be subject to risk or time preferences (Pennings et al., 2002). Lusk and Coble (2005) found that people's acceptance of genetically modified food is dependent on the interaction between risk perception and risk preference. In our case, land reallocation that may occur in the near future can be considered an external stimulus associated with uncertainty and risk. Farmers with higher risk preference may feel less worried when they perceive a higher likelihood of future land reallocation. Time preference is associated with anxiety. People with lower discount rates are more likely to be anxious or worried as they pay more attention to uncertainty in the future than people with higher discount rates (Caplin and Leahy, 2001).

4. Data and methods

4.1. Data collection

The data set we used in this study was collected from a household survey in Jiangsu, Jiangxi, and Liaoning provinces of China in February 2019 as part of a larger survey examining farm-size enlargement in rural China. The three provinces are assumed to be representative of the southeast, central-east and northeast of China, respectively (see Fig. 2 for their location). A multistage sampling strategy was applied to select sample households. In each province, two counties differing in geographical location and economic development were selected by consulting local officials.⁴ Within each county, we applied stratified random sampling method to select five townships from an ordered list based on average land endowment per rural household. The same approach was applied to randomly select four villages within each township. In each village, all households were then classified into one of three groups: households renting in land only, households renting out land only, and households without renting activities.⁵ Next, we randomly selected four households per group in each village. In total, 1420 household observations were sampled across 120 villages.⁶ In this study, information for 1359 households was used, because 57 households that had no contracted land and 4 households with missing information on major variables were dropped from the sample.⁷ We also collected village level information by interviewing 120 village cadres.

4.2. Choice of variables and expected effects

The dependent variables are indicators of the cognitive and affective perceived tenure security of farmers. Cognitive aspect was measured by two variables reflecting households' subjective expectations about land reallocation. Specifically, we asked to what extent the household expected that an administrative land reallocation would take place within the next five-year period and after the contract period would end (roughly after ten years), respectively. We adopted a 5-point Likert scale running from 1 (*not expecting land reallocation at all*) to 5 (*expecting land reallocation for sure*) for the answers. Affective aspect was measured by

⁴ A more detailed description of sampling procedure is given in Zhou et al. (2019).

⁵ A small portion of rural households rented in and rented out farmland at the same time. These households were classified as either renting-in or renting-out households, depending on which type of renting activity dominated in terms of land size.

⁶ In a few villages, the total number of households renting in or renting out land was less than four. As a result, we obtained 1420 households instead of 1440 in total.

⁷ The household head was invited to be interviewed. However, in case the household head was not available, we interviewed the household member that knew most about agricultural decision making.

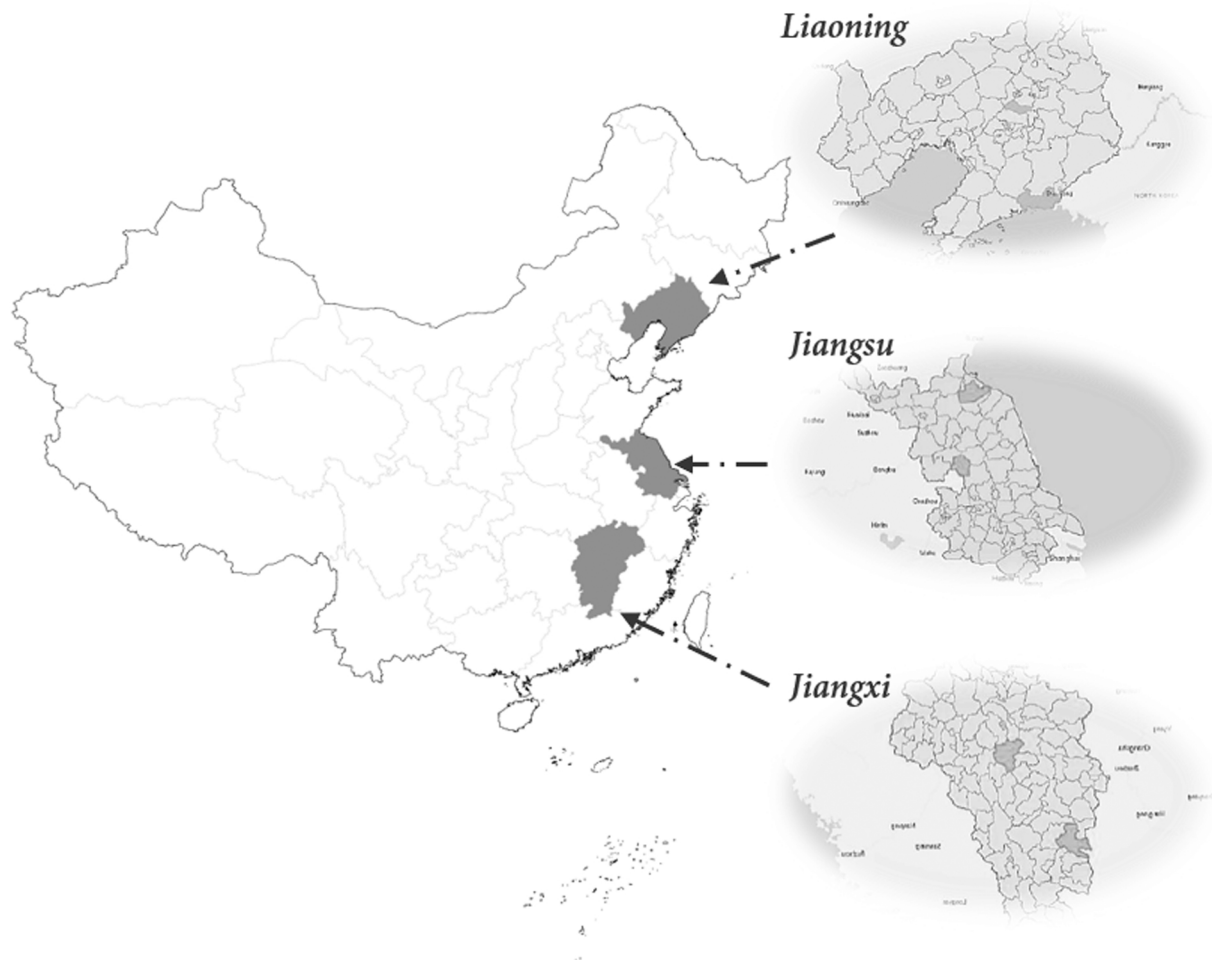


Fig. 2. Study areas in China.

asking to what extent farmers worried about the future land reallocation, on a scale from 1 (*household not worried at all*) to 5 (*household worried badly*).

Personality and preference factors are our focal explanatory variables. They include the farm household heads' Big Five personality traits, locus of control, risk preference and time preference.⁸ The measurement of such psychometric constructs through survey interviews, especially among less educated population, often has raised concerns about potential biases (Golsteyn and Schildberg-Hörisch, 2017; Laajaj et al., 2019). Several quality control measures were thus conducted in the field survey. We probed the comprehension of farmers to personality questions via extensive qualitative piloting in out-of-sample villages of the same region, as suggested by Laajaj and Macours (2021). We also administered these questions at the end of interviews, given the evidence from Laajaj and Marcours (2021) that personality traits are likely to be more reliably measured if these questions are not asked at the beginning.

We used the Chinese version of the Big Five Inventory-10 (hereafter BFI-10) to measure the personality traits on a 5-point Likert scale, which has shown reasonable measurement validity and reliability (Carciofo et al., 2016; Li, 2013), and has been widely used in economic and social-psychological studies (Donato et al., 2017; Rammstedt and John, 2007). We elicited LoC following the standard practice of Rotter (1966)

using the 10-item inventory with a 5-point Likert-type scale. In the pre-analysis stage, we first corrected the acquiescence bias in the LoC scale by using both positively and negatively phrased statements, following the procedure of Soto et al. (2008). Then, based on factor analysis, we constructed two separate LoC traits (i.e., internal and external) which is consistent with theoretical foundations that external and internal LoC should be distinguished (Gatz and Good, 1978). Moreover, Cronbach's α s of the external and internal LoC scales were 0.69 and 0.65, respectively, indicating reasonable levels of internal consistency.⁹ The average variance extracted (AVE) values were also calculated for all latent personality factors to assess convergent and discriminant validity. All values of AVE were greater than a rule-of-thumb critical value of 0.5, except for the external LoC scale.¹⁰ Risk and time preferences were measured following the streamlined version of a global preference module developed for eliciting time preference and risk preference among respondents having limited cognitive capacity in time-constraint settings (Falk et al., 2018). Both preference variables were obtained by combining one qualitative item (one-item self-assessment) and one quantitative item (hypothetical choice experiment). A higher value of the risk preference variable indicated a greater risk-taking tendency, and a higher value of the time

⁸ The direction of their expected effects on PTIS has been discussed in Section 3.2. They are also shown in Table 1, as are the signs of the expected effects of the other explanatory variables.

⁹ The external and internal LoC scales both have 4 items after 2 items were dropped from the external LoC scale given validity and reliability concerns.

¹⁰ The AVE value of external LoC equaled 0.463, which was still acceptable since the composite reliability (CR) was higher than 0.6 (CR (external LoC) = 0.774), according to Fornell and Larcker (1981).

Table 1
Descriptive statistics and expected signs of model variables ($N = 1359$).

	M				SD	Min	Max	Expected sign w.r.t. PTIS ^a	
	Liaoning	Jiangsu	Jiangxi	Full sample				Expectation	Worry
Perceived tenure insecurity									
Worry about or fear to future land reallocation (y^A)	2.058	2.218	2.009	2.096	1.207	1	5	n.a.	n.a.
Expect land reallocation within next five years (y^C)	2.459	2.959	2.968	2.792	1.174	1	5	n.a.	n.a.
Expect land reallocation after the contract period (y^C)	2.954	3.479	3.345	3.258	1.177	1	5	n.a.	n.a.
Personality traits & preferences (P & Pr)									
Openness to experience	2.912	3.072	2.947	2.977	1.045	1	5	+ /−	
Conscientiousness	4.100	4.230	4.020	4.144	0.789	1	5	+	
Extraversion	3.731	4.060	3.898	3.898	0.921	1	5	+ /−	−
Agreeableness	3.878	3.924	3.871	3.893	0.747	1	5		
Neuroticism	2.376	2.180	2.457	2.334	0.889	1	5	+	+
Internal locus of control	4.190	4.166	4.027	4.130	0.666	1	5	−	
External locus of control	3.057	2.862	3.251	3.054	0.804	1	5	+	
Risk preference	-0.096	-0.019	0.122	0.000	0.818	-0.97	2.16	n.a.	−
Time preference	-0.113	0.051	0.066	0.000	0.846	-1.14	1.39	n.a.	+
Actual tenure security (A)									
Land reallocation experience (1 =yes)	0.121	0.170	0.452	0.244	0.430	0	1	+	+ /−
Land certificate (1 =yes)	0.160	0.789	0.541	0.495	0.500	0	1	+ /− ^b	−
Land contract (1 =yes)	0.814	0.721	0.539	0.694	0.461	0	1	−	−
Other control variables (X and X')									
Imbalance of land (mu)	0.808	0.884	0.304	0.673	2.089	-3.36	17.57	n.a.	+
Absolute value of imbalance of land (mu)	1.664	1.453	0.804	1.315	1.757	0	17.57	+	n.a.
Number of contracted land plots (pieces)	3.006	3.769	5.884	4.188	3.662	1	40	+	−
Trust in villagers	3.748	3.645	3.563	3.562	0.836	2.778	4.273	+ ^c	
Age of head (years)	60.615	60.871	57.977	59.843	9.570	27	89	+ /−	+ /−
Gender of head (1 =female)	0.084	0.048	0.070	0.068	0.251	0	1	+	+
Household size (people)	3.214	3.998	4.683	3.950	1.918	1	14		+
Off-farm work (1 =yes)	0.104	0.172	0.138	0.138	0.345	0	1	+	+ /−
Cadre membership (1 =yes)	0.071	0.131	0.109	0.104	0.305	0	1	+	−

Note:

^a n.a. indicates the expected effects are not available; + indicates a positive effect; - indicates a negative effect; variables without formulating an expected effect are left blank.

^b We expect different effects of land certificates on the two expectation variables. Having a land certificate would negatively affect land reallocation expectation in 5 years, but positively affects the expectation after the contracting period because it contains detailed information of contract period.

^c The effect of trust on expectation of land reallocation only applies to short-term land reallocation.

preference variable indicated a greater level of impatience.

Several other variables are expected to affect perceived tenure security, including actual (*de facto*) tenure security and household characteristics like land endowments and trust. Following the relevant literature (Rao et al., 2020; Ren et al., 2019), actual tenure security was measured by three indicators, namely the household's land reallocation experience since the second-round land contracting, the possession of a newly-issued land certificate after the recent nationwide land certification program (that started in 2013), and the possession of a land contract issued by the village committee. Land reallocation experience was to measure whether a farm household had experienced land reallocation since the second round of land contracting, i.e., measured as a dummy variable at the household level with values equal to 1 (yes) or 0 (otherwise). Farmers who had experienced land reallocation since 1997 might expect land reallocation to occur again in the future, as it had happened before, but might not necessarily be worried about it. Possession of the new land certificate and the land contract were measured as dummy variables at the household level with values equal to 1 (yes) or 0 (otherwise). Without possessing land documents, farmers were expected to perceive themselves more insecure as being not provided a legal protection against potential rights infringement. Nevertheless, farmers having a new land certificate were expected to perceive land reallocation after the contract period would end because the certificate contained detailed information of the contract period.

Land endowments were measured by the imbalance of land endowment and land fragmentation. The imbalance of land endowment was measured by the difference between a household's contracted farmland per capita and the village-level average. The larger the absolute difference, the more likely the household was to expect a future land reallocation. If the land endowment exceeded the village average, the

household was expected to worry more about the land reallocation because they are meant to equalize per capita land resources in a village. If the household's per capita land endowment was below the village average, the household was expected to worry much less because it would gain land from a land reallocation. Land fragmentation was measured by the number of contracted farmland plots. Households with a larger number of plots were more likely to expect their plots to be reallocated and consolidated into fewer and larger plots. They were therefore expected to worry less about the land reallocation.

Household trust was measured by a 5-point scale of the respondent's trust in other villagers, running from 1 (*totally distrust*) to 5 (*totally trust*). As described in Section 3.1, local governments may use ambiguous formulations of relevant laws and prevailing self-governance rules to implement land reallocations provided a large majority (at least two-thirds) of the villagers agree with it. Trust among villagers may be essential to reach such a consensus. Hence, households with a high level of trust in other villagers were more likely to expect a land reallocation in the short term.

Household characteristics, including age, gender, household migration, and cadre membership may also affect perceived tenure (in)security. An elderly farmer may either worry more about land reallocation because his/her influence or social power within the village is deteriorating over time, or worry less due to their shorter time horizons of working on farm. A female household head was expected to be associated with lower perceived tenure security as she tended to have a weaker social and economic position than a male head (Ghebru and Lambrecht, 2017). A farm household head working off-farm as a migrant was expected to perceive a higher likelihood of land reallocation but not necessarily to worry about it. A household with a member being the village cadre was assumed to be more likely to perceive a secure land

tenure given the better chance of accessing policy information and other income opportunities (Holden and Yohannes, 2002). We had no a priori expectation about household size, as there was no direct evidence of its effect on perceived land tenure security in the literature.

4.3. Model specification and estimation strategy

We start by investigating whether farmers' personality and preferences affected each component of perceived tenure (in)security (PTIS). We also aim to examine the "consequentialist's" viewpoint that whether a respondent's affective feeling of tenure (in)security is a linear consequence of his/her cognitive future land reallocation perception or not. We therefore specify the following structural equation system:

$$y_{ij}^C = \alpha_0 + \alpha_1 P_{ij} + \alpha_2 A_{ij} + \alpha_3 X_{ij} + \varepsilon_{ij} \quad (1)$$

$$y_{ij}^A = \beta_0 + \beta_1 y_{ij}^C + \beta_2 (y_{ij}^C)^2 + \beta_3 P_{ij} + \beta_4 Pr_{ij} + \beta_5 A_{ij} + \beta_6 X'_{ij} + \rho_{ij} \quad (2)$$

where y_{ij}^C and y_{ij}^A denote cognitive and affective perceived tenure (in)security for farm household i residing in village j , respectively. P_{ij} is a vector of personality variables representing the Big Five personality traits and the locus of control. Pr_{ij} is a vector of preference variables including risk and time preferences. A_{ij} is a vector of actual tenure security variables. X_{ij} and X'_{ij} represent two sets of control variables for Eq. (1) and Eq. (2), respectively. Both sets of control variables comprise land endowments, trust, household socio-demographic characteristics, and province (dummy), but they are slightly different in terms of land endowment variables. In X_{ij} , we include the absolute value of the difference between per capita land endowment and the village average, while the normal value of it was included in X'_{ij} . Parameters α and β are unknown coefficients to be estimated. ε_{ij} and ρ_{ij} are village-clustered robust standard error terms following the standard normal distribution. In Eq. (2), the affective tenure (in)security perception y_{ij}^A is assumed to be influenced through the cognitive perceived tenure (in)security y_{ij}^C . A quadratic term of y_{ij}^C is also included in Eq. (2) to test for nonlinearity. This structural equation system estimates both the direct effects on affective PTIS and the indirect effects of psychological factors working through cognitive PTIS.

Structural equation modeling (SEM) is well-recognized to simultaneously estimate equations with inter-related variables (Jöreskog et al., 2001), and has extensively been used in psychometric studies and more recently in economics.¹¹ Eqs. (1) and (2) reflect a recursive structural cognitive–affective model combining two ordered probit regressions, for dependent variables measures using ordinal scales, which is simultaneously (instead of sequentially) estimated using a generalized structural equation model (GSEM) with robust standard errors clustered at village level. As an extension of SEM, GSEM allows for the estimation of relations between continuous or categorical variables (Muthén, 1984). In addition, the GSEM framework enables us to simultaneously examine the direct and indirect effects of psychological factors (Pearl et al., 2016; Preacher and Hayes, 2008).¹²

According to previous studies, personality and preference factors are largely genetically determined and are partially inherited (Bouchard and Loehlin, 2001). Albeit recent studies argue that personality may evolve over the life cycle as a result of age-related maturation (Borghans et al., 2008; Specht et al., 2014), personality and preferences are

assumed to be exogenous in this study as they appear to be stable among working-age adults over a short period of time (Cobb-Clark and Schurer, 2012; Schildberg-Hörisch, 2018). One of the control variables, trust, may be endogenous since a household not worrying about land reallocation may tend to show a high level of social trust. Following Ma et al. (2020), we apply the average trust of other interviewed villagers within the same village as a proxy of individual farmers' trust, assuming that one's trust is strongly related to the trust of fellow villagers through reciprocal behavior.

5. Results

5.1. Descriptive analysis

Table 1 shows the descriptive statistics of the variables used in the PTIS model. We observed that farmers were on average more likely to expect land reallocation to happen after the end of the current second-round land contracting period than within the contracting period. However, compared with farmers' relatively high expectations, their worry about future land redistribution is generally low, indicating that there is a difference between the cognitive aspect and the affective aspect of farmers' perceived land tenure security.

Regarding the actual tenure security variables, we observed that more than 45 % of the villages in the sample had reallocated their farmland since 1998. On the possession of land documents, 49.5 % of the interviewed households reported that the new land certificate had been distributed and 69.4% reported that the old land contract had been distributed to them by their village collectives.

5.2. Estimation results

Table 2 presents the GSEM estimation results. We discuss the results for the cognitive PTIS equation first, followed by a discussion of those for the affective PTIS equation including the relationship between the two components.

5.2.1. Factors influencing cognitive PTIS

Columns (1) and (3) of Table 2 report the regression results for cognitive PTIS as measured by expected land reallocation within five years and after the current contract period, respectively. In particular, we found that neuroticism had a significant positive impact. This finding provides support for the presumption that neurotic people tend to perceive their environment as unstable and are therefore more likely to expect that a land reallocation will occur. On average one additional point on the neuroticism scale corresponded to a 2.7 % increase in the likelihood of expecting land reallocation to be likely or very likely to happen in the near future.¹³ We further found a marginal positive effect ($p < .10$) of extraversion and a negative effect ($p < .10$) of internal LoC on the perceived likelihood that a land reallocation will take place in the short run. The other personality traits did not significantly affect cognitive PTIS.

We also obtained some interesting results for the actual tenure security variables included in the cognitive PTIS equation. On the one hand, past experiences of land reallocation significantly affected cognitive tenure (in)security. For farmers who had experienced at least one land reallocation since 1997, it was associated with an 8.7 % increase in the likelihood of expecting land reallocation within five years (combining categories of "likely" and "very likely" to happen), as compared to farmers without an experience of land reallocation in the past. On the other hand, the observation that the possession of a land contract significantly reduced the expectation of land reallocation in the near future was noteworthy, whereas the possession of a newly-issued

¹¹ It is worth noting that SEM is valid for estimation of equation systems with observed variables only, simply by specifying identity relationships between observed and latent variables in the measurement model.

¹² Note that our ordered probit GSEM model could not take the covariance of error terms in the two equations into account. No statistical method has been developed to address this potential correlation yet.

¹³ This is calculated by adding the marginal effects associated with the two highest values of the expectation scale, i.e., 0.014 and 0.009.

Table 2Estimation results for cognitive–affective tenure insecurity perception, generalized structural equation model (GSEM)^a.

Variables	Land reallocation within 5 years				Land reallocation after the contracting period			
	Expectation (Cognitive perception)		Worry (Affective perception)		Expectation (Cognitive perception)		Worry (Affective perception)	
	Coefficients ^b	S.E. ^c	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.
Expectation	(1)		(2)		(3)		(4)	
Square of Expectation	–	–	0.664***	0.141	–	–	1.067***	0.155
Openness to experience	–	–	-0.116***	0.025	–	–	-0.167***	0.024
Conscientiousness	0.047	0.031	0.004	0.035	0.024	0.032	-0.004	0.035
Extraversion	0.021	0.036	0.021	0.029	0.013	0.035	0.024	0.029
Agreeableness	0.064*	0.034	-0.048	0.034	0.070**	0.032	-0.044	0.035
Neuroticism	0.014	0.032	0.001	0.033	-0.032	0.033	0.004	0.033
Internal locus of control	0.079**	0.035	0.086**	0.036	0.052	0.033	0.099***	0.037
External locus of control	-0.058*	0.032	0.010	0.031	0.011	0.033	0.014	0.031
Risk preference	-0.036	0.031	0.063	0.039	-0.039	0.034	0.061	0.039
Time preference	–	–	0.054	0.044	–	–	0.061	0.046
Land reallocation experience	–	–	-0.001	0.042	–	–	-0.002	0.042
Land certificate	0.262***	0.079	-0.125	0.082	0.261***	0.080	-0.148*	0.082
Land contract	-0.083	0.075	-0.005	0.078	0.043	0.076	-0.021	0.080
Imbalance of land (abs)	-0.213***	0.067	0.018	0.072	-0.150**	0.067	0.026	0.071
Imbalance of land	0.018	0.019	–	–	0.030	0.020	–	–
Plot number	–	–	0.042***	0.016	–	–	0.042***	0.016
Trust in villagers	-0.002	0.009	-0.002	0.010	0.012	0.007	-0.004	0.011
Age of head	0.067*	0.035	-0.031	0.038	0.029	0.032	-0.033	0.039
Gender of head	-0.003	0.003	-0.010***	0.004	-0.005	0.003	-0.010***	0.004
Household size	-0.148	0.118	-0.002	0.121	-0.229*	0.121	-0.021	0.118
Off-farm work	0.008	0.020	0.055***	0.018	-0.003	0.018	0.050***	0.019
Cadre membership	0.133	0.085	-0.075	0.094	0.044	0.089	-0.055	0.094
Obs.	.114	0.100	-0.319***	0.110	0.214*	0.110	-0.301***	0.110
Pseudo R ²	1359		1359		1359		1359	
Province dummy	0.024		0.028		0.024		0.032	
	YES		YES		YES		YES	

^a The mean value of VIF was 1.29, with a maximum value of 2.39. We therefore concluded that multicollinearity was low.^b * $p < .10$; ** $p < .05$; *** $p < .01$.^c Standard errors clustered at village level.

land certificate did not significantly affect cognitive PTIS. Specifically, the possession of a land contract issued by the village administration was associated with a 7.1 % increase in the perceived likelihood of land reallocation occurring in the short term. A plausible explanation is that farmers perceive land certificates issued by the central government as less effective than land contracts issued by the village-level government in resisting the risk of future administrative land reallocation within a village.

5.2.2. Factors influencing affective PTIS

Columns (2) and (4) of Table 2 show the simultaneously estimated coefficients of factors influencing farmers' affective worry about the land reallocation within five years and after the contract period expires, respectively. The results show a highly significant inverse U-shaped relationship between cognitive expectation and affective feelings of worry. In other words, when a farmer expressed that a land reallocation was either very likely or very unlikely, (s)he tended to worry less about it. When a farmer did not expect a land reallocation, there was evidently not much to worry about. And when a farmer considered the occurrence of a land reallocation in the future as very likely, (s)he may simply accept it and not worry much about it whether or not it would be in the farmer's self-interest. When farmers were less sure about whether the land reallocation could be expected they would worry more about it.¹⁴ Hence, our findings provide strong support for the "risk-as-feelings" approach and show that the linear "consequentialist" viewpoint was rejected in this context. Table 3.

With regard to personality and preferences, we found that neuroticism had a significant positive impact on farmers' worries about the land

reallocation in the short run (within five years) as well as in the long run (after the contract expires), even controlling for the perceived likelihood that a land reallocation would occur. This finding is consistent with a priori expectations. One additional point on the neuroticism scale was associated with 2 % higher likelihood of being worried or very worried about the future land reallocation.¹⁵ However, we did not find any significant effects for the other personality traits, nor did we find significant effects for risk and time preferences on affective PTIS of farmers. Hence, neuroticism seems to be the main personality factor leading farmers to worry about the future land reallocation. Its estimated effect, however, is modest.

We further found that actual tenure security played a much smaller role in affective PTIS than in cognitive PTIS. Although we found that past experience of land reallocation would increase the farmer's expectation of future land reallocation, we did not find that it was associated with a higher level of farmer's worry. In contrast, farmers who experienced land reallocation in the past were slightly less worried about the land reallocation after the current contracting period ($p < .1$). This finding is consistent with our a priori expectation (see Table 1), and shows that even when farmers expected land reallocation to happen in the future, they did not necessarily worry about it. The impact of land documents on farmers' worries about the land reallocation was not found to be significantly different from zero, which is in line with Rao et al. (2020) that official land documents do not reduce farmers' worry about losing land.

Estimation results for the control variables also provided several interesting insights. As expected, the land endowment imbalance was found to have a significant positive effect on farmers' worries regarding land reallocation. This finding means that farm households with above-

¹⁴ The coefficient estimates indicate that farmers' worries are highest on average at a level of 2.8 for land reallocation within five years and 3.2 for land reallocation after the contract period expires (on a 5-point scale), respectively.

¹⁵ This is calculated by adding the marginal effects associated with the two highest values of the worry scale, i.e., 0.011 and 0.009.

Table 3
Marginal effects of the ordered probit models ^a, ^b, ^c.

	Cognitive PTIS: Prob (y_{ij}^C) ^d					Affective PTIS: Prob (y_{ij}^A) ^d				
	Pr ($y_{ij}^C = 1$)	Pr ($y_{ij}^C = 2$)	Pr ($y_{ij}^C = 3$)	Pr ($y_{ij}^C = 4$)	Pr ($y_{ij}^C = 5$)	Pr ($y_{ij}^A = 1$)	Pr ($y_{ij}^A = 2$)	Pr ($y_{ij}^A = 3$)	Pr ($y_{ij}^A = 4$)	Pr ($y_{ij}^A = 5$)
Expectation	–	–	–	–	–	0.044*** (0.009)	-0.003*** (0.001)	-0.015*** (0.003)	-0.014*** (0.003)	-0.012*** (0.003)
Square of Expectation	–	–	–	–	–	-0.252*** (0.052)	0.018*** (0.006)	0.085*** (0.019)	0.082*** (0.018)	0.066*** (0.015)
Extraversion	-0.014* (0.008)	-0.010* (0.005)	0.003* (0.002)	0.013* (0.007)	0.009* (0.005)	–	–	–	–	–
Neuroticism	-0.018** (0.008)	-0.012** (0.005)	0.003** (0.002)	0.016** (0.007)	0.011** (0.005)	-0.032** (0.014)	0.002** (0.001)	0.011** (0.005)	0.011** (0.005)	0.009** (0.004)
Land reallocation	-0.059*** (0.017)	-0.039*** (0.012)	0.011*** (0.004)	0.052*** (0.016)	0.035*** (0.011)	–	–	–	–	–
Land contract	0.048*** (0.015)	0.032*** (0.010)	-0.009*** (0.003)	-0.042*** (0.013)	-0.029*** (0.009)	–	–	–	–	–
Imbalance of land	–	–	–	–	–	-0.016*** (0.006)	0.001** (0.001)	0.005*** (0.002)	0.005*** (0.002)	0.004*** (0.002)
Trust in villagers	-0.015** (0.008)	-0.010* (0.005)	0.003* (0.002)	0.013* (0.007)	0.010* (0.005)	–	–	–	–	–
Age of head	–	–	–	–	–	0.004*** (0.001)	-0.001** (0.000)	-0.001*** (0.001)	-0.001*** (0.001)	-0.001*** (0.000)
Household size	–	–	–	–	–	-0.021*** (0.007)	0.002** (0.001)	0.007*** (0.002)	0.007*** (0.002)	0.005*** (0.002)
Cadre membership	–	–	–	–	–	.121*** (0.041)	-0.009** (0.004)	-0.041*** (0.015)	-0.040*** (0.014)	-0.032*** (0.011)

^a Only variables with significant estimated coefficients ($p < .05$) in Table 1 are shown in this table.

^b * $p < .1$; ** $p < .05$; *** $p < .01$.

^c Standard errors clustered at village level are shown in parentheses.

^d We only present the marginal effects of cognitive and affective PTIS within 5 years. Marginal effects for PTIS after the contracting period are very similar.

average per capita land endowments were more worried about land reallocations, which usually aim at restoring the balance in per capita land resources, whereas those with below-average land endowments worried much less. The age of the household head was found to have a significant negative impact on worries about land reallocation. This finding may imply that more experienced farmers are less worried in general about conditions affecting their farm resources. Larger households expressed significantly higher levels of worry as compared to smaller ones. A potential explanation for this finding is that larger households usually have more members involved in migration (e.g., Hu et al., 2011; Shi et al., 2007), and therefore may be allocated less land per capita in new rounds of reallocation. Finally, we found that having a member being the village cadre in the household had a significant negative influence on its worry about land reallocation. Household having at least one member being the village cadre were 7.2 % less likely to be worried or to be very worried about future land reallocation. This finding provides support for the presumption that households with close links to the village council have better access to policy information and/or to resources that can be used for other income generating activities opportunities, and therefore are less worried about land reallocation.

Table 4 presents the standardized indirect and total effects of key psychological factors and actual tenure security factors on the affective feelings of worry. The indirect effect, in this case, was the effect of a variable on affective perceived security via cognitive perceived security. Notably, the total effect of neuroticism on worry was significantly positive, implying that farmers scoring high in neuroticism experienced a significant negative effect, particularly in a situation of high uncertainty about the future land reallocation. The total effect of other personality trait variables on worry was found to be insignificant.

It is notable that the total effect of land reallocation experience in the past on the current insecure feelings was insignificant, indicating again that although the past experience of land reallocation could increase farmers' expectation of future land reallocation, their sense of insecurity was not necessarily affected. The total effect of official land documents on reducing farmers' affective worry was insignificant, further suggesting that even though some of the land documents may reduce

farmers' perception of future land reallocation taking place, holding them cannot provide farmer with a sense of security once land reallocation happens.

As a final note, we would like to point out that most post-estimation tests and indices were unavailable in GSEM due to the assumption of joint normality of the observed variables. We also estimated a bootstrapped SEM, run on the same dataset, as a way to overcome the limitation in the post-estimation indices.¹⁶ The estimated coefficients and their significance in SEM were similar to those in GSEM. In SEM, the goodness of fit of the structural model can be calculated. In this model, the standardized root mean squared residual (SRMR) equaled 0.065 and the coefficient of determination (CD) equaled 0.39. An acceptable range for the SRMR index is between 0 and 0.08 (Hu and Bentler, 1999). This means our result is acceptable.

6. Conclusion

Following the proposed holistic framework of tenure security, the present study investigated the interrelation between cognitive and affective aspects of perceived land tenure security based on a recursive structural cognitive–affective model. We further analyzed the influence of internal factors (i.e., personality traits and economic preferences) on farmers' perceived land tenure security. Our results were estimated using an ordered probit GSEM model based on a dataset of 1359 rice farmers in three provinces in China. The main findings are as follows.

First, we found a non-linear (inverse “U-shape”) relationship between the cognitive PTIS and the affective PTIS, showing that these two components can diverge. In other words, farmers are not necessarily worried about the possible land reallocation even if they think it is very likely to take place in the future. This finding empirically not only corroborates that the twofold perceptions on tenure security proposed by Van Gelder (2007) can also be applied to the context of rural farmland, it also substantiates Ho's (2014) assertion that land reallocation is perceived as a “socially supported (credible) insecure tenure” by farmers

¹⁶ Estimation results can be requested from the first author.

Table 4
Standardized indirect and total effects ^{a b}.

Variables	Within 5 years				After the contracting period			
	Indirect effect		Total effect		Indirect effect		Total effect	
	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.	Coefficients	S.E.
Extraversion	0.042 *	0.024	-0.006	0.043	0.074 * *	0.035	0.030	0.049
Neuroticism	0.053 * *	0.027	0.137 * *	0.048	0.056	0.036	0.155 * *	0.053
Internal LoC	-0.038 *	0.023	-0.029	0.040	0.011	0.035	0.025	0.047
Land reallocation	0.174 * *	0.064	0.041	0.107	0.278 * *	0.095	0.119	0.122
Land contract	-0.141 * *	0.056	-0.128	0.100	-0.160 * *	0.077	-0.137	0.116
Land certificate	-0.055	0.051	-0.061	0.091	0.046	0.081	0.025	0.108

^a * $p < .10$; ** $p < .05$; *** $p < .01$.

^b Direct effects are shown in Table 2.

in rural China. More importantly, this finding contributes to the academic debates on the accurate measurement of perceived land tenure security in developing countries. It implies that one should go beyond the pure cognitive assessment and incorporate the “feeling” component into the quantification of perceived tenure security. Without taking farmers’ psychological factors into account, measuring their cognitive expectations alone may not correctly reflect their overall perception on land tenure (in)security.

Moreover, we found moderate effects of personality traits on the feeling aspect of PTIS, while improvements in legal and actual land tenure security were found to only have a rather limited effect. Farmers scoring high on neuroticism not only cognitively anticipated unstable land tenure within the contracting period, but also affectively worried more about it. This result indicates that neuroticism is an important personality trait that naturally undermines the overall level of perceived tenure security, though the estimated impact was relatively modest. Other personality and preference factors did not significantly affect PTIS, with one exception that farmers scoring high on extraversion perceived a higher likelihood of future land reallocation.

Our findings have important implications for policymaking. The recent land reforms in China as well as the newly-revised RLCL in 2019 have prioritized the stabilization of rural land property rights and the strengthening of tenure security. However, several supporting measures may be taken into consideration to achieve the policy goals in a more effective way.

First, since the farmer’s worry about land reallocation (i.e., affective PTIS) is higher when there is greater uncertainty regarding the future land reallocation, it could be a plausible reason for the discrepancies in the recent literature investigating the “perceived land tenure security–investment” link in rural China (Hong et al., 2020; Ma et al., 2013). This is because, due to improvements in legal land tenure situations (e.g., land certification), a decrease in the probability of future land reallocation perceived by farmers, particularly from high to medium levels, is found to cause greater emotional concern and thereby compromise the potential increase in investment incentives. In other words, uncertainty about the possibility of the future land reallocation may even rise due to the increasing divergence between legal land tenure institutions (prohibition on land reallocations) and informal land tenure arrangements (periodical minor land reallocations within the village), thus undermining farmers’ affective sense of security. Such a divergence may be a combined consequence of both the ambiguous nature of land laws and their weak legal enforcement (Ho, 2001; Zhu and Prosterman, 2009). Therefore, without alleviating the inconsistencies between legal land institution and informal land arrangements in terms of land reallocation, e.g., through less ambiguous expressions of land property law (Ma et al., 2015), land certificates may not be sufficient to reduce the perceived uncertainty among farm households, but remains nothing more than a nominal paper agreement, making institutions “empty” and non-credible (Ho, 2014; Ho and Spoor, 2006).

Second, supporting measures that pay some attention to personality traits are likely to be warranted in practice. For example, in this study,

we found that neurotic farmers held greater insecure perception on land tenure, probably because they had above-average sensitivity to threats and uncertainties emotionally (DeYoung, 2010; Hirsh and Inzlicht, 2008), and thereby felt more depressed or insecure especially when land reallocation took place occasionally. Therefore, efforts to enhance the overall level of perceived land tenure security should consider intervention programs more inclusively for psychologically vulnerable farmers. Although previous research has suggested that personality traits are malleable during adulthood via clinical interventions (Roberts et al., 2017), nudging farmers’ personality traits on a large scale may be costly and difficult to implement in rural areas. Instead, rural development programs focusing on enhancing farmers’ cognitive and social skills can be useful to compensate for the negative effects of unfavorable personality traits such as neuroticism. Given that fear and uncertainty are at the core of neuroticism, mastering soft skills in communications or obtaining more complete information about the institutional environment may provide neurotic farmers with competences to overcome neurotic tendencies in perceiving tenure situations (Cuesta and Budría, 2015; McElwee, 2006). More importantly, early interventions that develop non-cognitive skills might be more economical to pay off for building emotional strengths in the future given the long-lasting effects than scattershot outreach efforts to alleviate farmers’ anxiety disorders (Heckman et al., 2013; Heckman and Kautz, 2014).

There are a few limitations that should be acknowledged in this study. First, emerging literature has suggested that land reallocation may not be the only source of land tenure insecurity in rural China. Farmers’ land rights can also be deprived due to increasing land assembly for large farm operators through coercive rural land transfers (Hong and Sun, 2020; Luo and Andreas, 2020). Even though our data on past land reallocations can partially reflect the potential incidence of coercive land transfers since this process is likely to involve reallocations of land within villages, especially when some villagers are unwilling to rent their land out (Luo and Andreas, 2020), future research may further investigate the extent to which coercive land transfers compromise farmers’ perceived land tenure security. Second, psychological determinants of perceived tenure security in this study focus on individual personality traits while ignore the potential effects of collective psychology, which warrant future studies, as community-level psychology matters as much as individual psychology do in the rural and regional development (Huggins and Thompson, 2019). Third, personality traits in this study are measured using a short version of BFI inventory, i.e., BFI-10, for its advantages of being able to fairly measure personalities when the survey interview time is rather limited. Nevertheless, critics fall on its low correlations between items belonging to the same personality trait, compared to the well-proven 44-item BFI inventory (BFI-44) (Ludeke and Larsen, 2017). Future studies are encouraged to employ BFI-44 to gauge the personality traits of farmers.

Declarations of Competing Interest

None.

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