

Journal Pre-proof

Land property rights and rural enterprise growth: Evidence from land titling reform in China

Di Bu, Yin Liao

PII: S0304-3878(22)00028-1

DOI: <https://doi.org/10.1016/j.jdeveco.2022.102853>

Reference: DEVEC 102853

To appear in: *Journal of Development Economics*

Received date: 3 July 2021

Revised date: 17 February 2022

Accepted date: 21 February 2022

Please cite this article as: D. Bu and Y. Liao, Land property rights and rural enterprise growth: Evidence from land titling reform in China. *Journal of Development Economics* (2022), doi: <https://doi.org/10.1016/j.jdeveco.2022.102853>.

This is a PDF file of an article that has undergone enhancements after acceptance, such as the addition of a cover page and metadata, and formatting for readability, but it is not yet the definitive version of record. This version will undergo additional copyediting, typesetting and review before it is published in its final form, but we are providing this version to give early visibility of the article. Please note that, during the production process, errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

© 2022 Published by Elsevier B.V.



Land Property Rights and Rural Enterprise Growth: Evidence from Land Titling Reform in China ☆

Di Bu^a, Yin Liao^b

^aMacquarie Business School, Macquarie University, Australia

^bMacquarie Business School, Macquarie University, Australia

March 28, 2022

Abstract

We exploit a large-scale land titling reform in China that clearly entitles rural households to land rights by issuing uniform land use certificates and study how this impacted entrepreneurship in rural areas. We find that the reform significantly increases business creation in rural areas without decreasing the quality of new entrants or incumbent businesses. It also spurs entrepreneurship among professional and large farmers and attracts more urban residents to start new businesses in rural areas. Additional analysis provides evidence that increased land and labor availability and productivity, and improved social trust may serve as the mechanisms underlying these effects. Altogether, these results reveal that well-defined land property rights have enabled more enterprise growth in rural areas.

JEL classification: J15; L26; M13

Keywords: Land Property rights; Enterprise; Collateral; Labor mobility; Social trust

☆

Corresponding author: yin.liao@mq.edu.au (Liao).

1 Introduction

Rural enterprise has long been recognized as essential for rural economic development and as important for reducing wealth inequality between urban and rural areas. However, in most developing countries, the growth rate of rural enterprises remain remarkably low; for example, as of 2008 in China, newly created businesses in rural area only accounted for 5.8% of the total new businesses, and the proportion increased to only 15.9% by 2014. There is a large body of studies in the current literature that investigates the factors that discourage enterprise growth, including regulation limits (e.g., Chatterji and Seamans 2012, Hombert et al. 2020), access to capital (e.g., Wang 2012, Schmalz et al. 2017), free occupational choice (e.g., Wang 2012), and downside risk such as financial distress (e.g., Babina 2019). In this paper, we focus on a much less-studied factor that critically affects enterprise development in rural areas: land right security.

We shed light on this topic by focusing on a large-scale land titling and certification reform recently conducted in China. Understanding land reform in Chinese setting is important, because, the reform is firstly the largest land titling program in the world. From its pilot program in 2009 to the near completion of nationwide land titling at the end of 2018, the reform lasted 10 years, with an estimated fiscal cost of RMB 60 billion (Zhang et al. 2020). Second, the reform largely enhances the security of land use rights in rural areas, which should have a large effect on rural individuals' occupational choices. In the past, property rights over rural land in many developing countries including China are maintained through continuous personal use instead of through land titles. This imposes restrictions on labor mobilities towards alternative jobs, due to that leaving the land idle or letting it to others creates a risk of the loss of rights (de Janvry et al. 2015). In addition, under use-based property rights, rural lands were continuously redistributed with the population growth, causing lands to be fragmented and small plotted and lowered the land supply and productive efficiency for new business creations. Last, without a formal titling process, the land property rights are

uncompleted and ambiguous, causing a large amount of land-related disputes. This largely discourages farmers from participating in land transfers and impedes their ability to access capital based on the value of the land (e.g., bank loans or land rental incomes) and to release financial or liquidity constraints for starting new businesses. The land titling reform issued land-use titles to rural households in the form of a certificate that specifies particular plots of contracted land and their respective boundaries and areas. With clearly defined land boundaries and land use rights, the lands will not be redistributed again, are transferrable, and can be used as collateral to access credit or , capital. In the meantime, the clear land property right may create many more possibilities for rural households to move from their own-land-based activities. We thus examine in this paper how these secured land use rights have affected the growth of enterprises in rural area and the channels or mechanisms behind the effect.

The strengths of our analysis are threefold. First, our empirical identification strategy is built on the staggered introduction of the land titling and certification schemes that varied across counties and over time in China. This quasi-natural experiment allows us to use the difference-in-differences (DID) methodology to identify the causal effect of secured land property rights on rural enterprises. Second, we leverage both business-level administrative data and nationwide individual-level survey data to evaluate the growth of enterprises, which provides more robust measurements on enterprises compared to many other studies that only used household survey data (e.g., Bing Han and Zhengyi 2020, Corradin and Popov 2015, Schmalz et al. 2017, Aretz et al. 2020). Lastly, although most studies on land titling reform in China tracked the timing of the reform by using household surveys, which are affected by self-reporting bias (e.g., Zhang et al. 2019, 2020), we obtained the official roll-out timing of the reform across counties and over time from the Chinese Ministry of Agricultural and Rural Affairs database. This source offers the most accurate timing of the reform and helps a better identification of the causal effect.

We conduct a range of checks to verify that we indeed estimate the causal effect of

the land titling reform. A major concern regarding our identification is that the timing of the reform implementation may have been endogenous to county-level conditions. We first examine the determinants of the timing of reform implementation, and find that a range of county-level outcomes, such as economic prospects, agricultural and land development, and demographic characteristics do not predict the timing of implementation. Second, we conduct event study DID to firstly verify that our main outcomes of interest were not trending differently prior to the reform implementation, and secondly provide a valid estimates of the causal effect under the design of staggered DID. Last, one may concern that the land reform implementation may have coincided with other changes occurring across counties at different times, e.g., infrastructure development (roads, electrification). We include the number of newly connected expressway each year at the county level in our regressions, and find that this inclusion has almost no impact on our estimates.

Our first empirical analysis establishes that the land titling reform significantly boosted new business creation in rural areas. We find that the introduction of land titling reform by a county significantly increases the number of businesses created and the business entry rate in this area. After one year, the number of newly created businesses is 4% more in the counties that experienced land titling reform than in the counties where the land reform had not yet started. These estimates are robust to a variety of robustness checks. We next document that the businesses created in response to the reform have a better quality. We first measure the quality of businesses by using job creation, namely, the number of employees. We find that the land reform led to the creation of new businesses that are significantly more likely to hire and create more employment in rural areas.

We also measure quality by using businesses' self-reported accounting information, including total assets, sales revenues, total liabilities, and total equity. Similarly, we find significantly positive changes in these accounting variables after the land reform. In addition, our analysis shows that land reform does not crowd out employment growth or lower the accounting performance of incumbent businesses. Overall, this evidence supports the view

that well-defined land property rights induce rural entrepreneurship without significantly reducing the average quality of the new and incumbent businesses.

We next look at entrepreneurs' characteristics and document that the land reform mainly encourages more professional farmers and urban residents to start businesses in rural areas.

Using household-level survey data, we access the characteristics of entrepreneurs such as age, education, agricultural skills and residential area. We find no significant effect of the reform on the composition of entrepreneurs regarding their age and educational background, and we find a positive effect on rural households with higher agricultural skills (professional or large farmers) and urban residents. Overall, the evidence supports that the titling reform induces new business creation without significantly reducing the average quality of the new entrepreneurs. It spurs more professional farmers and urban residents to start new businesses in rural areas.

After establishing a positive causal effect of land reform on rural enterprise growth, we next explore four possible mechanisms to explain how the effect worked. First, we expect that the land titling reform has allowed rural individuals to better access *financial capital* due to the increased value of land after the reform, which in turn, releases financial constraints for entrepreneurs to start new businesses. Financial constraints caused by insufficient financial capital are a common problem faced by entrepreneurs in the early stage of entrepreneurship (Wang 2012, Schmalz et al. 2017, Aretz et al. 2020). Evans and Jovanovic (1989) and Blanchflower and Oswald (1998) documented that wealthier individuals are more likely to become entrepreneurs. Conceptually, land titling can improve rural households' ability to access capital due to several reasons. First, making land-use titles available as collateral improves households' ability to access credit from formal financial institutions. In developing countries, land is often not lacking per se, but sound property rights institutions are lacking that can turn 'dead' property, such as land, into 'live' assets for productive purposes (De Soto 2000a). Credit providers understand the increased value of the land when sound land property rights are established, and they price it accordingly, which makes credit

more available and inexpensive to rural individuals (Besley et al. 2012). Second, land titling increases the value of the land, which, in turn, reduces titleholders' credit risk by raising their wealth and income (Zhang et al. 2020). Third, more secured property rights encourage more land transactions, which allows landholders to better capitalize land values in land rental market. We test these explanation by examining land collateralized bank loans and land rental incomes in treated and control counties before and after the land titling. Our empirical results suggest that, after the land titling reform, rural enterprises significantly grows due to that rural households can better capitalize the value of the land from rental market rather than financial institutions.

Second, we examine whether land titling has increased the land availability and productivity for rural enterprises through land reallocation or *land consolidation*. This mechanism focuses on the land titling institutions that allow the small fragmented farmland plots to be reallocated and consolidated into larger farms through the rental market. After the titling reform, more stable and secure property rights allow the land to be freely transacted and transferred to other people to achieve optimal configuration (Chamberlin and Ricker-Gilbert 2016). The land transfer can thus first encourage land flow to professional and large farmers, which enables agricultural-based enterprise growth in their local areas, and second, stimulate urban residents, who either previously migrated out of rural areas or who are permanent urban residents but have mastered advanced technologies, accumulated funds, and identified rural business opportunities, to start new businesses in rural areas (Demurger and Xu 2011). We test this channel by investigating whether the treated counties have more land rent-in activities and whether individuals or households who have rented large lands are more likely to start new businesses. Our empirical findings support these arguments by showing that more land rent-in activities occur in the treated counties in terms of both extensive (rent in land or not) and intensive (land rent-in areas) margins. Meanwhile, individuals or households who have rented large lands are more likely to be entrepreneurs.

Third, we argue that delinking land rights from land use could increase labor availabil-

ity and productivity in rural areas, which encourages more and better *human capital* to transition into entrepreneurial activities. The land certification and titling program removes constraints on land use and promotes land transfers. This reduces the opportunity cost of allocating labor to off-own-farm activities and makes farmers, particularly farmers with small land plots, seek higher paying jobs, e.g., to be hired by more productive farms in local areas or hired by local non-agricultural businesses (Deininger et al. 2014, de Janvry et al. 2015, Wang et al. 2015, Chari et al. 2020). Meanwhile, land-transfer-out promotes non-agricultural employment in local areas, from which rural households can access new knowledge and skills to enhance their abilities to identify and develop entrepreneurial opportunities. We test this explanation by checking land rent out activities and households' occupational choices in the treated and control counties before and after the land reform. We indeed observe that more farmers with small land plots rented out land after the titling program, and a majority of them were hired by a local business rather than migrating out of the villages.

Finally, we consider *social capital* as a factor that affects entry into rural entrepreneurship after the land reform. Many researchers in recent years have focused on understanding the role of social capital in enterprise development (e.g., Sengupta 2010, Kwon et al. 2013, Nieto 2017). As an inseparable part of social capital, social trust is considered useful for facilitating learning, reducing uncertainty, and thereby increasing risk taking, work efficiency and effectiveness (Neace 1999, Saxenian 1991) in a society. Thus, we expect that after the land titling reform, the resulting well-defined land property can reduce land-related disputes among rural society, which, in turn, increases social trust, risk-taking propensity, and rural enterprise. Using individual-level survey data, we measured households' general trust towards local society and risk-taking propensity. We find that both measures positively change in the treated counties after the land titling reform, and individuals or households with higher changes of social trust or risk-taking propensity are more likely to start new businesses in local areas. This confirms that improved social capital would be an additional factor that explains increased rural enterprise.

Our work contributes to three established streams of literature. The first focuses on the literature on self-selection into entrepreneurship (Kihlstrom and Laffont 1979, Blanchflower and Oswald 1998, Hamilton 2000, Moskowitz and Vissing-Jørgensen 2002, Hombert et al. 2020). These papers document large heterogeneity in the talent, ambition, and risk preferences of entrepreneurs. In addition to personal traits, we extend this literature by showing how background risks affect self-selection into entrepreneurship. The background risks discussed in the literature include Corradin and Popov (2015), who have shown how an increase in house prices affects self-employment. (Hombert et al. 2020) investigated how an increase in downside insurance affects entrepreneurship. Zandberg (2021) studied whether better access to reproductive healthcare increases women’s propensity to become entrepreneurs. Herkenhoff et al. (2021) examined how consumer credit affects entrepreneurship. We complement this literature by focusing on rural entrepreneurship and study how land property rights security affects households’ propensity to become entrepreneurs in rural areas.

Our paper also contributes to the literature that investigates property rights and economic development. There is a certain amount of consensus among economists that when institutions create better property rights, this leads to improved economic outcomes. Acemoglu et al. (2001) documented that property rights are the fundamental cause of the large differences in income per capita across countries. Field (2007) studied the effect of property rights on household-level decisions regarding labor. Besley (1995), Field (2005), Galiani and Schargrodsky (2010) explored the relationship between property rights and investment. This paper contributes to the existing property rights literature by offering an empirical test of the effect of property rights on entrepreneurship. De Soto (2000b) popularized the idea that the real estate occupied by urban squatters contains vast amounts of potential wealth that could be transformed into capital for entrepreneurial ventures through the formalization of property rights. Wang (2012) extended the idea that private property rights over the stock of state-owned housing allow individuals to fully capitalize on the value of their property. The focus of our work is on the creation of private property rights over the use of rural land

and its effect on rural entrepreneurship.

Finally, our paper is related to the vast literature that examines how land property rights distort labor allocation. Field (2007) found that providing land titles to urban squatters in Peru resulted in an increase in the amount of labor allocated to working away from home. Galiani and Schargrodsky (2010) showed that the provision of land titles to squatters in urban Argentina had no effect on labor market outcomes. de Janvry et al. (2015) suggested that removing the link between land use and land rights through the issuance of ownership certificates in Mexico resulted in large-scale migration. Relative to these papers, our contribution emphasizes the distortion effect of obscure property rights over rural land on the transition into entrepreneurship. In the same way that land use-based property rights can reduce the incentives of farmers to move from own land-based agricultural activities, the risk of losing land rights can reduce the incentives of farmers to start a new business. Our results show that the land titling reform caused labor reallocation in rural areas: farmers with small land plots moved from own-land based agricultural activities, and a majority of them were employed by local businesses. Professional farmers with relatively large land plots tend to rent more land to start with agriculture-based entrepreneurship.

The remainder of our study proceeds as follows. In Section 2, we discuss the institutional setting and background. The next section discusses in detail the sources of data and the sample (Section 3). In Section 4, we discuss the results along with the identification strategy and empirical research design. Section 5 investigates the mechanisms through which well-defined land property rights affect rural entrepreneurship. The final section concludes the paper.

2 Institutional Background

2.1 Description of the Land Reform History in China

Land reform has characterized rural China since the founding of the People's Republic in 1949, and there have been three major farmland reforms. First, a radical farmland revolution in the early 1950s expropriated land from landlords and distributed it to landless peasants, which allowed China to achieve the goal of giving tillers their own land. In the mid-1950s, China carried out its second land reform, namely, a campaign of collectivization. During the process, individual farmers were compelled to join collectives. This collectivization ultimately developed into an institution called the People's Commune. With centrally controlled property rights and a misapplied egalitarian principle of distribution, the communes destroyed farmers' operational freedom and their enthusiasm for production. Much literature illustrates the poor performance of the commune system (e.g., Stavis 1982). Therefore, at the end of the 1970s, China launched a third land reform by introducing a family-based contract system, the so-called household responsibility system (HRS). Since then, household responsibility has been the nationwide statutory pattern of agricultural land tenure. This system successfully separated ownership and contract rights. Because of this reform, the land in a village was owned by the village collective, but farmers held the contract rights. Village collectives signed contracts with farmers and investigated the implementation of these contracts. Farmers could farm by themselves, but if they preferred, they could relinquish their operational rights to others. As such, operational rights were not explicitly defined. In addition, village collectives had the right to distribute and adjust land allocations in the interest of public use, infrastructure or otherwise.

Although the fruits of the HRS for rural land reform have been remarkable, this system, which characteristically divided the land among participants equally, has had a series of negative impacts on economic development (Deininger and Jin 2009). First, land tenure

security under the HRS is determined primarily by the duration of the lease of land to a household. In the early stages of the HRS, the land contract period for contracts between rural households and their village collective was 15 years, which was further extended to another 30 years in 1997 when the initial contract of 15 years expired. A temporary land leasing contract between rural households was normally only one or two years. Such a short contract period offered households poor land tenure security and discouraged them from making land-improving investments. The second factor that influences land tenure security under the HRS is the periodic reallocation of land by village authorities. To distribute land in a welfare-improving way, communities often allocate land based on household size and past labor decisions. Rural communities often adopt practices of labor-contingent land access and frequent land reallocations under communal tenure. The labor-contingent access to land imposes conditions on the amount of labor used on the land by requiring that it be kept in production, which ignores the return to labor for alternative activities. Such labor-contingent access to land, coupled with tenure insecurity under periodic reallocations, creates distorted incentives for households to oversupply labor to agriculture. The labor-contingent rule of allocation leads households to oversupply labor to agriculture (de Janvry et al. 2015). In addition, these reassignments lead to small-scale, decentralized, and fragmented farming, which results in land being abandoned or shifted to low productivity functions (Vendryes 2010).

2.2 Land Certification and Titling Program

More recently, the Chinese central government has gradually made further efforts to secure land rights over rural land by conducting the land certification program (LCP). In 2008, a number of land titling program (LTP) pilot projects were initiated via Document No. 1 of the Central Committee of the Communist Party of China. Villages and towns from eight provinces including Shandong, Sichuan, Hunan, Chongqing, Guangdong, Guangxi, Hei-

longjiang, and Jiangxi were selected by the Ministry of Agriculture as LTP implementation pilot samples, and an initial nationwide scheme was launched by this ministry and six other departments in March 2011. Document No. 1 continued to emphasize the importance of the LTP in subsequent years and clearly stipulated that this process should be implemented across more provinces to attain national coverage until 2019. In the land titling process, the first step is to ascertain that each farmer's rights and obligations are clearly defined for each household at a technical level, such as having a uniform measurement of the location and size of each farmland plot, and then, a uniform land ownership certificate was issued to entitle land rights to each rural household. After the implementation of land titling, the collective farmland ownership was weakened, as the farmland will not be redistributed again, and collectives need to follow the policy of protecting the stable property rights of farmland. This reform thus entails the weakening of collective ownership and the enhancement of landowners' use right of farmlands.

Compared with previous land reforms in China, the LCP differs in many ways. First, it consolidated the identity of collective membership according to the principle of “no additional land for population expansion and no reduction of land for population reduction”, which endows farmers with stable and assured land property rights and encourages farmers to participate in land transfers. Second, it implemented a “four boundaries” policy that demarcated clear land boundaries. The longitudes and latitudes of the plots were thus registered in this round of land certification without ambiguity, which better maintains the benefits of farmers than previous reforms (Deininger et al. 2011, Luo 2018). Third, as is well known, land rights in China are partial land rights that guarantee only the security of ownership and contracts, provide no access to credit, and prohibit any sale of land following the rural land reforms circa 1980. Land operational rights are separate from land contract rights in this new round of the LCP, with these land rights containing three specific rights, which are known as the three-rights division, specifically, ownership rights, contract rights, and operational rights. The government has also begun a pilot that allows the mortgage of

land operational rights. Thus, operating land became a more enticing prospect than before.

3 Data

We employ the following three sources of data in our analysis: the land reform roll-out information at the county level; the business registry, which has accounting data on business performance and employment; and demographic and personal information on entrepreneurs and land transactions and bank loan information from a nationwide survey that has been conducted every two years since 2011. All the variables defined from the datasets are provided in Online Table 12.

3.1 The Information of Land Reform Roll-out

We obtained complete information on the local county-level implementation of land reform from the Chinese Ministry of Agricultural and Rural Affairs during the period from 2009, when the land reform first launched, to 2019. The data include information on 2,286 counties (more than 80% of China's total counties) that records the precise timing of the land reform (e.g., the start and completion dates) implemented in each county. The start of land reform in a county is defined by the date when the first certificate was issued to a household in this county. It usually took approximately one-and-a-half years to complete the reform throughout an entire county.

Figure 1 maps the roll-out of the land reform at the national level, which helps to visualize its extensiveness and national scope. The reform officially came into effect in 2009, when the central government issued the “No. 1 Document” that required local governments to pilot the LCP in 8 villages. In 2011, the Ministry of Agriculture issued the “Opinions on the Pilot of the Rural Land Certification Program”, and the reform was extended to 6 counties, mainly located in Sichuan Province, in 2012. In 2014, the reform increased to a

national program of 15 counties, and it covered 1,729 counties in 2016 and 2,117 counties in 2018. Overall, the reform was introduced in a staggered manner across counties and over time.

One concern of our identification is that the implementation of land certification and titling schemes may be not random which might be related to county-level conditions, such as demographics, distance to urban areas, agriculture development, and economic prospects, etc,. To address the question of why some counties implemented the reform at different times than others, we collect county-level data from four sources. First, we have data reflecting county economic conditions from Statistical Yearbooks, including GDP per capital, public finance expenditure, total deposit, total loan balance, average household income, etc,. Second, we collect data reflecting agriculture development from local government, including agricultural employment, the frequency of land reallocations, land disputes and land productivity. Third, we gather data reflecting demographical characteristics, including population, the distance between each county and the corresponding provincial capital (using Google maps), and the average age of households.

Online Appendix Table 13 conducted a probit analysis of the land titling reform (as an event) by using the lagged county per capita GDP, public finance expenditure, total deposit, and total loan balance as proxies of the local economic conditions. None of these variables has explanatory power for the land titling reform, suggesting that economic condition is not related to the government's land reform decision. Also, we examine whether the timing of reform in a county is predicted by local agricultural and land development. It is reassuring that agricultural employment, the frequency of land reallocations, land disputes and land productivity are not significantly correlated with the timing. These results provide evidence against the idea that agricultural or land outcomes may directly drive the decision of the land reform. Last, we test for whether the land reform adoption is determined by local demographical characteristics. It is clear that population, the distance to the provincial capitals and the household age are insignificant variables in predicting the timing of reform,

indicating that the land reform does not depend on county-level demographics.

3.2 Business Registry and Accounting Data

The business registry data contain information on businesses registered in rural China from 2010 to 2018, which include over 1.3 million businesses and cover 2,828 counties. We use business-level data from the National Enterprise Credit Information Publicity System. The database includes an administrative dataset that covers the business registration date, business name, registered address, industry classification, and business closing date if applicable. It also provides the businesses' legal status, e.g., sole proprietorship, limited liability corporation, or corporation.

Figure 2 reports the 12-month moving average of the number of monthly business creations over our sample period. We observe that starting in 2013, that is, the year after the reform was nationally extended, the number of businesses created each month increased from 20,000 in early 2013 to approximately 60,000 at the end of 2016. The increase is substantial compared to the statistics before 2013. After reaching a plateau in 2016, business creation maintained its high level until 2019. Overall, we see that the reform is accompanied by a surge in the creation of businesses.

Table 1 Panel A provides the summary statistics for the aggregate data of newly registered businesses across five industries from 2010-2018. We observe that the newly created businesses are largely concentrated in agriculture, forestry, animal husbandry and fishery. These industries comprise approximately 97% of all business creations, followed by the wholesale and retail, transportation, education and catering industries. Figure 3 plots the yearly number of newly created businesses across industries over the sample period. These plots confirm a large surge in business creations starting from 2013 in all industries. They also show that the industries with the largest growth of new business creations post-reform are agriculture, forestry, animal husbandry and fishery.

To analyze the performance of new business creations, we complement the registry data with accounting information from the National Enterprise Credit Information Publicity System. The database provides us with annual financial information on these businesses, including total assets, total liabilities, total equity, total sales revenue, and the number of employees. Table 1 Panel C presents the descriptive statistics of these accounting variables. The average new business has around 9 (8.767) employees, approximately RMB 426 thousand in assets, RMB 223 (222.4) thousand in sales, RMB 31 (30.93) thousand in total liabilities, and RMB 612 (611.75) thousand in total equity.

3.3 China Household Survey Data

To obtain additional demographic and personal information on entrepreneurs, land transformation and bank loan information, we use the China Household Finance Survey (CHFS) and the China Rural Household Panel Survey (CRHPS), a large-scale survey run by the Research Centre at the Southwestern University of Finance and Economics (SWUFE) and the Social Science Experimental Center of Zhejiang University (SSECZU). The survey started in 2011 and runs every two years, and it is available until 2019. In this paper, we use the 2011, 2013, 2015 and 2017 waves of the survey. To match the land reform roll-out information, we obtain geographic information for each household at the county level.

The survey contains households' demographic characteristics, including age, gender, education, and residential area. We limit our sample to working-age adults between 18 and 60 years old, as we focus on individuals' entrepreneurial activities. The survey also contains questions to measure households' other information, including residential condition, employment condition, land transaction condition, bank loan access condition, risk aversion, social trust and health status. Table 1 Panel D reports the descriptive statistics for a set of survey variables. As we can see, only approximately 8% of households conduct entrepreneurial activities. The average entrepreneur surveyed in the CHFS is approximately 45 (44.71) years

old and majority of entrepreneur surveyed has a high school education. A total of 62.6% of the surveyed entrepreneurs are male and 91.4% of them have been married.

3.4 County Level Macroeconomic and Infrastructure Information

We obtain information on the macroeconomic variables at the county level from 2010-2018 to control for the underlying economic conditions in a later empirical analysis. The macroeconomic variables include the per capita gross domestic product (GDP), GDP growth rate, total public expenditure, total deposit balance, and total loan balance. The transport infrastructure variable includes the yearly number of newly connected expressways, which was determined by the statistical data of the opening time of the highway section provided by the local transport authority and county statistic yearbook.

Table 1 Panel D reports the summary statistics for these macroeconomic variables. The average logarithm of the GDP per capita and GDP growth rate in our sample counties are 19.19 and 5%, respectively, and the average logarithm of total public expenditure, total deposit balance and total loan balance are 12.77, 14.05 and 13.87, respectively.

3.5 Representativeness of the data

Our survey dataset is largely representative of the geographic distribution of the rural population in China. The household survey data combines the four waves of two nationally representative surveys, namely, the China Household Finance Survey (CHFS) and the China Rural Household Panel Survey (CRHPS), which were conducted by the SWUFE and the SSE CZU in 2011, 2013, 2015 and 2017. The surveys employed a stratified three-stage probability proportion to size (PPS) random sample design; that is, the first stage of sampling uses counties, the second stage of sampling uses residential communities from the counties, and the final stage of sampling uses extracted households from the neighborhoods and village committees. This process ensures that the final sample is representative of the

entire country's population in terms of both economic development and geographic location.

Regarding the rural household proportion, in the 2011 survey round, the primary sampling household units were taken from 2,585 counties all over the country with the exception of a few less-populated provinces, e.g., Tibet and Xinjiang. The survey round was completed with 8,438 households and 29,450 individuals, among which there are over 4,000 rural households and 10,000 individuals. From 2013 onwards, the survey experienced a large expansion, and the primary sampling units covered the majority of cities and counties all over the country, which is not only nationally representative but also provincially representative. The survey in 2015 was further expanded to collect information from approximately 35,000 households, with 22,535 rural households that consist of 76,675 individuals. Clearly, the rural household proportion in each round survey is not less than 40%, which is close to the rural population (% of total population) in China (39.69%). Overall, the share of rural observations in our sample closely follows the population share for all 30 Chinese provinces.

We obtained the business registry data from the Industrial and Commercial Registration Agency in China, which covers 1.3 million businesses registered in 2,828 counties. The dataset is nationally representative in terms of geopolitical location, and it includes both administrative information, such as the business registration date, business name, registered address, industry classification, business closing date, business legal status, e.g., sole proprietorship, limited liability corporation, or corporation, and self-reported annual financial information, such as the total assets, total liabilities, total equity, total sales revenue, and number of employees. We confess that the self-reported annual financial information has limitations, as it only covers the businesses that choose to report and has business information only on the reporting years. However, the administrative data that contain this financial information should solve this problem or at least be able to provide a robustness check. We leave this imperfection for future work due to the current data limitations.

4 Effect of the Land Reform on Entrepreneurial Activities

4.1 Empirical Strategy

We begin by examining whether the implementation of the land titling reform affects entrepreneurial activity. Our empirical strategy exploits the staggering of the implementation of the reform across counties to identify the causal effect. Our baseline specification employs a difference-in-differences estimator that compares the outcome variables in the counties that started the land reform relative to other counties without the reform in each year. The regression is specified as below:

$$y_{i,t} = \alpha + \beta PostTreated_{i,t} + X_{i,t} + p_i + \tau_t + p_i \times Year_t + \varepsilon_{i,t}, \quad (4.1)$$

where $y_{i,t}$ refers to the outcomes of interest for unit i in year t . The indicator variable $PostTreated_{i,t}$ equals one for the years the reform was implemented or following the implementation of the reform; otherwise, it is zero. The coefficient β thus provides the DID estimate, which states the difference in $y_{i,t}$ between the (reform) treated and non-treated samples. We controls for economic conditions (e.g., the per capita GDP, GDP growth rate, total public expenditure, and total deposit balance) for county-level regression, and demographic characteristics (e.g., age, education, etc.) for household-level regressions. We also control for county (or household) (p_i) and year (τ_t) fixed effects. To further address the concern that the introduction of land reform might be correlated with the long-term trend of the outcome variables in each county, county-level time trend $p_i \times Year_t$ is included in the regressions. The standard errors are clustered at the county level.

A potential concern with the staggered DID estimates is that the estimates are susceptible to the biases created by treatment effect heterogeneity over time or across sample groups.

For this concern to be valid, we estimate a specification that uses event study DID with three leads and lags around the reform implementation:

$$y_{i,t} = \alpha + \sum_{k=-3}^2 \beta_k Treated_{i,t+k} + X_{i,t} + p_i + \tau_t + \varepsilon_{i,t}, \quad (4.2)$$

where $Treated_{i,t+k}$ is an indicator variable that indicates the period relative to the reform implementation in the county. For example, $Treated_{i,t-2}$ refers to two years prior to the year of reform implementation. The reference group is one year before the reform implementation (that is, $k = -1$) which is omitted in the regression. This specification firstly helps solve the potential bias problem of the standard DID with staggered treatment timing as described before, and also, it helps evaluate the credibility of the parallel trends assumption embedded in DID analysis.

Another related concern with DID estimates is that there may be other changes happening at the same time that are driving the results. The one other significant change for rural community around this period is the development of transport infrastructure. We measure the status of transport infrastructure using the number of newly connected expressways each year at the county level, and include it as a control in all the regressions.

4.2 Creation of New Businesses

We first analyze the growth in business creation induced by the land reform. We estimate equation 4.1 by using the following two dependent variables: 1) the log number of businesses created in county i and year t ; and 2) the business entry rate, which is defined as the number of new businesses created in year t divided by the number of established businesses in year $t - 1$. The results of the estimation with the log number of businesses created and the business entry rate are reported in Tables 2 and 3, respectively.

Table 2 reports the results by using administrative data. Columns (1) and (3) include

the treatment dummies, county-level economic controls, and county and year fixed effects. Columns (2) and (4) contain the county-specific time trend as one more control. As shown in Column (1), the introduction of the land titling reform by a county significantly increases the number of businesses created and the business entry rate. The parameter estimates imply that the number of newly created businesses is 3.90% ($100 \times (\exp(0.039) - 1)$) more in the counties that have experienced the land titling reform than in the counties where the land reform has not yet started. Given that the sample average of the yearly newly created businesses in a given county is approximately 73 ($204,915/2828$), this indicates almost 3 more business creations in land reformed counties. The results are economically substantial and maintained after controlling for the county-specific time trends (Column (2)), which ensures that they are not driven by unobserved cross-sectional differences in entrepreneurial activities.

Turning to the baseline results of the business entry rate (Column (3)), we observe that our findings are not affected after the number of new businesses is scaled by the number of established businesses in the previous year. The business entry rate is 4.2% more in the counties that have started land reform than in the counties without land reform, which implies an almost 7.5% increase given that the sample average yearly entry rate is approximately 50% (46.6%) in a given county. These results are also robust after adding county-specific time trends (Column (4)). Since the reform was implemented gradually over time with no clear event window, in the Online Appendix, we check whether our results are robust to alternative definitions of the timing of the land titling reform. We show that when we exclude 2011-2013 from the sample, the estimated effects are actually still significant, as expected, since the reform was massively extended nationally from mid-2013 (see Online Appendix Table 14).

Estimation results of event study DID are reported in Online Table 15. Columns 1-2 of the table reports the estimates corresponding to Equation 4.2, where the dependent variable is the log number of of businesses created and the business entry rate. We still

observe a significantly positive treatment effect in reformed counties after the land reform implementation. Furthermore, there are no significant trends in these variables prior to the reform implementation. This provides support for the positive treatment effect of the reform, as well as the identification assumption that the treatment effect is not driven by

In addition to the administrative data, we also study the effect of the land reform on business creation by using survey data. We rely on a question in the CHFS survey, “what do you do for living”, to construct a dependent variable, $Businesscreation_{i,t}$, which equals one if household i reports business creation activities in year t ; otherwise, it is zero¹. The business creation activities include creating registered enterprises (or business) and self-employed businesses (i.e., online sales). Table 3 provides the panel probit regression results. The table shows that after one year, the land reform increases the proportion of entrepreneurs by approximately 5% after controlling for households’ demographic information and county and year fixed effects, which is substantial given that the average proportion of entrepreneurs is 8% in our sample.

4.3 Quality of New Businesses

We have shown that the land reform significantly increases business creation; now, we can examine whether the reform led to a significant change in the characteristics of newly created businesses. We first examine an ex post measure of business quality and job creation (namely, the number of employees). If the effect of the reform was to attract high-ability entrepreneurs, then start-ups created after the reform should be more likely to create jobs, which would improve employment in rural areas.

We estimate equation 4.1 by using the log No. of employees as the dependent variable. We mainly focus on the short-run effect, specifically, we look at the businesses created one

¹We only include the samples who have responded this questions. The average response rate is around 25%.

year after the land reform and compare their number of employees with that of newly created businesses in the same year in the counties where the land reform has not yet started. The estimation results are reported in Table 4 Column (1) and show that there is a significant increase in a start-up's propensity to hire after the land reform. The parameter estimates indicate that the newly created businesses in the land reform counties create approximately 24% more employment compared with the newly created businesses in the not-yet-reformed counties. Given approximately the 9 (8.767) average employees in the newly created businesses in our sample, this indicates that 2 more jobs are created by new businesses after the land reform. Overall, this finding is consistent with the view that the reform led to the creation of new businesses that are significantly more likely to hire, which creates more employment in rural areas.

The second set measure of ex post quality that we use is the accounting information of the created businesses, including the total assets, sales revenues, total liability, and total equity. We estimate equation 4.1 by using the logarithm of these variables and report the results in Table 4 columns (2)-(8). Similarly, we find significantly positive effects on these accounting variables after the land reform. For example, the (log) total assets in newly created businesses increase by 19.6%, which is approximately RMB 83,496 and is economically substantial given that the sample mean of total assets in the newly created businesses is RMB 426,000. Likewise, (log) sales revenues increase by 23.3%, (log) total liabilities decrease by 17.5%, and (log) total equity increases by 21.5%, which correspond to RMB 51,824, RMB 5,413 and RMB 131,526, respectively, given that the sample means of these variables are RMB 222,420, RMB 30,930 and RMB 611,750, respectively. Online Table 15 Columns 3-7 confirm the effects over 2-3 years after the reform implementation. Also, the results support that the effects are not driven by pre-trend of these variables.

Finally, to investigate the possible crowding-out effect on incumbent businesses induced by the land reform, we conduct the same analysis with the quality measures of incumbent businesses as the dependent variable. We define incumbents as the businesses present in our

sample in year t but created before year $t - 3$ ². Table 5 reports the results. In Column (1), we focus on the job and employment creation of these businesses, and in Columns (2)-(5), we focus on the accounting performance of these businesses. The results show that the reform does not lead to lower employment growth for incumbent businesses. Following the reform, we find no significant changes in the employment growth and accounting performance variables, except for the slight increase in the total liability of incumbent businesses. Taken together, the results do not show that the land reform leads to a significant crowding-out effect on incumbent businesses.

4.4 Characteristics of Entrepreneurs

After studying the quality of newly created businesses, we now provide further evidence of business quality by investigating the characteristics of entrepreneurs. We focus on three demographic characteristics of entrepreneurs, namely, age, education and financial literacy. Since these variables come from the CHFS survey, they are available for 2011, 2013, 2015 and 2017.

We estimate equation 4.1 by using the three characteristics as dependent variables. We first examine the characteristics of entrepreneurs who created a business one year after the land reform and compare these measures with those of entrepreneurs who created a business in the same year but in a county without the land titling reform. Table 6 presents the results (Columns (1)-(5)). We observe that the coefficients of the three characteristics are all nonsignificant, which indicates that there are no significant changes in entrepreneurs' characteristics in terms of education, age or financial literacy after the land titling reform.

In addition, as we know, land reforms attract not only professional and large farmers but also urban residents who want to rent land and start a new business in rural areas. There-

²This time lag is used to ensure that all the incumbent businesses that we consider here were started before the land reform.

fore, we study whether the land reform increases the probability of entrepreneurs coming in from professional farmers or urban areas. The CHFS survey asked a question about the households' status³. We can thus use this information to distinguish whether households are urban or rural residents, and we construct a dummy variable, *Urban*, to study the effect of the land reform on entrepreneurs coming from urban areas. Meanwhile, we construct a dummy variable, *professional farmers*, which takes the value of one if the household answered "professional farmer" in the survey question: "what type of farmers are you?".

Table 6 presents the results (Columns (6)-(7)). The parameter estimate in these columns indicates that after one year of the land reform, the probability of entrepreneurs coming from professional farmers increases by 9.3 percentage points and from urban areas, increases by 12.7 percentage points. These effects are all statistically significant at the 1% level. Meanwhile, given that the average proportion of entrepreneurs coming from urban areas is 58% in our sample, the increase accounts for 22% of the sample mean, which is economically substantial. Thus, we can conclude that the land reform significantly increases the probability of professional farmers and urban residents engaging in entrepreneurship in rural areas, and the effect on urban residents appears to be more pronounced.

5 How does Land Reform Spur Entrepreneurial Activities?

Thus far, we have firmly established that well-defined land property rights through the land certification and titling program have significantly increased entrepreneurial activities in rural China. In this section, we evaluate the possible channels or mechanisms to explain

³Hukou is a system of household registration used in mainland China. It is the registration of an individual in the system that officially identifies a person as a permanent resident of an area and includes identifying information such as name, parents, spouse and date of birth.

how this worked.

5.1 Financial Capital: Liquidity Constraint

The first possible explanation that we consider here is the increase of financial capital induced by the land tilting reform. The land reform increased the value of the land by establishing sound land property rights. This allows landholders to better access bank credit and land rental incomes, which, in turn, alleviate the financial or liquidity constraints that entrepreneurs may face.

To test the validation of this mechanism, we first focus on two questions in the CHFS and CRHPS surveys to see whether individuals or households in the treated counties have accessed more land collateralized bank loans or earn more land rental incomes after the land titling reform. The survey questions asked: “How much is your income from the land rental market? ” and “Have you accessed credit from formal financial institutions? How much is it, and what is your collateral?” Using households’ response to the first question, we construct a variable, *Land rental income*, which is the logarithm of the annual rental income for household j in county i in year t . The households’ response to the second question provides us with an indicator variable, *Land collateralized loan(dummy)*, which takes the value of one if a household answered “yes” for credit access and answered “land” as collateral, and a variable, *Land collateralized loan(dummy)*, which records the bank loan amount that each household has accessed. We estimate the equation 4.1 by using the three measures as dependent variables. The results are presented in the first three columns of Table 7.

In Columns (1)-(2) of Table 7, the parameter estimates suggest that after the land reform, bank loan access with land as collateral has not significantly increased in the treated counties in terms of both the extensive (the access proportion) and intensive (the access amount) margins. Turning to the land rental income (Column (3)), the average (log) amount in treated counties increased by 15.8 percentage points ($100 \times (\exp(0.158) - 1)$). These

differences are statistically significant at the 5% level; they are also economically substantial, given that in our sample, only 1% of the bank loan access used land as collateral, and the average households' (log) land rental income is 6.92 RMB yuan. These results confirm that rural households can better capitalize on the value of the land from rental market rather than financial institutions after the tilting reform.

To further enhance the financial capital channel, we conduct a triple difference analysis to examine whether the increased capital access from the land has transformed into more rural entrepreneurship. We estimate equation 4.1 by using *Entrepreneurship* as a dependent variable, which is a dummy variable that takes the value of one if the household responded “Yes” to the survey question: “Have you conducted entrepreneurial activities during the survey year?” In addition, we add one more independent variable, specifically, $Treated_{i,t} * Land\ collateralized\ loan(dummy)$, $Treated_{i,t} * Land\ collateralized\ loan(dummy)$, or $Treated_{i,t} * Land\ rental\ income$, to equation 4.1 to test whether the individuals or households that have accessed bank loans (using land as collateral) are more likely to start new businesses and whether the likelihood increases with the bank loan amount that they have accessed or the land rental income that they have earned. The results are reported in Columns (4)-(6) of Table 7. The parameter estimates in Columns (4) and (5) once again indicate that, in the treated counties, accessing land collateralized bank loans has not significantly increased the average likelihood of entrepreneurship. In contrast, the likelihood of entrepreneurship increases with the rise in land rental income. Earning one more (log) unit (RMB yuan) of rental income increases the likelihood by 1.3 percentage points. These effects are all statistically significant at the 5% level and are also economically substantial given that entrepreneurs only account for 5.7% of our sample. Overall, our results confirm that land titling increases rural entrepreneurship partially by relieving households' financial constraint due to the increased land value in rental rather than formal credit market.

5.2 Land Consolidation: Large-scale Land Supply

Our second explanation corresponds to land consolidation. After the land certification and titling scheme, farmland will not be redistributed again, which endows farmers with more stable and secured land property rights and encourages more land transfers. This allows land to be freely transacted and transferred to achieve optimal configuration and increases the availability and productivity of large-scale land for rural entrepreneurship.

To evaluate the merit of this explanation, we first examine whether land rent-in activities and land lease areas (namely, land rent-in areas) are significantly increased in rural areas after the land reform scheme, which increases the availability of large-scale land for rural entrepreneurship. We construct the two dependent variables of *Land rent in* and *land lease area*, based on the survey questions “Have you rented land during the survey year? If yes, what’s the land size?” Thus, *Land rent in* is an indicator variable that takes the value of one when household j residing in county i answered “yes” in year t to the survey question, and *land lease area* is a variable that records the land rent-in areas. We then estimate equation 4.1 to test the results. Columns (1) and (4) of Table 8 show that after the land titling reform, land rent-in activities increased significantly more in treated counties than in control counties in terms of both the extensive (e.g., proportion of households who rented land) and intensive (e.g., the land lease areas) margins. The proportion of households that rented land is 4.7 percentage points more in treated counties than in control counties, and the average land lease areas is 13.7 percentage points $((100 \times (\exp(0.137) - 1)))$ more in treated counties than in control counties. These effects are both statistically and economically significant. Given that the availability of land for rent may benefit the two groups of professional or large farmers who can enlarge farms to enable agricultural-based entrepreneurial activities and urban residents who can rent land to start a new business in rural areas, we further explore the land rent-in activities and land lease areas of the two groups by adding two more independent variables to the equation, namely, $Treated_{i,t} * Professional\ farmer$ and

$Treated_{i,t} * Urban\ resident$. Columns (2)-(3) of Table 8 show that both professional farmers and urban residents increased their land rent-in activities in treated counties after the titling reform, and the increase appeared to be more pronounced among urban residents. Columns (5)-(6) of Table 8 indicate similar findings in terms of land lease areas.

Although these results support that land rent-in activities and land lease areas have significantly increased since the land titling reform, a natural question that follows is whether the rent-in lands were used for entrepreneurship. To answer this question and also to enhance the causal effect of land consolidation on entrepreneurial activities, we estimate equation 4.1 by using *Entrepreneurship* as a dependent variable, which is a dummy variable that indicates whether the individuals or households started entrepreneurship in the survey year. We also add one more independent variable, $Treated_{i,t} * land\ lease\ area$, to the equation to test whether the likelihood of entrepreneurship increases with more large-scale land access, as measured by individuals' or households' land lease areas. Column (7) of Table 8 shows that the likelihood of entrepreneurship increases by 4.5 percentage points with one more (log) unit ($\mu = 666.7m^2$) of land lease area. Overall, these results jointly support the large-scale land supply channel.

5.3 Human Capital: Labor Mobility

The third possible explanation that we consider here is human capital. We expect that delinking land use from land property rights can contribute to entrepreneurship by encouraging more and better human capital to participate in entrepreneurial activities. Specifically, the land titling reform may motivate more labor to rent lands and move away from their own land-based agricultural activities to release a large number of labor to meet the employee demand of new businesses.

To evaluate this interpretation, we first test whether land rent-out activities, have significantly increased in the treated counties compared with the control counties by using

equation 4.1. The dependent variable, *Land rent out*, is an indicator variable that takes the value of one when household j residing in county i answered “yes” in year t to the survey question, “have you rented land out during the survey year?” The coefficient of the dummy variable, $Treated_{i,t}$, thus states the difference between the treated and control counties in land rent-out activities before and after the land titling reform. To further identify whether farmers with small land plots are the main contributors of land transfer-out activities, we include one more independent variable, $Treated_{i,t} * land\ area(dummy)$, to test whether the land rent-out activities depend on the land areas that the rural households originally held, where $land\ area(dummy)$ is a dummy variable that takes the value of one if the land area that household j (living in county i) held in year t is greater than the median land size of our sample. The land areas were measured based on the survey question, “how much is your land area in the survey year?”

The coefficient estimates of $Treated_{t-1}$ in Table 9 (Column (1)) show that rent-out activities increased significantly more in the treated counties after the land titling reform. Furthermore, the coefficient estimates of $Treated_{t-1} * land\ area(dummy)$ in Table 9 (Column (2)) imply that individuals or households with smaller farmland are more likely to rent-out lands by 1.9 percentage points. These results are consistent with our expectation and support that the land titling reform promoted more land transfer-out activities, which releases the small farmers from their own-land-based agricultural activities.

Next, we investigate whether the increased land transfer-out activities have affected households’ occupational choices, which, in turn, contribute to rural entrepreneurial activities. Specifically, we would like to know where the released laborers (small farmers) have gone. Relying on three survey questions in the CHFS and the CRHPS, specifically, “how many people in your household migrated out for urban employment in the survey year?” “how many people in your household were employed by local businesses in the survey year?” and “have you engaged in entrepreneurship in the survey year?” we construct the three dependent variables of *Migrate out*, which quantifies the number of people in a household

who migrated out of the counties, *Local Employed*, which quantifies the number of people in a household who live in a rural area and are employed by local businesses, and *Entrepreneurship*, which indicates whether or not the household has engaged in entrepreneurship in the survey year. We estimate equation 4.1 by using the three dependent variables to test whether the land titling reform has changed rural households' occupational choices. In addition, we add one more independent variable, $Treated_{t-1} * Land\ rent\ out$, to examine the occupational choices of the households that have rented out lands. These results are reported in Table 10.

The coefficient estimates of $Treated_{t-1}$ in Table 10 show that after the land titling reform, the three occupational choices of locally employed, migrate out of the village, and entrepreneurship all increased more in the treated counties than in the control counties. Although we see a slight increase in migrants, locally employed and entrepreneurship show a much larger rise. This evidence confirms that the land titling reform provides more job mobility after removing the link between land use and rights. Meanwhile, the coefficient estimates of $Treated_{t-1} * Land\ rent\ out$ indicate that the households that have rented out lands (e.g., farmers with small land plots) are more likely to be locally employed (e.g., the likelihood increases by 5.8%) or migrate out of the villages (e.g., the likelihood increases by 1.6%), but the latter effect appears to be much weaker.

Taken together, the results support the human capital channel that the land titling reform released more laborers from their own-land-based agricultural activities, which increased the labor supply for local businesses.

5.4 Social Capital: Trust towards Society

Finally, we consider social capital to explore the effect of the land titling reform on rural entrepreneurship. We expect that the more stable and assured land property rights after the land titling reform in rural areas can decrease land-related disputes and increase house-

holds' social trust and risk-taking propensity, which, in turn, increases their entrepreneurial activities. The influence of social capital on entrepreneurial activities is of long-standing theoretical interest. Putnam (2001, 1992) have pointed to social networks - and the trust inherent in them - as a source of community social capital that facilitates access to resources for entrepreneurs.

To test this social capital channel, we focus on the following two survey questions in the CHFS: "How much do you trust strangers in society?" and "If you had money to invest, what kind of investment project (with different risk levels) would you choose?" The 1-5 Likert scale-based answers indicate households' general trust in society from "not at all" to "strongly" trust and their propensity to engage in risk taking from "don't want to take any risk" to selecting the "most risky and most profitable project." We thus construct the two dependent variables of *social trust* and *risk aversion* to test whether households' social trust and risk-taking propensity changed after the land reform.

Starting from the rural household sample, Column (1) of Table 11 shows that compared with the control counties, rural households' social trust significantly increased by 2.6 percentage points more in treated counties after the titling reform. Turning to risk aversion, Column (2) of Table 11 shows that the average risk aversion decreased 2.8 percentage points more in treated counties than in control counties. These effects are statistically significant at the 5% level, and they are also economically significant given that the average scores of social trust and risk aversion are 3.86 and 1.83, respectively, in our sample. These findings support that the land reform improves the social capital in reformed counties.

We next examine whether the improved social trust and decreased risk aversion have transformed into entrepreneurial activities. We conduct a triple difference analysis by estimating equation 4.1 by using *Entrepreneurship* as the dependent variable and adding two more independent variables to the equation, namely, $Treated_{i,t} * change\ of\ social\ trust$, and $Treated_{i,t} * change\ of\ risk\ aversion$, to establish the causal effect of the land reform-induced change of social trust and risk taking on rural entrepreneurship. Columns (3)-(4) of Ta-

ble 11 show that although the likelihood of entrepreneurship increased by 4.9 percentage points when the social trust score increased by one unit, the likelihood increased by 2.6 percentage points when the risk aversion score decreased by one unit. These effects are statistically significant at the 1% level and economically substantial given that the proportion of entrepreneurs is only approximately 5.7% in our sample. This supports that the land titling reform significantly improves the social capital in treated counties, which, in turn, spurs more risk-taking and entrepreneurial activities.

6 Conclusion

This paper investigates a large-scale land reform that provided stable and secure property rights over rural land. The reform led to a large increase in business creation, and the reform did not lower the quality of both newly created and incumbent businesses. Although the new businesses created more employment and exhibited better accounting performance, the incumbent businesses showed no significant differences in job creation, total assets, sales revenue, total liabilities or equity. Meanwhile, the characteristics of entrepreneurial quality, such as education, age and financial literacy, were not lower for the entrepreneurs attracted by the reform. More urban residents were attracted to entrepreneurial activities in rural areas after the reform.

Our work also explores four mechanisms through which the land reform affects rural entrepreneurship. We document that the increased *financial capital* is the first critical factor that influences entrepreneurial activities in rural areas after the land reform. Well-defined land property rights after the reform increases the value of the land, which helps the landholders better access bank credit or land rental incomes. We indeed find that the households in the treated counties accessed more credit and earned more rental incomes, which also transformed into more rural entrepreneurial activities. Second, we consider *human capital* and verify that the titling reform first released more laborers from their own-land-based

agricultural activities by providing a large amount of employees for local businesses and second, encouraged more professional farmers to rent land and start agricultural-based entrepreneurship. Third, land consolidation after the titling reform contributes to the increased rural entrepreneurship. Specifically, more land transfer activities after the land reform increases the availability of large-scale land, which provides a critical production factor for entrepreneurship. Finally, we find that the improved *social capital* after the reform was also positively associated with increased rural entrepreneurship. Households' trust towards rural societies and their propensity towards risk taking are increased after the titling reform, which, in turn, corresponds to more business creation.

References

- Acemoglu, D., Johnson, S., Robinson, J. A., December 2001. The colonial origins of comparative development: An empirical investigation. *American Economic Review* 91 (5), 1369–1401.
- Aretz, K., Campello, M., Marchica, M.-T., 2020. Access to collateral and the democratization of credit: France’s reform of the napoleonic security code. *The Journal of Finance* 75 (1), 45–90.
- Babina, T., 11 2019. Destructive creation at work: How financial distress spurs entrepreneurship. *The Review of Financial Studies* 33 (9), 4061–4101.
- Besley, T., 1995. Property rights and investment incentives: Theory and evidence from ghana. *Journal of Political Economy* 103 (5), 903–937.
- Besley, T. J., Burchardi, K. B., Ghatak, M., 01 2012. Incentives and the de soto effect. *The Quarterly Journal of Economics* 127 (1), 237–282.
- Bing Han, L. H., Zhengyi, Z., 2020. Housing market and entrepreneurship: Micro evidence from china. SSRN working paper.
- Blanchflower, D. G., Oswald, A. J., 1998. What makes an entrepreneur? *Journal of Labor Economics* 16 (1), 26–60.
- Chamberlin, J., Ricker-Gilbert, J., 2016. Participation in rural land rental markets in sub-saharan africa: Who benefits and by how much? evidence from malawi and zambia. *American Journal of Agricultural Economics* 98 (5), 1507–1528.
- Chari, A., Liu, E. M., Wang, S.-Y., Wang, Y., 2020. Property rights, land misallocation and agricultural efficiency in china. *The Review of Economic Studies*, forthcoming.

- Chatterji, A. K., Seamans, R. C., 2012. Entrepreneurial finance, credit cards, and race. *Journal of Financial Economics* 106 (1), 182–195.
- Corradin, S., Popov, A., 2015. House prices, home equity borrowing, and entrepreneurship. *The Review of Financial Studies* 28, 2399–2428.
- de Janvry, A., Emerick, K., Gonzalez-Navarro, M., Sadoulet, E., October 2015. Delinking land rights from land use: Certification and migration in Mexico. *American Economic Review* 105 (10), 3125–49.
- De Soto, H., 2000a. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*. London: Bantam.
- De Soto, H., 2000b. *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else*. New York: Basic Books.
- Deininger, K., Ali, D. A., Alemu, T., 2011. Impacts of land certification on tenure security, investment, and land market participation: Evidence from Ethiopia. *Land Economics* 87 (2), 312–334.
- Deininger, K., Jin, S., 2009. Securing property rights in transition: Lessons from implementation of China's rural land contracting law. *Journal of Economic Behavior & Organization* 70 (1), 22–38.
- Deininger, K., Jin, S., Xia, F., Huang, J., 2014. Moving off the farm: Land institutions to facilitate structural transformation and agricultural productivity growth in China. *World Development* 59, 505–520.
- Demurger, S., Xu, H., 2011. Return migrants: The rise of new entrepreneurs in rural China. *World Development* 39 (10), 1847–1861.

- Evans, D. S., Jovanovic, B., 1989. An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy* 97 (4), 808–827.
- Field, E., 05 2005. Property rights and investment in urban slums. *Journal of the European Economic Association* 3 (2-3), 279–290.
- Field, E., 2007. Entitled to work: Urban property rights and labor supply in peru. *The Quarterly Journal of Economics* 122 (4), 1561–1602.
- Galiani, S., Schargrodsky, E., 2010. Property rights for the poor: Effects of land titling. *Journal of Public Economics* 94 (9), 700–729.
- Hamilton, B. H., 2000. Does entrepreneurship pay? an empirical analysis of the returns to self-employment. *Journal of Political Economy* 108 (3), 604–631.
- Herkenhoff, K., Phillips, G. M., Cohen-Cole, E., 2021. The impact of consumer credit access on self-employment and entrepreneurship. *Journal of Financial Economics*.
- Hombert, J., Schoar, A., Sraer, D., Thesmar, D., 2020. Can unemployment insurance spur entrepreneurial activity? evidence from france. *The Journal of Finance* 75 (3), 1247–1285.
- Kihlstrom, R. E., Laffont, J.-J., 1979. A general equilibrium entrepreneurial theory of firm formation based on risk aversion. *Journal of Political Economy* 87 (4), 719–748.
- Kwon, S.-W., Heflin, C., Ruef, M., 2013. Community social capital and entrepreneurship. *American Sociological Review* 78 (6), 980–1008.
- Luo, B., 2018. 40-year reform of farmland institution in china: target, effort and the future. *China Agricultural Economic Review* 10 (1), 16–35.
- Moskowitz, T. J., Vissing-Jørgensen, A., September 2002. The returns to entrepreneurial investment: A private equity premium puzzle? *American Economic Review* 92 (4), 745–778.

- Neace, M., 1999. Entrepreneurs in emerging economies: Creating trust, social capital, and civil society. *The ANNALS of the American Academy of Political and Social Science* 565 (1), 148–161.
- Nieto, M., G.-Á. N., 2017. Housing collateral and entrepreneurship. *The Journal of Finance* 72 (1), 99–132.
- Putnam, R. D., 1992. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press.
- Putnam, R. D., 2001. *Bowling Alone: The Collapse and Revival of American Community*. Carmichael, CA: Touchstone Books.
- Saxenian, A., 1991. The origins and dynamics of production networks in silicon valley. *Research Policy* 20 (5), 423–437.
- Schmalz, M. C., Sraer, D. A., Thesmar, D., 2017. Housing collateral and entrepreneurship. *The Journal of Finance* 72 (1), 99–132.
- Sengupta, A., 2010. Social capital and entrepreneurship: An analysis of methodological issues. *Sociological Bulletin* 59 (3), 67–88.
- Stavis, B., 1982. *The Chinese agricultural economy*. Boulder, Colorado, USA, Westview Press/London, UK, Croom Helm, Ch. Rural institutions in China.
- Vendryes, T., 2010. Land rights in rural china since 1978. *China Perspectives* 4.
- Wang, H., Riedinger, J., Jin, S., 2015. Land documents, tenure security and land rental development: Panel evidence from china. *China Economic Review* 36, 220–235.
- Wang, S.-Y., 2012. Credit constraints, job mobility, and entrepreneurship: Evidence from a property reform in china. *The Review of Economics and Statistics* 94 (2), 532–551.

Zandberg, J., 2021. Family comes first: Reproductive health and the gender gap in entrepreneurship. *Journal of Financial Economics*.

Zhang, L., Cao, Y., Bai, Y., 2019. The impact of the land certificated program on the farmland rental market in rural china. *Journal of Rural Studies*, forthcoming.

Zhang, L., Cheng, W., Cheng, E., Wu, B., 2020. Does land titling improve credit access? quasi-experimental evidence from rural china. *Applied Economics* 52 (2), 227–241.

Table 1 Summary Statistics. This table reports summary statistics for all the data sets, including the business registry and accounting data, survey data for entrepreneurs, and county-level macroeconomic variables. The sample period is from 2010-2018. The survey data are summarized based on samples from year 2011, 2013, 2015 and 2017. Column 1 includes variable names, Column 2 includes the number of observations, Column 3 report the average (or mean) value, and Column 4 presents the standard deviation. Columns 5-7 provide the 25% percentile, median and 75% percentile. Values of accounting variables are reported in Chinese Yuan.

Variable	N	Mean	SD	P25	Median	P75
Panel A: No. of Business Creations (by year)						
Transportation, Education and Catering	359	481	280	263	436	636
Telecommunication, Construction and Environmental Management	221	447	266	275	468	509
Agriculture, Forestry, Animal husbandry and Fishery	47,781	217,734	57,659	221,906	231,743	250,949
Manufacturing	292	789	252	632	775	923
Wholesale and Retail	581	2242	381	1,784	2,418	2,547
Total	49,234	211,628	67,197	221,906	231,743	250,949
Panel B: Business Entry Rate (by year)						
Transportation, Education and Catering	359	0.376	0.093	0.312	0.404	0.451
Telecommunication, Construction and Environmental Management	221	0.377	0.092	0.330	0.398	0.455
Agriculture, Forestry, Animal husbandry and Fishery	47,781	0.471	0.018	0.472	0.478	0.478
Manufacturing	292	0.441	0.031	0.437	0.447	0.459
Wholesale and Retail	581	0.358	0.089	0.245	0.363	0.446
Total	49,234	0.466	0.034	0.471	0.478	0.478
Panel C: Business Accounting data						
No. of Employees	49,234	8.767	11.369	5.000	5.000	6.000
Total Assets	49,234	426,000	540,710	50,000	200,000	500,000
Sales Revenue	49,234	222,420	322,930	0.000	100,000	300,000
Total Liabilities	49,234	30,930	80,190	0.000	0.000	0.000
Total Equity	49,234	611,750	795,930	90,000	300,000	800,000
Panel D: Survey data (only for entrepreneurs)						
Proportion to the whole population	9,072	0.080	0.062	0	0	0
Age	9,072	44.71	10.53	38	44	51
Education						
High School	9,072	0.823	0.115	0	1	1
College	9,072	0.151	0.092	0	1	0
College above	9,072	0.026	0.004	0	1	0
Marital Status	9,072	0.914	0.263	1	1	1
Male	9,072	0.626	0.488	0	1	1
Health	9,072	3.283	1.057	2	3	4
Risk Aversion	9,072	1.472	1.125	1	1	3
(log) Liquid Asset	9,072	10.048	2.016	8.681	10.126	11.461
Financial Literacy	9,072	2.367	0.722	1	2	3
(log) Land Rental Income	2,019	6.896	1.475	5.927	6.727	8.002
Land Collateralized Loan	7,318	0.028	0.0154	0	0	0
Land Rent Out	6,044	0.084	0.337	0	0	0
Land Rent In	8,625	0.138	0.263	0	0	0
General Trust	7,137	3.98	1.272	3	4	5
Panel E: County-level macroeconomic variable						
(log) GDP per capita	25,452	19.19	1.95	19.08	19.49	19.93
(log) GDP growth	25,452	0.05	0.13	0.04	0.07	0.09
(log) Total public expenditure	25,452	12.77	0.53	12.42	12.77	13.13
(log) Total deposit balance	25,452	14.05	0.84	13.54	14.13	14.62
(log) Total loan balance	25,452	13.87	0.94	13.29	13.88	14.42

Table 2 Effect of Land Titling Reform on Business Creation (administrative data). This table presents the effect of land titling reform on business creation in a given county for a given year using business-level administrative data. Coefficients of the regressions are estimated with OLS. Robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	(log) No. of business created		(log) Business entry rate	
	(1)	(2)	(3)	(4)
PostTreated _t	0.039*** (0.010)	0.031*** (0.010)	0.042** (0.020)	0.037** (0.010)
(log) GDP per capital	0.006 (0.090)	-0.131 (0.150)	-0.046 (0.050)	-0.171 (0.180)
(log) GDP growth rate	0.117 (0.070)	0.021 (0.100)	-0.003 (0.070)	0.068 (0.130)
(log) Total public expenditure	0.208*** (0.060)	0.002 (0.070)	0.027 (0.070)	-0.202 (0.180)
(log) Total deposit balance	0.146** (0.070)	-0.065 (0.110)	0.068 (0.050)	0.048 (0.110)
(log) Total loan balance	-0.070 (0.050)	-0.159** (0.060)	-0.046 (0.040)	-0.099 (0.080)
No. of newly connected expressway	0.034 (0.021)	0.032 (0.025)	0.006 (0.005)	0.007 (0.006)
Year fixed effects	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes
County-specific Time Trends	No	Yes	No	Yes
R ²	0.835	0.928	0.263	0.507
Observations	25,452	25,452	25,452	25,452

Table 3 Effect of Land Titling Reform on Business Creation (survey data). This table presents the probit analysis of effect of land tilting reform on business creation in a given county for a given year using household-level survey data. Standard errors are reported in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	Business creation dummy		
	(1)	(2)	(3)
PostTreated _t	0.087** (0.035)	0.049* (0.027)	0.041* (0.024)
Age		-0.020*** (0.005)	-0.016*** (0.004)
High School		0.015 (0.025)	4.329 (3.038)
College		0.008 (0.027)	3.321** (0.115)
College above		0.009 (0.012)	1.332 (0.931)
Marital status		0.126 (0.245)	0.201 (0.356)
Male		0.126*** (0.022)	0.128*** (0.025)
Health		0.189*** (0.021)	0.192*** (0.023)
Risk taking		0.058* (0.031)	0.036 (0.037)
Log liquid asset		0.072* (0.041)	0.063* (0.036)
Year fixed effects	Yes	No	Yes
County fixed effects	Yes	No	Yes
County-specific Time Trends	Yes	No	Yes
R ²	0.070	0.127	0.126
Observations	10,216	10,216	10,216

Table 4 Effect of Land Titling Reform on Quality of New Businesses. This table presents the effect of land titling reform on quality of newly created businesses using business-level administrative data. Robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	(log) No. of Employees	(log) Total Asset	(log) Sales Revenue	(log) Total Liability	(log) Total Equity
	(1)	(2)	(3)	(4)	(5)
PostTreated _t	0.240** (0.110)	0.196* (0.100)	0.233*** (0.090)	-0.175* (0.090)	0.215** (0.090)
(log) GDP per capital	0.507 (1.090)	-0.020 (0.580)	0.242 (0.960)	0.078 (0.500)	0.309 (0.490)
(log) GDP growth rate	-1.167 (1.040)	0.356 (0.390)	-0.744 (0.940)	-0.559 (0.450)	0.743** (0.340)
(log) Total public expenditure	-0.532* (0.290)	0.118 (0.270)	-0.468* (0.250)	-0.488** (0.220)	-0.046 (0.210)
(log) Total deposit balance	-0.439 (0.740)	0.390 (0.500)	-0.499 (0.510)	-0.189 (0.250)	-0.098 (0.380)
(log) Total loan balance	0.257 (0.180)	-0.143 (0.300)	0.005 (0.150)	0.028 (0.360)	-0.149 (0.240)
No. of newly connected expressway	0.022 (0.018)	0.034 (0.029)	0.055 (0.043)	0.037 (0.022)	0.015 (0.017)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes
County-specific Time Trends	Yes	Yes	Yes	Yes	Yes
R ²	0.798	0.800	0.828	0.729	0.847
Observations	49,234	49,234	49,234	49,234	49,234

Table 5 Crowd-out Effect of Land Titling Reform on Quality of Incumbent Businesses.

This table presents the crowd-out effect of land titling reform on quality of incumbent businesses using business-level administrative data. Coefficients of the regressions are estimated with OLS. Robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	(log) No. of Employees	(log) Total Asset	(log) Sales Revenue	(log) Total Liability	(log) Total Equity
	(1)	(2)	(3)	(4)	(5)
PostTreated _t	0.008 (0.080)	0.001 (0.090)	0.012 (0.080)	0.137** (0.060)	0.077 (0.080)
(log) GDP per capital	-0.931* (0.560)	0.592 (0.570)	-0.767 (0.550)	-0.104 (0.470)	0.154 (0.440)
(log) GDP growth rate	-0.057 (0.450)	-1.006* (0.530)	0.206 (0.390)	0.222 (0.370)	0.019 (0.430)
(log) Total public expenditure	-0.152 (0.240)	-0.166 (0.220)	-0.308 (0.210)	-0.150 (0.140)	-0.340* (0.180)
(log) Total deposit balance	-0.425 (0.410)	-1.184** (0.560)	-0.488 (0.340)	-0.506 (0.590)	-0.650 (0.470)
(log) Total loan balance	0.149 (0.250)	-0.236 (0.230)	0.344* (0.190)	0.158 (0.210)	-0.162 (0.150)
No. of newly connected expressway	0.089 (0.077)	0.074 (0.066)	0.091 (0.083)	0.065 (0.051)	0.077 (0.064)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes
County-specific Time Trends	Yes	Yes	Yes	Yes	Yes
R ²	0.783	0.797	0.807	0.801	0.847
Observations	107,856	107,856	107,856	107,856	107,856

Table 6 Effect of Land Titling Reform on Characteristics of Entrepreneurs. This table presents the effect of land titling reform on entrepreneurs' characteristics using household-level survey data. Coefficients of the regressions are estimated with OLS. Robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	High School (1)	College (2)	College above (3)	Age (4)	Financial Literacy (5)	Professional farmers (6)	Urban (7)
PostTreated _{it}	0.021 (0.023)	0.015 (0.011)	0.020 (0.016)	-0.016 (0.014)	0.003 (0.002)	0.093*** (0.016)	0.127* (0.071)
Marital Status			-0.082 (0.117)	0.152 (0.138)	0.105 (0.122)	0.087 (0.068)	0.123 (0.135)
Gender			0.086** (0.036)	0.065* (0.028)	0.073*** (0.006)	0.121*** (0.036)	0.054 (0.046)
Health			0.024 (0.033)	0.083 (0.068)	0.026 (0.037)	0.034 (0.026)	0.011* (0.006)
(Log) Liquid Asset			0.047 (0.046)	0.024 (0.033)	0.038* (0.018)	(0.142***) (0.036)	0.089*** (0.009)
Year fixed effects	Yes	Yes	Yes	Yes	Yes		
County fixed effects	Yes	Yes	Yes	Yes	Yes		
County-specific Time Trends	Yes	Yes	Yes	Yes	Yes		
R ²	0.056	0.052	0.049	0.047	0.044		
Observations	9,072	9,072	9,072	9,072	9,072		

Table 7 How the land reform affects financial constraint? This table presents the effect of land titling reform on households' financial constraint using household-level survey data. Coefficients are estimated with OLS and robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	Land collateralized loan(dummy) (1)	(log) Land collateralized loan(amount) (2)	(log) Land rental income (3)	Entrepreneurship (4)	Entrepreneurship (5)	Entrepreneurship (6)
PostTreated _{it}	0.139 (0.136)	0.408 (0.303)	0.158*** (0.060)	0.087 (0.106) 0.016*** (0.003)	0.077 (0.154)	0.064*** (0.021)
PostTreated _{it} * bankloan(dummy)						
PostTreated _{it} * bankloan(amount)					0.027*** (0.005)	
PostTreated _{it} * landrentalincome						0.013** (0.006)
Age	-0.021*** (0.000)	0.034** (0.012)	-0.008*** (0.002)	-0.002** (0.000)	-0.002** (0.000)	-0.004* (0.002)
High School	0.003 (0.003)	0.048 (0.100)	0.012 (0.029)	-0.011 (0.009)	-0.007 (0.011)	-0.012 (0.007)
College	0.005 (0.004)	0.050 (0.108)	0.015 (0.033)	-0.014 (0.011)	-0.008 (0.010)	-0.009 (0.012)
College above	0.002 (0.003)	0.032 (0.045)	0.008 (0.012)	-0.009 (0.015)	-0.012 (0.009)	-0.006 (0.008)
Marital Status	-0.004 (0.003)	0.210 (0.465)	0.226** (0.088)	-0.087*** (0.037)	-0.167*** (0.062)	-0.069 (0.064)
Gender	0.003 (0.003)	-0.398 (0.236)	0.177** (0.068)	-0.034 (0.023)	-0.043 (0.029)	-0.028 (0.026)
Health	-0.005*** (0.001)	-0.748*** (0.119)	0.046* (0.026)	-0.006*** (0.001)	-0.028*** (0.009)	-0.009*** (0.002)
Log Liquid Asset	0.002 (0.002)	0.095* (0.056)	0.013 (0.012)	0.015 (0.013)	0.026 (0.024)	0.034 (0.023)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County-specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.081	0.056	0.074	0.097	0.076	0.083
Observations	7,318	2,019	4,269	7,318	2,019	4,269

Table 8 How the land reform affects land consolidation (land supply)? This table presents the effect of land titling reform on land consolidation and supply using household-level survey data. Coefficients are estimated with OLS and robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	Land rent in (1)	Land rent in (2)	Land rent in (3)	(log) Land lease area (4)	(log) Land lease area (5)	(log) Land lease area (6)	Entrepreneurship (7)
PostTreated _t	0.047*** (0.012)	0.039*** (0.009)	0.041*** (0.011)	0.137*** (0.041)	0.174*** (0.052)	0.131*** (0.022)	0.064*** (0.018)
PostTreated _t * <i>Urbanresident</i>		0.034*** (0.006)			0.163*** (0.046)		
PostTreated _t * <i>Professionalfarmer</i>			0.028*** (0.005)			0.056*** (0.014)	
PostTreated _t * <i>Landleasearea</i>							0.045*** (0.013)
Age	-0.035*** (0.000)	-0.002*** (0.000)	-0.003*** (0.000)	-0.019*** (0.003)	-0.033*** (0.008)	-0.003*** (0.000)	-0.005*** (0.000)
High School	-0.015*** (0.001)	-0.016*** (0.005)	-0.021*** (0.006)	0.147*** (0.040)	0.092 (0.087)	0.015*** (0.004)	-0.008 (0.006)
College	-0.012 (0.009)	-0.009 (0.015)	-0.015 (0.016)	0.112 (0.103)	0.076 (0.087)	0.015 (0.014)	-0.008 (0.016)
College above	-0.009 (0.009)	-0.008 (0.007)	-0.005 (0.006)	0.049 (0.040)	0.092 (0.087)	0.012 (0.014)	-0.007 (0.006)
Marital Status	0.069*** (0.015)	0.067*** (0.021)	0.042*** (0.014)	0.067*** (0.021)	0.039 (0.026)	0.063*** (0.019)	-0.068** (0.032)
Gender	0.057*** (0.015)	0.055*** (0.013)	0.037*** (0.008)	0.115 (0.142)	0.133 (0.121)	0.057 (0.046)	-0.022 (0.018)
Health	-0.007 (0.006)	-0.006 (0.005)	-0.004 (0.004)	-0.016*** (0.003)	-0.013*** (0.004)	-0.006*** (0.000)	-0.004*** (0.001)
Log Liquid Asset	0.005*** (0.000)	0.003*** (0.000)	0.006*** (0.001)	0.046** (0.019)	0.047* (0.019)	0.031** (0.015)	0.052*** (0.016)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County-specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.079	0.077	0.082	0.092	0.069	0.089	0.062
Observations	8,625	8,625	8,625	8,225	8,225	8,225	7,243

Table 9 How the land reform affects human capital (land rent-out activities)? This table presents the effect of land titling reform on human capitals through looking at land transfer activities. Coefficients are estimated with OLS and robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	Land rent out (1)	Land rent out (2)
PostTreated _{<i>t</i>}	0.082*** (0.017)	0.093*** (0.024)
PostTreated _{<i>t</i>} * <i>landarea(dummy)</i>		-0.019*** (0.005)
Age	0.008*** (0.002)	0.011*** (0.003)
High School	-0.003*** (0.000)	-0.008*** (0.001)
College	-0.002 (0.011)	-0.008 (0.023)
College above	-0.009 (0.023)	-0.005 (0.011)
Marital Status	0.013 (0.012)	-0.023*** (0.005)
Gender	0.014*** (0.003)	0.021*** (0.006)
Health	0.001 (0.000)	0.002** (0.000)
Log Liquid Asset	0.000 (0.000)	0.001 (0.000)
Year fixed effects	Yes	Yes
County fixed effects	Yes	Yes
County-specific Time Trends	Yes	Yes
R ²	0.077	0.089
Observations	6,044	6,044

Table 10 How the land reform affects human capital (occupational choices)? This table presents the effect of land titling reform on human capitals through looking at households' occupational choices using household-level survey data. Coefficients are estimated with OLS and robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	Local employed (1)	Local employed (2)	Migrate out (3)	Migrate out (4)	Entrepreneurship (5)	Entrepreneurship (6)
PostTreated _{<i>t</i>}	0.087*** (0.023)	0.116*** (0.024)	0.062* (0.033)	0.058* (0.031)	0.074*** (0.015)	0.071*** (0.017)
PostTreated _{<i>t</i>} * Landrentout		0.058*** (0.013)		0.016* (0.080)		0.009 (0.005)
Age	-0.028** (0.014)	-0.023** (0.012)	0.011*** (0.003)	0.013*** (0.003)	-0.014*** (0.003)	-0.016*** (0.004)
High School	0.021*** (0.005)	0.027*** (0.008)	0.015* (0.007)	0.019 (0.029)	0.124 (0.108)	0.191 (0.131)
College	0.019*** (0.005)	0.021** (0.008)	0.011 (0.007)	0.018 (0.023)	0.134 (0.115)	0.145 (0.187)
College above	0.015 (0.023)	0.019 (0.019)	0.011 (0.015)	0.021 (0.029)	0.127 (0.134)	0.109 (0.098)
Marital Status	0.031 (0.052)	0.044 (0.027)	0.104 (0.094)	0.176* (0.080)	0.164 (0.356)	0.201 (0.152)
Gender	0.022 (0.018)	0.017 (0.021)	-0.021 (0.032)	-0.012 (0.029)	0.116*** (0.021)	0.128*** (0.025)
Health	-0.023 (0.021)	-0.014 (0.013)	-0.021 (0.016)	-0.024 (0.023)	-0.055*** (0.016)	-0.052*** (0.013)
Log Liquid Asset	0.003 (0.002)	0.004 (0.003)	0.004 (0.003)	0.003 (0.005)	0.082*** (0.027)	0.074*** (0.021)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
County-specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes
R ²	0.069	0.075	0.063	0.072	0.083	0.088
Observations	10,907	10,907	10,907	10,907	7,292	7,292

Table 11 How the land reform affects social trust (social capital)? This table presents the effect of land titling reform on social trust using household-level survey data. Coefficients are estimated with OLS and robust standard errors clustered at the county level are in parentheses. ***, **, and * indicate significant at the 1, 5, and 10 percent levels, respectively.

	<u>Social trust</u> (1)	<u>Risk aversion</u> (2)	<u>Entrepreneurship</u> (3)	<u>Entrepreneurship</u> (4)
PostTreated _t	0.026*** (0.006)	-0.028** (0.012)	0.058*** (0.014)	0.052*** (0.013)
PostTreated _t * <i>change of social trust</i>			0.049*** (0.013)	
PostTreated _t * <i>change of risk aversion</i>				-0.026*** (0.007)
Age	0.008** (0.003)	0.012*** (0.001)	0.006 (0.005)	0.005 (0.004)
High School	0.028 (0.034)	0.071 (0.058)	0.022 (0.028)	0.037 (0.031)
College	0.015 (0.022)	0.071 (0.069)	0.018 (0.030)	0.034 (0.049)
College above	0.019 (0.022)	0.086 (0.089)	0.021 (0.025)	0.033 (0.042)
Marital Status	0.083 (0.071)	0.125** (0.052)	0.072 (0.066)	0.093 (0.088)
Gender	-0.069*** (0.013)	-0.150*** (0.033)	-0.053*** (0.011)	-0.092 (0.087)
Health	0.006 (0.008)	-0.017 (0.015)	0.003 (0.002)	-0.021 (0.019)
Log Liquid Asset	0.011 (0.009)	-0.009 (0.007)	0.004 (0.004)	0.002 (0.002)
Year fixed effects	Yes	Yes	Yes	Yes
County fixed effects	Yes	Yes	Yes	Yes
County-specific Time Trends	Yes	Yes	Yes	Yes
R ²	0.091	0.112	0.086	0.094
Observations	12,152	12,152	7,137	7,137

Figure 1 Roll-out of Land Titling Reform across Time and Space. This map plots the roll-out timing of land titling reform across space from the period of 2012-2018. The shaded areas highlighted in orange are counties where the land reform has been implemented.

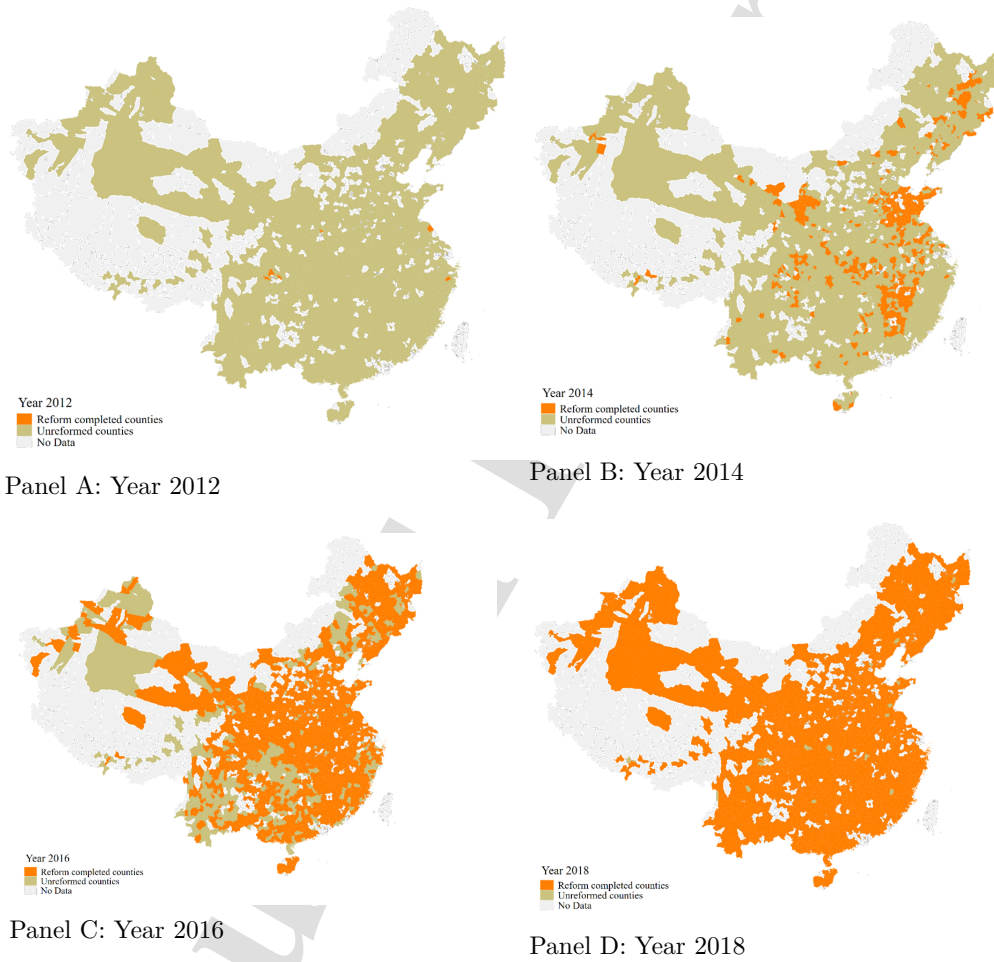


Figure 2 Monthly number of new business creations. This figure plots the 12-month moving average of the number of businesses created between 2008 and 2019, covering 2828 counties in rural China.

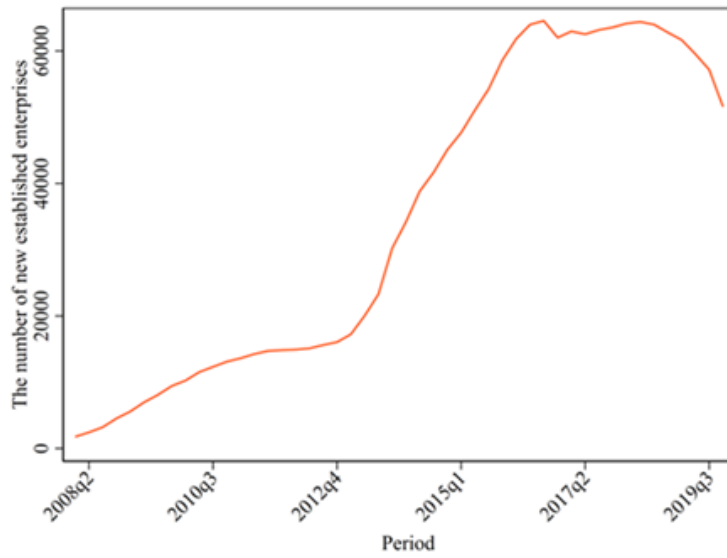
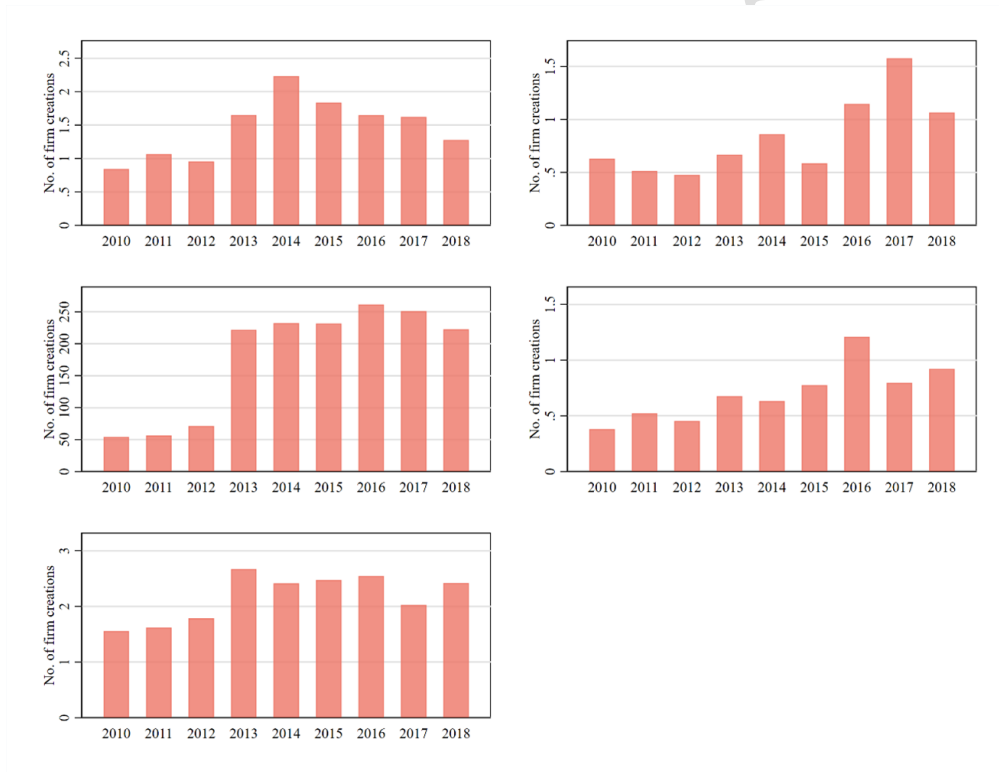


Figure 3 Yearly number of new business creations across industries. This figure plots the yearly number of businesses created between 2010 and 2018 across industries. The upper panel covers Transportation, Education and Catering industries (left) and Telecommunication, Construction and Environmental Management industries (right). The middle panel covers Agriculture, forestry, animal husbandry and fishery industries (left) and Manufacturing industry (right). The lower panel covers Wholesale and Retail industries. The numbers in y axis are scaled down by 1000.



Highlights

- Land property rights impact entrepreneurship in rural areas.
- Well-defined land property rights spurs entrepreneurship among professional and large farmers.
- Well-defined land property rights attract more urban residents to start new businesses in rural areas.
- The increase of credit access, land and labor availability and social trust served as the mechanisms.

Di Bu: Conceptualization, Methodology, Software, Writing- Original draft preparation

Yin Liao.: Data curation, Methodology, Software, Writing- Original draft preparation.