INHERITANCE, TENURE SECURITY AND THE FUNCTIONING OF RENTAL MARKETS IN RURAL PAKISTAN

by

Asalwe Edwige Lydie Tia

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ABSTRACT

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Asalwe Edwige Lydie Tia
University of Guelph, 2017

Co-advisors: Professor Brady Deaton
Professor Getu Hailu

This thesis provides empirical insights into the manner by which rural farmers in Pakistan access farmland using the Pakistan Rural Household Panel Survey round 3.5 conducted during 2014-2015. The results suggest that approximately 86% of owned land is inherited, 13% is purchased and the remaining 1% is acquired through other means (e.g., gifts, illegal settlements). Moreover, variation in ownership documentation does not appear to affect perceptions of tenure security for inherited land. An important component of this study is an exploration of rental arrangements. Forty percent of survey respondents rent-in farmland, half of these are landless. Hence, rental arrangements are an important pathway by which land is redistributed to enable agricultural production. Regression results also confirm that the rental market contributes to redistribute land from the land-rich to the land-poor despite signs of friction in the market. These findings are relevant to ongoing efforts to improve land governance and agricultural production in rural areas of Pakistan.

ACKNOWLEDGMENTS

I give all thanks to God in whom are all the treasures of wisdom and knowledge.

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I am thankful to the McCain Foundation for their financial support without which this thesis would not have been possible. I am also grateful to the International Food Policy Research Institute (IFPRI) particularly Hina Nazli and Asjad Tariq for sharing the data set and knowledge of Pakistan with me.

To my husband, Traore Adama Georges, thank you for all the sacrifices you have made to allow me to pursue my dreams miles across the Atlantic.

My eternal gratitude goes to my parents Mathias and Catherine who have sustained me and encouraged me to follow my own path.

I dedicate this thesis to all the Pakistani rural families who are working hard to put food on the table. May God bless your land and make it fruitful.

Totus tuus ego sum, et omnia mea tua sunt, María

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INTRODUCTION

In rural Pakistan about 60% of households are landless and landless households make up the poorest segments of rural Pakistan (Anwar, Qureshi and Ahmad, 2004). For these reasons, land access is a critical issue for food security, equity and national stability (USAID, 2010). In Pakistan, inheritance is the main pathway to land ownership, land is unequally distributed, and rental arrangements play an important role in providing access to land for production purposes. This paper makes three important contributions. First, the importance of inheritance is empirically documented. Second, I assess the extent to which perceptions of land tenure security vary by different types of land ownership documentation. Third, I empirically assess the equity and efficiency characteristics of the rental markets in rural Pakistan.

Since independence in 1947, the government of Pakistan has attempted three major land reform programs. Reforms were enacted in 1959, 1972 and 1977 to redistribute land to smallholders and landless tenants by expropriating large owners and imposing landholding ceilings. Naqvi, Khan and Chaudhry (1987) argue that these reforms were largely ineffective. Moreover, the 1972 and 1979 reforms were deemed unconstitutional by the Islamic court thus allowing some large owners to regain their possession (Herring and Chaudhry 1974, Hussain 1989). More recent efforts to address land issues in Pakistan have shifted from coercive redistribution to softer measures including the modernization of land records and administration (Ali 2014, USAID 2010). The expected benefits of these more recent policies will depend, in part, on the extent that they enhance tenure security and corollary economic outcomes (Besley, 1995).[1] One contribution of this research is to directly assess the extent to which households associate more formal ownership with enhanced tenure security.

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[1] An important aspect in the economic literature related to land is the issue of security of property rights. Enhanced tenure security is associated with the following four benefits: (1) improved access to credit markets, (2) increased incentives to make long-term investments (3) enhanced land market activity due to gains from trade (Besley 1995, De Soto 2000) and (4) labour market efficiency (Field 2007, Deininger 2015).

A great deal of research on Pakistan argues that land ownership is unequally distributed and that this unequal distribution has increased overtime. Mahmood (1993) finds evidence of increased concentration of operated land in Pakistan overtime. Mahmood (1993) shows that Gini coefficients for operated land rose from 0.514 in 1960 to 0.584 in 1991. Qureshi, Qureshi and Salam (2004) estimate that the Gini coefficient for land ownership has increased from 0.66 in 1972 to 0.75 in 2000. Qureshi et al. (2004) also argue that past reforms focused on land ceiling have discouraged sharecropping, thus leading to further concentration in operated landholding over time. Thus, the Gini coefficient for operated land has also increased from 0.53 in 1972 to 0.61 in 2000.

There is strong evidence that rural poverty is correlated with lack of access to land in Pakistan. According to Spielman, Malik, Dorosh and Ahmad (2016), 95% of the rural poor are landless or operate less than 5 acres of land. Although overall poverty rates have decreased in Pakistan overtime, the reduction was largely driven by urban areas (Chaudhry, Malik and Ashraf, 2006). Rural poverty is an enduring problem in Pakistan. About 61% of the population live in rural areas yet rural residents account for 80% of the poor in Pakistan (IFAD, 2016). Anwar et al. (2004) show evidence that the incidence of poverty is higher among landless and households with limited ownership of land. As a result, the unequal ownership of land has been widely blamed for the persistence of poverty in rural Pakistan.

This paper provides an empirical assessment of land distribution in Pakistan and assesses the extent to which rental arrangements redistribute land towards farmers with smaller land holdings. Despite recurrent concerns surrounding land distribution and its implications for equity and poverty in Pakistan, few studies assess the impact of rental arrangements on the reallocation of land for production purposes. To the best of my knowledge, Nabi (1985) and Kousar and Abdulai (2015)[2] are the only studies that make such an attempt. Nabi (1985) finds that rental arrangements transfer land from the land-rich to the land-poor. Kousar and Abdulai (2015) find that male headed households were more likely to self-cultivate their land whereas female-headed households were more likely to lease in land as cash renters.

The present study builds on the above literature and examines both the distributional role of farmland rental markets and assesses how well it is functioning using an empirical approach advanced by Bliss and Stern (1982) and Skoufias (1995). This empirical approach applies regression analysis to a unique data set from

[2] Kousar and Abdulai (2015) do so within the context of a broader study on the impact of off-farm work and tenancy contracts on land productivity and conservation in Punjab.

the Pakistan Rural Household Survey, Round 3.5, collected in 2014-15 by the International Food Policy Research Institute (IFPRI).

The rest of paper is organized as follows. First, I provide a brief description of Pakistan as well as the legal and institutional framework governing land tenure. Then, I present a conceptual model of the rental market and derive testable hypotheses regarding the effects of key endowment (e.g. land and household labour) on rental decisions. In the next section, I discuss the empirical methods used to examine the role of inheritance for land acquisition, to characterize the relationship between perceptions of tenure security and land documentation, and to assess the rental market equity and efficiency characteristics. The following section introduces the data. In the next section, I discuss the results before concluding. Throughout the remainder of this paper, I pay particular attention to regional differences.

PAKISTAN BACKGROUND

The Islamic Republic of Pakistan is the sixth most populated country in the world with a population estimated at 188.9 million and growing at 2.1% rate (World Bank database). Agriculture accounts for 19.8% of GDP and 42.3% of employment (Government of Pakistan, 2015). Growth in the sector was 2.4% between 2007 and 2014 (FAO country profile, 2015). Forty-five percent of the land is arable and is classified as semi-arid or arid. Most of the agricultural activity takes place along the Indus river basin which is the largest contiguous irrigation system in the world. This basin covers 65% of the territory and encompasses the provinces of Sindh and Punjab which account for 90% of farmland and agricultural production (FAO Aquastat survey 2011, USAID 2010). Food insecurity remains a pressing concern in Pakistan. The prevalence of undernourishment has decreased from 25.7% in 1990 to 22% in 2015 but the absolute number of undernourished people has increased by nearly 13 million during the same period (FAOSTAT).

The concentration of land ownership and the land administration system in Pakistan can be traced back to the British colonial rule (Pakistan gained independence from the British in 1947). During the colonial period, ownership rights over large tracts of land were granted by the British to local leaders in return for tax collection and political support especially in the provinces of Punjab and Sindh (Beringer 1962, Spielman et al. 2016). Land administration is the prerogative of provincial Boards of Revenue whose main purpose is to collect land taxes (Board of Revenue Act, 1957, Qazi 2006).

Pakistan is officially an Islamic country. The laws governing land are a mix of British inspired and Islamic laws (USAID 2010). Rules governing transfer of intergenerational land rights are based on religious affiliation. For Muslims who comprise over 95% of the population, inheritance rules are based on Islamic law or *Shariat* (Muslim Family Laws Ordinance 1961, The West Pakistan Muslim Personal Law Act 1962). Shares are allocated to relatives based on the closeness of the relationship and the gender. However in Pakistan, it is a common practice for females to concede their share to their male relatives (FAO Gender and Land Rights Database, 2017). Inheritance rules combined with population growth are associated with the shrinking of landholdings and the explosion of small farms observed over time in Pakistan (Spielman et al. 2016). The proportion of farms less than 5 acres has more than tripled over time from 19% in 1960 to 65% in 2010 (Pakistan Agricultural Censuses 1960 and 2010).

In Pakistan, land can be state-owned, privately-owned or held by a community. State-owned land is managed by the State and may be leased out to tenants (USAID 2010). Communal land is subject to customary law and is granted by the government to a community for joint purposes (UN Habitat 2011).

Privately owned land may be bought or sold freely. However, Qureshi et al. (2004) and Spielman et al. (2016) argue that the lack of formal titles and preemption rights create inefficiencies in the land sales market in Pakistan. The law of preemption gives priority to co-owners or neighbours as potential land buyers (UN Habitat 2011). Land registration follows very complex processes in Pakistan (USAID 2010). As a result, land registration is not very common (USAID 2010, UN Habitat 2011). The two most important processes are mutations *(Intilqaanama*) and registration (*Fard Malkiat*). Mutations are changes in the land records that are kept for administrative purposes (Ali and Nasir 2010). Mutations do not confer ownership rights though they constitute a step toward formal registration (UN Habitat 2011). *Fard Malkiat* are formal ownership documents which can be obtained through a separate process (Ali and Nasir 2010). I exploit this variation in land documentation to explore whether formal registration has any impact on households perceptions of tenure security and their decisions to participate in the rental markets.

The country administrative make up includes four provinces and four territories (See Annex A for a map of the country). The provinces namely Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan are home to 97% of the population. This study covers the largest agricultural provinces of Pakistan namely Punjab, Sindh and also Khyber Pakhtunkhwa (KPK). Other parts of the country are not included due to security issues which prevented the survey from being conducted in those areas. I use regional variations to explore differences in land tenure and rental market structure in Pakistan.

CONCEPTUAL FRAMEWORK

In this section, I present the theoretical model used to analyze the functioning of the rental market. The model will serve to generate testable hypotheses and to assess the allocative efficiency of the rental market.

Bliss and Stern (1982) conceptualize land transactions through tenancy markets as attempts by households to fill the gap between their endowment of owned land and their desired cultivated area given the amount of non-tradable, non-land resources available to the household. Thus, at the beginning of the agricultural season, a farming household decides how much to rent (in or out) based on its fixed endowments of family labour and oxen.

To explain how land is allocated through rental markets, I derive a pure exchange economy model with two agricultural households (I = 1, 2) and two factors of production (L and X). This theoretical model draws on models developed by Bliss and Stern (1982), Skoufias (1995), Otsuka (2007) and Holden et al (2009, Chapter 2). I assume that households are identical except in their initial endowment of land (L) and some other resource (X). Production technologies are the same and factor markets are competitive. The latter assumption which implies that there are no transaction costs will be relaxed later.

The individual household production functions are expressed as follows:

$y_i = F_i\,(L_i, X_i)$ where i =1, 2 represents the two households (1)

The joint output maximization problem is:

$Y = F_1\,(L_1, X_1) + F_2\,(L_2, X_2)$ (2)

The production function F (.) is strictly increasing in L and X ($F_L\ , F_X > 0$) and strictly concave ($F_{LL}\ , F_{XX} < 0, F_{LX}\ , F_{XL} > 0\ and\ F_{LX}\ = F_{XL}$).

Subject to the following endowment constraints:

$L_1 + L_2 = \bar{L}$ and $X_1 + X_2 = \bar{X}$ (3)

Substituting (3) in (2):

$Y = F_1\,(L_1, X_1) + F_2\,(\bar{L} - L_1, \bar{X} - X_1)$ (4)

The price of output is normalized to 1.

The first-order conditions yield the following relationships:

$\mathrm{VMPL}_1 = \mathrm{VMPL}_2$ (5)

$\mathrm{VMPX}_1 = \mathrm{VMPX}_2$ (6)

To achieve an efficient allocation of resources, the value of marginal products of the two households must be equal. The value of marginal product for an input represents the increase in output generated by each additional unit of input added. In cases where the values of marginal products differ, the two households would engage in factor transactions in order to maximize output. The direction of the exchanges will depend on their relative factor endowments.

Figure 1, below, illustrates a scenario where two households are endowed with different fixed levels of land but with the same level of the other resource. These initial levels of land endowment can be thought as determined exogenously by means of inheritance. Thus, households 1 and 2 start with $\bar{L}_1$ and $\bar{L}_2$ respectively. Let $\bar{X}_1 = \bar{X}_2$. As shown on the graph, household 1 is relatively land-poor and its value of marginal product for land (VMPL) is higher. The efficient allocation levels of landholdings denoted L_1* and L_2* is achieved when the land-rich household, in this case household 2, leases out land to household 1 who is land poor. Households trade up to the point where their VMPLs are equal. The amount of land transacted by household 1 and 2 are respectively R_1* and R_2*, such that $R_1* + R_2* = 0$, $R_1* > 0$ which is the amount rented in and $R_2* < 0$ is the amount rented out.

L_1*, L_2* is the equilibrium in the tenancy market when transaction costs are non-existent. In the presence of transaction costs the equilibrium conditions will differ. In the extreme case where transaction costs are prohibitively high, exchanges through the rental market may not be observed. In Figure 1, the actual amount of land rented in will be between 0 and R_1* depending on the level of transaction costs associated with renting in land. Whereas, the actual amount of land rented out will be between 0 and R_2* depending on the level of transaction costs associated with renting out land.

Several authors argue that other factor markets are incomplete (Bliss and Stern 1982, Skoufias 1995, Nabi 1985; Taslim 1992). For example, households might be reluctant to trade family labourers preferring to retain them on the family farm where they are more efficient. In this setting, an increase in household 2's endowment of X such that $\bar{X}_1 > \bar{X}_2$ leads to an upward shift in its value of marginal product of land from VMPL_2 to VMPL'_2 . Other factors that may affect the value of marginal product for land include ownership of farm assets such as tractors and oxen, farming ability and access to credit.

The following hypotheses are derived from the conceptual framework:

1. Households that are land-poor (with small initial land endowments) will tend to rent in land
2. Households with relatively more endowments in non-land resources will rent in more land

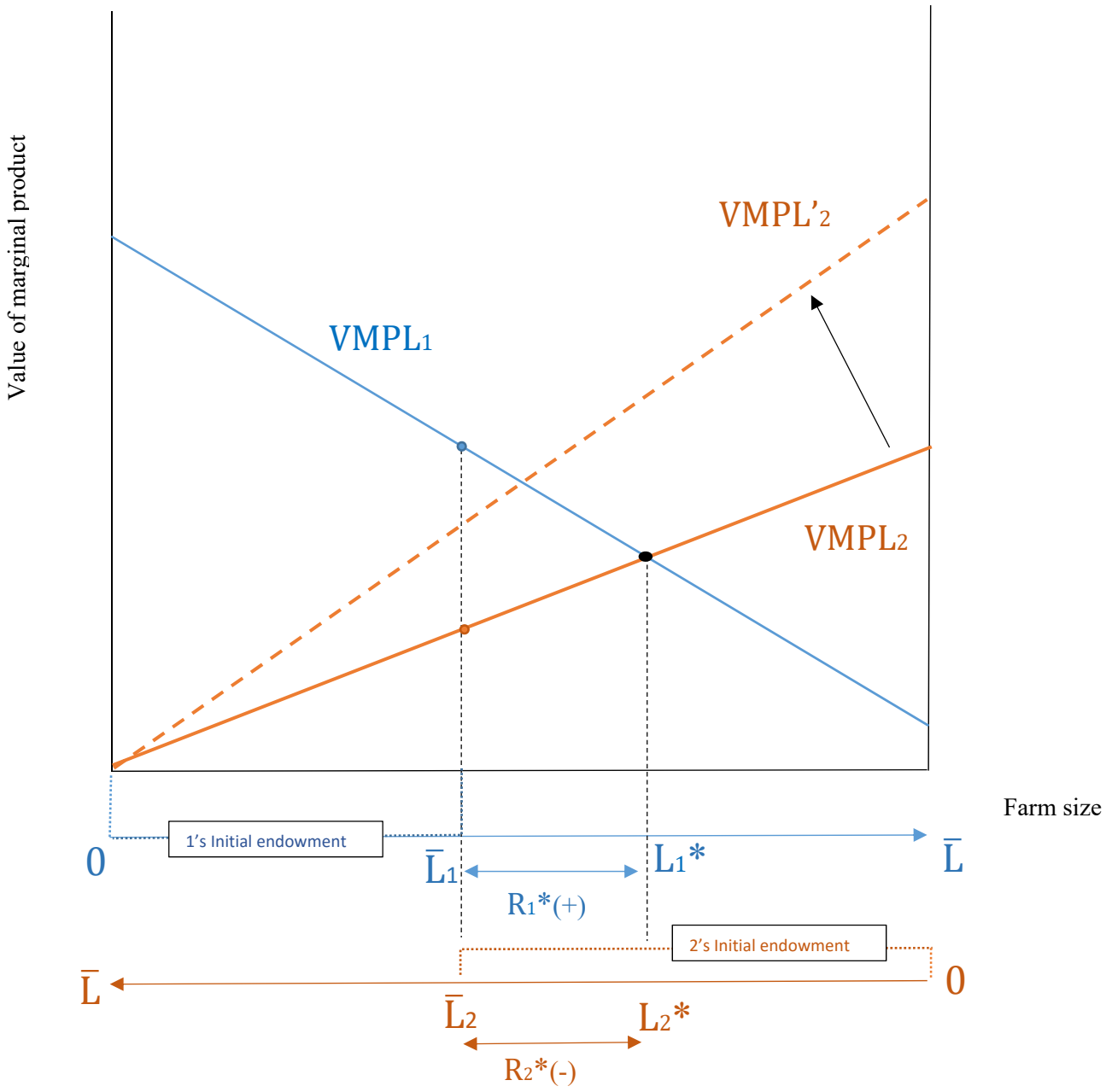


Figure 1[3]. Illustration of exchanges in the land rental market with two households

[3] $\bar{L}_1$, $\bar{L}_2$ represent household 1 and 2 initial land endowments exogenously determined through mechanisms such as inheritance

$\bar{L}$ is the total amount of land available in this two-household market: $\bar{L} = \bar{L}_1 + \bar{L}_2$

L_1^*, L_2^* are the landholding size achieved by household 1 and 2 after transactions in the rental market when transaction cost are inexistent

R_1^* is the amount leased in by household 1 under zero transaction costs

R_2^* is the amount leased out by household 2 under zero transaction costs

EMPIRICAL METHODS

I use survey data to assess the primary pathways to ownership in Pakistan. Then, I examine the survey data to identify the various forms of land ownership documentation and the associated perceptions of tenure security. In the context of the land rental markets I use Gini-coefficients to compare farmland owned and operated. Finally, I use regression analysis to assess the aforementioned hypothesis. The regression analysis examines mainly the relationship between land rented in and one's owned land. I refine the assessment by including additional covariates such as labour endowments, farm assets, while controlling for regional differences.

I operationalize the theoretical model of the rental market using the following regression equation for a representative household *i*:

$$R_i = f(\bar{L}_i, \mathbf{H}_i, \boldsymbol{A}_i, \mathbf{Z}_i) + \varepsilon_i \quad (7)$$

$$R_i = \beta_0 + \beta_1 \bar{L}_i + \beta_2 \mathbf{H}_i + \beta_3 \boldsymbol{A}_i + \beta_4 \mathbf{Z}_i + \varepsilon_i \quad (8)$$

Where R_i is the amount of land leased in by household *i*. $R_i > 0$ if the household leases in land, $R_i < 0$ if $R_i = 0$ if the household neither leases in nor leases out.

Equation 7 identifies the amount of land leased in, R_i, as a function of initial land $\bar{L}_i$, household characteristics $\mathbf{H}_i$, household assets $\boldsymbol{A}_i$ and geographical factors $\mathbf{Z}_i$. ε_i is the error term. For reasons discussed later, I only estimate the leasing-in equation. Thus, R_i is equal to zero for households that do not leased in land and greater than zero for net tenants. As we will see later, households tend not to lease in and lease out simultaneously. Landlords and tenants form two distinct categories in the sample.

Equation 8 is a more formal representation of the regression relations where β_s are parameters to be estimated. While each of the covariates are important to the analysis, previous literature has focused on β_1. $\bar{L}_i$.

$\bar{L}_i$ represents land owned by the household before transactions in the rental market (leasing in or leasing out). Owned land is defined as the total amount of land over which the household claims ownership rights regardless of the means of acquisition and registration status. β_1 captures the change in the amount of land rented resulting from variations in the amount of land owned. Based on the theoretical model, β_1 is expected

to be negative. Previous literature has interpreted β_1 as a measure of allocative efficiency for rental markets (Bliss and Stern 1982, Skoufias 1995). A value of -1 indicates perfectly efficient markets. A significant deviation of β_1 from -1 indicates the presence of transaction costs which prevent households from achieving their optimal landholding sizes through rental arrangements.

$\mathbf{H}_i$ denotes household characteristics including household size, number of adult males, number of adult females, number of children, age and gender of the household head. I expect household members to provide labour for family farms. Thus, larger households will have a higher demand for land. Everything else equal, the larger the household size the more land they are willing to rent in. Another reason why large households may rent in more land is the fact that their subsistence needs are larger especially for households with many children. Women participation in the rural labour market compared to men in Pakistan is low at 19.26% against 48.54% (GOP; Labour Force Survey 2012-13). Since men provide the bulk of farming labour, I hypothesize that the number of adult males will have a positive effect on the number of acres rented in. However, I anticipate that households with more female will rent in less land.

$\mathbf{A}_i$ represents farm assets that can influence the household's productivity such as ownership of oxen and tractors. I hypothesize that the presence of oxen and tractors will have a positive effect on the amount of land leased in. I use binary variables which take the value 1 if the household owns oxen or tractors and 0 otherwise.

$\mathbf{Z}_i$ represents location dummy variables including agro-climatic zones or districts. I include these variables to account for climatic, agricultural practices and cultural differences. I use Pinckney (1989) classification of Pakistan into 9 agro-climatic zones. These zones account for differences in rainfall, irrigation intensity, type of crops and cropping intensity.

I estimate the model using both Ordinary Least Squares (OLS) and Tobit specifications. When the dependent variable takes non-negative values and significant clustering of observations around zero is observed, OLS could potentially yield biased and inconsistent coefficients (Wooldridge 2012, pp.616-617). Under these conditions, the Tobit regression model is recommended. The problem with OLS is that it does not account for the censored nature of the dependent variable and can predict negative values. The Tobit model overcomes this issue by introducing a latent (unobserved) variable (y*) which is equal to the observed dependent variable (y) for positive values and to zero otherwise.

$$y_i = \begin{cases} y_i^* \ \ if \ \ y_i > 0 \\ 0 \ \ if \ \ y_i \leq 0 \end{cases}$$

The dataset used in this study meets the criteria set for the use of the Tobit model. Therefore, I mainly discuss the Tobit average partial effects but report the OLS estimates for comparison. I estimate the model using cross-sectional data. The next section presents the data used for this study.

DATA

This study relies on data from the Pakistan Rural Household Panel Survey round 3.5 (RHPS 3.5) conducted by the International Food Policy Research Institute (IFPRI) and its partner Innovative Development Strategies (IDS) as part of the Pakistan Strategy Support Program (PSSP). The PSSP is research-based program launched in 2011 and funded by the United States Agency for International Development (USAID) aimed at strengthening institutional capacity and policy making in Pakistan. The PSSP completed five rounds of household panel surveys in Pakistan designated as 1, 1.5, 2, 3 and 3.5. Round 1.5 and 3.5 are follow-up questionnaires administered to sub-samples of agricultural households who owned or operated land in Round 1 and Round 3. Round 3.5 includes households surveyed in round 1.5 in addition to households from four newly selected districts. The additional districts were included to achieve a better representation of the different agro-climatic zones of Pakistan.

Round 3.5 covers three out of four provinces of Pakistan namely Punjab, Sindh and Khyber Pakhtunkhwa (KPK), 23 districts and 92 *mouzas* or revenue villages. A revenue village is the smallest unit of the land administration system in Pakistan. Balochistan the fourth province of Pakistan was excluded from the survey due to security reasons. Certain districts of KPK were also excluded for the same reasons. According to Pinckney (1989), there are nine agro-climatic zones in Pakistan. Eight out of nine of these agro-climatic zones are represented in the survey. The missing agro-climatic zone being Balochistan.

The initial sampling for round 1 was performed using a multistage stratified method at the province, district and *mouza* level (IFPRI, 2014). Areas classified as urban or with population exceeding 25, 000 were excluded from the selection. Districts were selected using a probability proportionate to size method in order to give more weight to districts with a higher proportion of agricultural residents. Four *mouzas* were randomly selected in each district. *Mouzas* were then divided into enumeration blocks of maximum 200 households. One enumeration block was randomly selected in each *mouza.* In the final stage, 28 households were randomly chosen from the enumeration block.

The survey sample includes 1056 households owning or operating 1813 plots. The data set contains 1043 complete questionnaires and 12 partially completed questionnaires. 1029 households identify as agricultural households, agriculture being their main economic activity. The remaining 26 non-agricultural households are landowners who do not work on their land but lease it out or leave it idle. Out of the 1029 agricultural households, 1027 provided answers to all survey questions. I exclude one household and its two plots due

to recording errors. The distribution of households across provinces is the following 604 from Punjab, 343 from Sindh and 108 from KPK. The survey targeted household heads or other informed household members. Ninety-nine percent of respondents are males. Eighty-five percent of these respondents identify as household heads while the remaining are other household members (e.g. sons, daughters, spouses, parents, etc.). Only 23 out of 1055 households (2.3% of households) are headed by females.

The survey covers a wide range of topics including household characteristics, crop production, land management, farm assets, land inheritance and tenure security. Agricultural production activities are recorded for the Rabi season (2013-2014) and the Kharif season 2014. Table 1 and the figures below presents the land usage and the type crops for each season. The total cultivated area during Kharif and Rabi are respectively 3971.28 acres 4405.38 acres. In Rabi, more land is left fallow than in Kharif, 270.04 acres compared with 87.09 acres. Permanent crops cover 284.39 acres. Wheat, rice, cotton, sugarcane and sorghum are the main crops grown. Wheat is the dominant Rabi crop covering 71% of the entire cultivated area during that season. Lucern occupies the second place with 10% of Rabi cultivated area. Other crops grown in Rabi include oilseeds, vegetables, spices and tubers. Rice, cotton and sorghum cover respectively 45%, 22% and 10% of the area cultivated during Kharif. Other important Kharif crops include maize, millet and Gwaraseed. Sugarcane is grown year round on 83% of the area dedicated to permanent crops.

Table 1. Land use by season

Kharif	Rabi	Permanent crops	Fallow land in Rabi	Fallow land in Kharif
4058.37 acres	4675.42 acres	284.39 acres	270.04 acres	87.09 acres

Figure 2. Cultivated areas in Rabi by crops

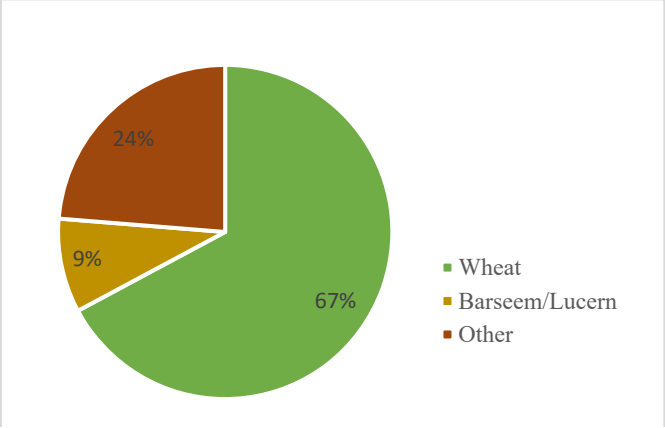


Figure 3. Cultivated areas in Kharif by crops

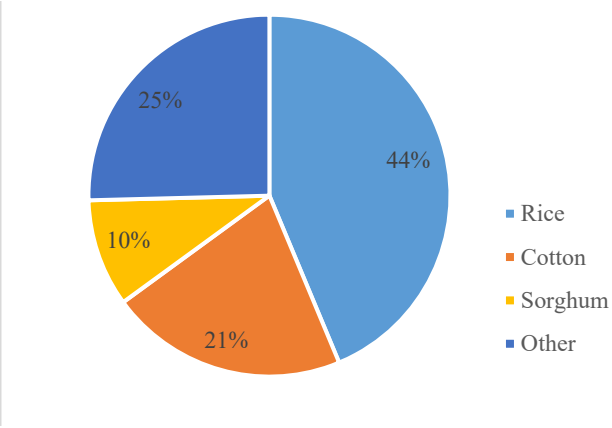
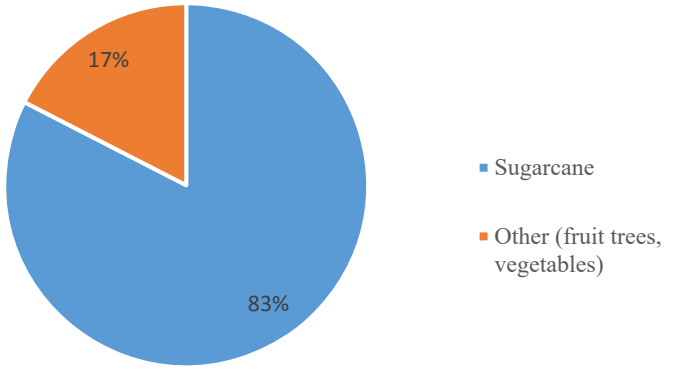


Figure 4. Cultivated area by type of permanent crops



RESULTS AND DISCUSSION

This section is structured as follows. First, I describe the various pathways to land ownership and their significance for land accumulation with a focus on inheritance and purchases. Second, I characterize the various forms of land documentation and their distribution across provinces. Third, I examine households' responses with regards to the security of their property rights. Next, I assess the impact of rental arrangements on equity by comparing the distributions of owned and operated land and Gini coefficients. Finally, I present some descriptive statistics of the variables used in the regression analysis and discuss the estimation results.

Pathways to land ownership

Inheritance is the primary mode of land acquisition in table 2, I find that 86% of the land owned in the sample is inherited. Thirteen percent of the land is purchased while the remaining 1% is acquired through gifts, illegal settlement or unidentified means. Inherited plots are slightly bigger than purchased plots. The average size of an inherited plot is 2.97 acres whereas the average size of a purchased plot is 2.26 acres.

Table 2. Modes of land acquisition for owned plots

			Plot size		
Plot type	Number of plots	Area (acres)	Average (acres)	Min (acres)	Max (acres)
Inheritance	1047 (79.74%)	3113.33 (86.05%)	2.97	0.02	70
Purchases	208 (15.84%)	470.54 13.01%	2.26	0.01	28
Gifts	24 (1.83%)	17.08 0.47%	0.71	0.13	4.17
Illegal settlement	26 (1.98%)	14.95 0.41%	0.57	0.19	1.5
Unclear	8 (0.61%)	2.13 0.06%	0.27	0.19	0.38
Total	1313 (100%	3618.03 100%			

In Table 3, I focus on the incidence of the two most important pathways to land ownership. Note that landless households and households with means of land procurement other than inheritance and purchases are not included in this analysis. I classify landowning households into four categories as follows. Marginal landowners are households whose total farm size is less than 5 acres. Small landowners own between 5 acres of land but less than 12.5 acres. Medium landowners have least 12.5 acres but less than 25 acres. Large landowners own farms with size equal to or greater than 25 acres. Out of 799 landowners, 638 households (80%) own inherited land only, 112 households (14%) own purchased land only, and 49 households (6 %) own both types of land. Though households rely primarily on inheritance for land capital formation, a significant number of households i.e. 112 households appear to compensate for the lack of inherited land through purchases in sales market. I observe that the incidence of purchases is highest among marginal landowners. Sixty-nine percent of households who own purchased parcels come from the group of marginal landowners. Small landowners are also important participants in sales market, they represent 23% of the households with land purchases. The incidence of purchases decreases as we move up to the bigger landowner groups. The fact that land purchases mainly occur for households who have limited access to land suggest that sales markets may also play a role in alleviating landholding inequality.

Table 3. Incidence of inheritance and purchases across farm size classes

	Mode of land acquisition			
Land ownership status	Inheritance only	Purchases only	Inheritance and Purchases	Total
Marginal landowners (less than 5 acres)	485 (70.60%)	111 (68.94%)	22 (44.90%)	618 (68.90%)
Small landowners (≥5 acres but <12.5 acres)	154 (22.42%)	38 (23.60%)	20 (40.82%)	212 (23.63%)
Medium landowners (≥12.5 but <25 acres)	34 (4.95%)	10 (6.21%)	6 (12.24%)	50 (5.57%)
Large landowners (≥25)	14 (2.04%)	2 (1.24%)	1 (2.04%)	17 (1.90%)
All	687 (100%)	161 (100%)	49 (100%)	897 (100%)

Land documentation

In this section I characterize the different forms of tenure arrangements by examining the documentation status of owned plots (owner-cultivated or leased out but not leased in). As shown in table 4, I find that land is rarely formally registered. Only 8% (109 out of 1313) of plots have formal ownership documents locally known as *Fard Malkia*t. Most plots are held semi-informally or informally. In 51% of cases, landowners have performed a mutation or *Intilqanaama*. Thirty-two percent of plots are held under customary rights without any form of registration or documentation. The incidence of plots under customary tenure varies between provinces. In KPK, 63% (134 out 213) of plots are held under customary rights whereas in Sindh and Punjab the incidence are 42% (94 out of 223) and 22% (194 out 877) respectively. Less common registration categories include power of attorney or *Mukhtiarnaama* and government grant documentation or *Khas Moqal* which account for 7% of plots. Note that 33 out 34 plots documented as government grants are located in Sindh. This appears to be the result government interventions to increase land access. Only 3% of plots do not have clearly defined registration status. The fact that most households do not complete the procedure for full ownership documentation is indicative that the costs of formal registration probably outweigh benefits. If property rights are traditionally well established there may be little need of titles to confirm rights over land.

Table 4. Distribution of plots by registration status

Registration status	Punjab	Sindh	KPK	All
Fard Malkiat (Legal title)	59	36	14	109 (8.30%)
Intiqaalnaama (Mutation)	596	19	60	675 (51.41%)
Mukhtiarnaama (power of attorney)	16	18	1	35 (2.67%)
Khas Moqal (government grant)	1	33	0	34 (2.59%)
Customary rights (undocumented)	194	94	134	422 (32.14%)
Unclear	11	23	4	38 (2.89%)
Total	877	223	213	1,313 (100%)

Perceptions of tenure security

In order to assess households' perceptions of their property rights I examine survey responses found in tables 5-7. The survey only includes questions regarding tenure security for inherited plots. Therefore, the analysis in this section is only limited to plots acquired through inheritance. Nonetheless, inheritance is the predominant form of land acquisition so this investigation is relevant for most households. In general, inherited land is divided into shares among heirs. Ninety-eight percent of plots were divided legally or through family arrangements. This is consistent with the increase in smallholdings observed between 1960 and 2010.

Landowners' rights over their shares are very secure. Nearly 95% of responses indicate that owners feel secure about their ownership rights. In less than 2% of cases owners feel somewhat secure while in 3.70% of cases they do not feel secure about their rights. The majority of respondents feel confident about their land alienation rights. For 88% of plots, owners claim that they do not require permission from anyone else to sell or rent their share of inheritance. However, 11% of plots cannot be alienated without permission. I explore further these plots that cannot be easily sold or leased by investigating their tenure documentation. Out of 119 plots 75 (63%) are held under customary arrangements. This suggests that customary arrangements may involve additional costs which could affect rental decisions.

Based on these responses I deduce that perceptions of tenure security on inherited plots are generally very strong despite the lack of formal registration. However, the perceptions presented mainly reflect the views of male heads of households on tenure security. Nonetheless, household heads probably play the most significant role in rental decisions. Therefore is no substantial evidence that tenure documentation can impact rental decisions at least based on this sample.

Table 5. Has the land of previous owner been divided amongst the owners?

Response	Observations	Percentage
Yes, legally	556	54.09
Yes, not legally but have some family arrangements	470	45.72
No	2	0.19
Total	1,028	100

Table 6. Do you feel secure in your ownership of this plot?

Response	Observations	Percentage
Yes, completely secure	972	94.55
Somewhat secure, but expect some issues	18	1.75
No	38	3.7
Total	1,028	100

Table 7. Do you require permission from anyone (other owners or anyone else) to sell, lease, or rent your share of this plot?

	Response		
Registration status	Yes	No	Total
Unclear	12	0	12
Intiqaalnaama	487	40	527
Fard Malkiat	73	3	76
Mukhtiarnaama	10	1	11
Customary rights (undocumented)	327	75	402
Total	909 (88.42%)	119 (11.58%)	1,028 (100%)

Land distribution and Gini coefficients

Table 8 shows the distribution of land by land ownership status. It shows that a significant number of households are landless. In total, 20% of households or 210 out of 1055 households own no land. Moreover, most households are marginal landowners. Fifty-nine percent of households own less than 5 acres of land. This finding is consistent with figures from the agricultural census of Pakistan. In 2010, the proportion of farms less than 5 acres was estimated at 65% (Pakistan Agricultural Census, 2010). Small landowners make up 16% of the sample. Only 5% of households fall into the medium and large landowners groups.

Table 8 also gives some indications on the identity of rental market participants and the equity effects of rental arrangements. A comparison of landholding sizes pre- and post- rental market participation (owned vs. operated land) reveals that rental markets have a positive impact on operated landholdings for the bottom three ownership categories (landless, marginal and small). Marginal landowners more than double their farm size. They scale up their farm size from 1.7 acres on average to 3.86 acres. The increase is more significant for landless households who operate on average 4.65 acres. Whereas, the improvement for small landowners is moderate. They own on average 7.30 acre but operate 8.28 acres. Conversely, landholding

sizes for medium and large landowners decrease after rental market participation. Medium and large landowners respectively lose on average 2.31 acres and 9.85 acres through rental arrangements. This contrasting behaviour between the three lowest categories and two highest categories allow us to characterize the first group as most likely tenants and the latter as most likely to be landlords.

Table 8. Sample distribution by land ownership status

Land ownership status	Number of households	Averages		
		Owned land (acres)	Operated land (acres)	Net rented in (acres)
Landless	210 (19.91%)	0	4.65	4.65
Marginal landowners (less than 5 acres)	621 (58.87%)	1.70	3.86	2.16
Small landowners (≥5 acres but <12.5 acres)	172 (16.30%)	7.30	8.28	0.98
Medium landowners (≥12.5 but <25 acres)	38 (3.60%)	17.32	15.01	-2.31
Large landowners (≥25)	15 (1.42%)	43.88	34.03	-9.85
All	1055 (100%)			

Table 9-10 give more details on landholding sizes and land distribution. Landholdings tend to be small. An average landowning household has 4.25 acres of land. However, 50% of households own less than 2 acres as shown by the median. In addition, farm sizes vary over a wide range between 0.03 for the smallest farm acres and 80 acres for the biggest farm. These disparities indicate that land distribution across households is skewed. Nonetheless, the figures for operated land are larger suggesting that rental arrangements contribute to redistribution of land across households. Operated farms have an average size of 5.12 acres and a median of 3 acres.

Table 9. Distribution of owned and operated farms in acres

	Mean size (acres)	Minimum size (acres)	Maximum size (acres)	Median size (acres)	Observations
Owned land	4.25	0.03	80	2	N=845
Operated land	5.12	0.06	80	3	N=1048

In order to further assess land inequality and the impact of rental arrangements on equity, I generate Lorenz curves[4] and calculate land Gini coefficients for the distribution of owned and operated land. The Lorenz

[4] Lorenz curves in this study are constructed using the Generalized Lorenz Curves concept which scales up the ordinary Lorenz curve by the mean of the distribution (Thistle 1989, Jenkins & Van Kerm 2008).

curves in figure 5 show the cumulative proportion of total land area owned (in red) and total land operated (in green) plotted against the cumulative proportion of the households in the sample. Households are ranked based on their landholding size from lowest to greatest. The 45-degree line denotes the line of perfect equality in landholdings. The degree to which the Lorenz curve falls below the 45-degree line indicates the degree of inequality. The Lorenz curve for operated land is clearly above the Lorenz curve for owned land i.e. closer to the line of perfect equality. Therefore, the distribution of operated land is less unequal than that of owned land.

The Gini coefficient[5] is a measure of inequality derived from the Lorenz curve. It is equal to the ratio of the area enclosed by the 45-degree line and the Lorenz curve and the total area below the 45-degree line. A value of 0 signifies perfect equality while 1 signifies perfect inequality. Table 10 displays the values of Gini coefficients calculated for the sample. The overall Gini coefficient for owned land is high at 0.673. The distribution of operated land appears to be less unequal with a Gini coefficient of 0.522. However, there is some regional variation. In Punjab and KPK, the Gini coefficients for land ownership are respectively 0.612 and 0.591 whereas in Sindh it is higher at 0.734. There is also a significant decrease in the Gini coefficient for operated land in Sindh to 0.362. In Punjab, the distribution of operated land appears to be more egalitarian with a Gini coefficient of 0.557. In KPK, the Gini coefficient for owned and operated land are essentially the same.

The estimates for Gini coefficients in this sample are generally consistent with previous literature. Based on the Pakistan Agricultural census for the year 2000, Qureshi et al. (2004) estimated ownership Gini coefficients of 0.71, 0.67 and 0.86 for Punjab, Sindh and KPK respectively. They estimated Gini coefficients for operated land to be 0.57, 0.56 and 0.63 in Punjab, Sindh and KPK respectively. Anwar et al. (2004) reported the following Gini coefficients 0.6339, 0.5072 and 0.5893 for owned land in Punjab, Sindh and KPK respectively. The aforementioned studies use samples that include other territories therefore their overall Gini coefficients are not comparable with the present study.

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[5] The Gini coefficients are estimated using the formula given by Jenkins (2008):

$$G = 1 + \frac{1}{N} - \left[\frac{2}{m.N^2}\right].\left[\sum_{i=1}^{N}(N - i + 1)\ .y_i\right]$$

Where N denotes the total number of households, m is the average amount of land owned (or operated) for the sample and y_i is the amount of land owned (or operated) by household *i*. Households are ordered in an ascending manner (i=1 through N) based on their level of y_i.

Table 10. Gini coefficients by province*

	Punjab	Sindh	KPK	All
Owned land	0.612	0.734	0.591	0.673
Operated land	0.557	0.362	0.584	0.522

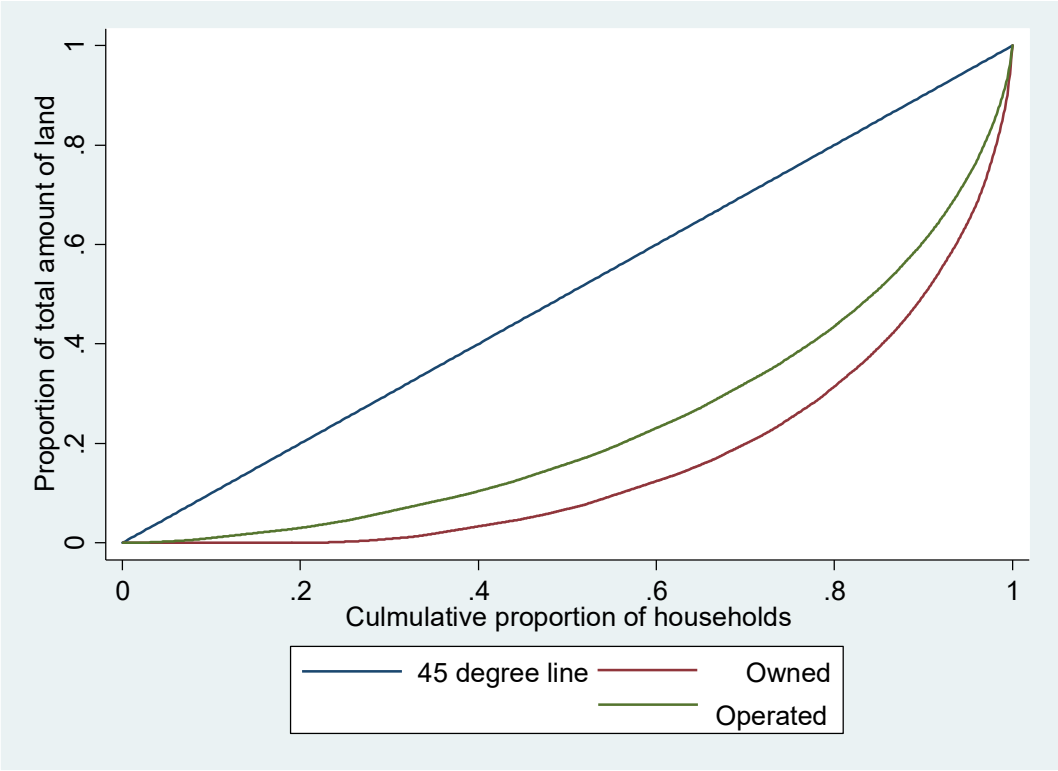
*Gini calculations include landless households

The value of the Gini for operated land in Sindh deviates significantly from the Qureshi et al. (2004) estimation. This could be due to the fact this sample includes a high proportion of landless households for Sindh. Table 11 shows the distribution of landless households across provinces. Out of 210 landless households, 156 households or 74% are from Sindh. They also make up 45% of the households surveyed in Sindh while the proportion of landless households in Punjab and KPK are only 8% and 4% respectively. Note also that landless households were the biggest buyers of land in the rental market with an average rented in area of 4.65 acres. The high incidence of landless tenants and the intensity of their activity in the rental market help explain the large difference between owned and operated land Gini coefficients obtained for Sindh. The prevalence of landlessness in Sindh is reported by Anwar et al. (2004) who estimated that 86% of households in Sindh are landless. This figure is the highest among all Pakistan provinces and includes households who do not work in agriculture.

Table 11. Distribution of landless households by province

Province	Number of households	Total number of landless households	Proportion of landless households
Punjab	604	50	8.28%
Sindh	343	156	45.48%
KPK	108	4	3.70%
Total	1055	210	19.90%

Figure 5. Lorenz curves for owned and operated land



Regression Analysis: Descriptive Statistics and Estimation Results

As shown in Table 12, sharecropping and fixed cash rentals are the prevailing forms of rental contracts. Overall, sharecropping is the dominant form of contracting. 58% of the plots (shared in or out) are under such contracts whereas 42% of plots are under fixed cash rentals. However, there is regional variation. The proportion of sharecropping contracts is respectively 98%, 48% and 23% for Sindh, KPK and Punjab. As mentioned earlier the Sindh sub-sample contains a very high proportion of landless households. These households rely on sharecropping contracts to access land for production. The predominance of sharecropping in Sindh is a historical phenomenon reported by previous literature on Pakistan (Anwar et al. 2004, Jacoby and Mansuri 2006, Mellor and Malick 2017). Jacoby and Mansuri (2006) used similar survey data from the Pakistan rural household survey (PHRS 2001) and found that approximately two-thirds of plots were under sharecropping contracts in Sindh. In terms of land area, 55% of the land is under the owner's management while 38% is leased in. Only 7% is found to be leased out.

Table 12. Distribution of plots by tenancy status

Tenancy status	Number of plots by province				Total area (acres)
	Punjab	Sindh	KPK	All	
Owner-cultivated	802	221	193	1,216 (67.15%)	3184.42 (54.88%)
Rented in (cash)	149	6	27	182 (10.05%)	903.38 (15.57%)
Rented out (cash)	60	1	6	67 (3.70%)	391.51 (6.75%)
Shared in	51	245	20	316 (17.45%)	1280.64 (22.07%)
Shared out	12	1	11	24 (1.33%)	35.21 (0.61%)
Mortgaged and being self-cultivated	3	0	0	3 (0.17%)	5 (0.09%)
Mortgaged but not being self-cultivated	0	0	3	3 (0.17%)	1.89 (0.03%)
All	1,077	474	260	1,811 (100%)	5802.05 (100%)

Table 13 shows that more than half of households cultivate their own land and do not participate in rental arrangements. 538 households or 52% of households identify themselves as owner-cultivators. The remaining 48% of households are active participants in rental markets: 431 households lease in land whereas 58 households lease out land. I classify households as net tenants if they lease in more than they lease out and as net landlords if they lease out more than they lease. There is a clear distinction between tenants and landlords since only four households simultaneously lease in and lease out land. Households who neither lease in nor lease out are considered non-participants. Only the 1027 agricultural households who have provided responses to all survey questions are considered for the regression analysis.

As shown below, tenants operate approximately 2 acres more than non-participants while landlords appear to operate farms bigger than non-participants and tenants. Tenants tend to be land-poor with only 1.16 acres of owned land on average whereas non-participants and landlords tend to be land-rich with owned farms averaging 4.29 acres and 12.34 acres respectively. This gives some indications that the rental market is transferring land from the land-rich to the land-poor. However, due to the small number of landlords in this sample, the results as they refer to the landlord sub-group should be taken with caution. There are no significant variations between the three groups in terms of household size and composition except that female-headed households tend not participate in the market. The number of adult males, females and

children for the three rental categories do not deviate considerably from the sample average. The incidence of tractors is significantly higher for non-participants and landlords than tenants. However, the use of draught animals is not very significant in the sample and does not differ based on rental market status.

Table 13: Household characteristics by rental market status

	Non-participants	Tenants	Landlords	All
Land operated (acres)	4.286	6.181	6.623	5.213
Land owned (acres)	4.286	1.158	12.339	3.428
Household size (number)	6.663	6.997	7.741	6.864
Number of adult males (>14 years)	2.141	2.090	2.362	2.132
Number of adult females (>14 years)	2.190	1.932	2.431	2.095
Number of children (<14 years)	2.332	2.993	2.948	2.644
Tractor ownership (yes=1)	0.108	0.090	0.138	0.102
Bullock ownership (yes=1)	0.013	0.012	0.017	0.013
Number of observations	538	431	58	1027

Table 14 below gives the estimates from the OLS and Tobit estimations. Results for both models are reported for the purpose of comparison, only the Tobit partial effects (column 3) will be discussed. Overall the results strongly support the two hypotheses of this paper by showing that land-poor households and relatively labour-abundant households tend to rent in more land. The coefficient for *land owned* has a negative sign and is statistically significant at the 1% level. This means that households with larger land endowments are less likely to lease in land in other words households with smaller land endowments are more likely to lease in land. If given an additional acre of land owned, an average household would decrease the amount it leases in by -0.32 acres. This number is not without economic significance given the high proportion of smallholdings and the prevalence of landlessness in Pakistan.

The regression results show that the household size positively influences the decision to lease in land. On average, an additional household member would increase the amount leased in by 0.12 acres. I also explore heterogeneity in household labour by running the regression with the adult males, females and children instead of the number of household members. This change does not affect the coefficients for other variables. The results for this regression (See Table 19 in the Appendix) show that *the number of adult males* and *the number of children* have a positive impact on the amount of land leased in. An additional male adult increases land leased in by 0.22 acres. An additional child increases the amount leased in by 0.17. Overall these results suggests that rental markets provide a means to adjust landholdings to family surplus labour. However, the number of female adults, as well as the age and gender of the head of the

household, are not a statistically significant factors influencing leasing in decisions. Tractor ownership is highly significant. Its coefficient indicates that a household with a tractor would lease in 2.5 acres more than a household without a tractor. These results hold with an OLS estimation. The major discrepancy is with the coefficient of *Land owned* which is significantly lower at -0.14. Results are also robust to using district fixed effects instead of agro-climatic effects (See Table 18 in Appendix).

Table 14: Regression results with leased in (acres) as the dependent variable

	(1) OLS	(2) Tobit APE
Land owned	-0.145***	-0.317***
	(0.0257)	(0.0535)
Number of household members	0.156***	0.121***
	(0.0482)	(0.0346)
Head of household gender	-0.309	-0.575
	(0.558)	(0.721)
Household head age (years)	0.0276	0.0412
	(0.0578)	(0.0389)
Household head age squared (years)	-0.000208	-0.000376
	(0.000604)	(0.000400)
Bullock ownership (yes=1)	-0.372	-0.399
	(0.678)	(0.673)
Tractor ownership (yes=1)	3.469***	2.534***
	(0.812)	(0.481)
Rice/wheat Punjab	0.00518	0.274
	(0.565)	(0.397)
Low Intensity Punjab	3.331***	2.285***
	(0.988)	(0.545)
Cotton/Wheat Punjab	0.112	-0.0525
	(0.597)	(0.412)
Barani Punjab	-1.266**	-1.985***
	(0.534)	(0.567)
Mixed Punjab	-0.124	-0.312
	(0.541)	(0.421)
Rice/Other Sindh	1.167**	1.137***
	(0.509)	(0.328)
Cotton/Wheat Sindh	1.734***	1.238***
	(0.563)	(0.351)
Constant	-0.219	
	(1.341)	
Observations	1027	1027

Note: Asterisks (***, **, *) indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Robust standard errors are reported in parentheses.
*Yes=1 identifies households who indicate using their own tractor or bullocks for cultivation.
KPK is the omitted agro-climatic zone.
Colum 3 reports conditional average partial effects. Unconditional average partial effect for land owned is – 0.390.

As mentioned previously, the coefficient on *Land owned* is used in the literature as a measure of the allocative efficiency of the rental market. A deviation from -1 indicates that there are significant transactions which prevent households from achieving their optimal operated landholding sizes. Thus adjustments between the household initial endowment and its optimal landholding are incomplete. Based on their non-tradable resources, households would like to lease in more land but they are unable to do so. The coefficient on *land owned* found in this study (-0.32) is significantly different from -1 which indicates that rental markets are not allocating land efficiently.

The table below shows a summary of the coefficients for *land owned* from selected previous studies. The coefficients from Bliss and Stern (1982) and Nabi (1985) are not entirely comparable with this study since they assess the demand and supply side of the market simultaneously whereas this study only assesses the demand side. As shown below, this coefficient takes a wide range of values in the literature. For recent studies conducted in conducted in Africa, the coefficient is found to be closer to zero. Earlier studies in South Asia found values relatively closer to -1. For instance, Skoufias (1995) found a value of -0.68 in India.

Table 15. Summary of coefficients for *land owned* from selected past studies

Study	Location	Variable	Model	Coefficient
Bliss and Stern (1982)	Palanpur, Indian	Net land leased in (land leased in minus land leased out)	OLS	- 0.78
Nabi (1985)	4 villages, Punjab, Pakistan	Net land leased in (land leased in minus land leased out)	OLS	-0.76,0.00013,-0.29, -0.35
Skoufias (1995)	4 villages, India	Land leased in	Tobit	-0.68
Yamano et al. (2009)	100 communities, Kenya	Land leased in	Tobit ; Double-hurdle	-0.11;-0.2
Chamberlin and Ricker-Gilbert (2016)	Malawi; Zambia	Land leased in	Tobit	- 0.022; - 0.0059

Adapted from Holden et al (2009)

In order to explore regional differences in the rental market, I disaggregated the Tobit partial effects by province as shown in Table 16. For all the provinces, the sign of the coefficients for all the variables are consistent with the overall results. In terms of magnitude, the coefficient for *Land owned* in Punjab and KPK are respectively -0.235 and -0.260. These values are similar to the overall regression. However, in

Sindh the coefficient for *land owned* is unexpectedly high at -1.323. This result is not consistent with the theory advanced by Skoufias (1995) which suggests that the coefficient for *land owned* should be between 0 and -1. I suspect that the high proportion of landless in the Sindh sample explains this situation. Using a linear estimation method I get a coefficient of -0.610. An alternative explanation is that the model assumes linear transaction costs. But in reality transaction costs could be non-linear. Holden et al (2009, Chapter 2) show that when transaction costs are convex the coefficient may take values larger than 1 in absolute value.

The coefficient for *number of adult males* is higher in Punjab than in the other two provinces. Punjab is also the only province where tractor ownership is statistically significant. The *number of children* though significant in Punjab has the lowest coefficient of all. The coefficient on *land owned* is also smaller than in other provinces. This suggests that land ownership constraints play a relatively smaller role in land leasing in decisions in Punjab. Households in Punjab may be using rental markets to improve factor ratio imbalances.

For KPK, *Land owned* is only statistically significant at 10%. Whereas the *number of children* has the largest coefficient in KPK, *number of adult males* is not statistically significant. Bullock ownership has a high statistical significance in KPK whereas it is not significant in the other provinces. This suggests that farming in KPK could be relatively more oxen-based. Thus, households who have oxen take advantage of their increased capacity to farm by lease in more land.

The high coefficients for *number of children* in Sindh and particularly in KPK may indicate a greater pressure for survival in these regions. The incidence of poverty and food insecurity are higher in these two provinces (Anwar et al 2004, WFP 2009). Given the limited economic opportunities in Sindh and KPK these results could suggest that households with more children may feel a greater pressure to lease in land for sustenance but also a greater need for children participation in farming tasks.

Table 16: Partial effects from the Tobit estimation by province with area leased in (acres) as the dependent variable

	Punjab	Sindh	KPK
Land owned (acres)	-0.235***	-1.323***	-0.260*
	(0.0566)	(0.203)	(0.152)
Number of adult males (> 14 years)	0.345**	0.275**	0.138
	(0.142)	(0.108)	(0.245)
Number of adult females (>14 years)	0.0278	-0.164	-0.341
	(0.109)	(0.123)	(0.318)
Number of children (<14 years)	0.125	0.225***	0.529***
	(0.0802)	(0.0617)	(0.185)
Head age (years)	-0.0101	0.00979	0.00967
	(0.0118)	(0.00829)	(0.0247)
Bullock ownership (yes=1)	-0.578	N/A	3.642***
	(0.836)	N/A	(0.857)
Tractor ownership (yes=1)	2.174***	1.058	0.917
	(0.541)	(1.552)	(0.974)
Observations	584	340	103

Note: Asterisks (***, **, *) indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
N/A: There are 0 observations for bullock ownership in Sindh.
Robust standard errors are reported in parentheses.
*Yes=1 identifies households who indicate using their own tractor or bullocks for cultivation.

CONCLUSION

Relying on micro-level data from households in three provinces in Pakistan, I examine the structure of farmland ownership, perceptions of tenure security, land distribution, and the distributive influence of the farmland rental market. Consistent with previous literature, I find that inheritance is the primary pathway to property. Importantly, irrespective of how the land is formally recognized – e.g., formally titled, registered, or communally owned – survey respondents perceive themselves as tenure secure with respect to their rights to use, rent, or alienate land. This finding has an important implication for current government efforts to register land: given the already strong perceptions of tenure security, registration of land is unlikely to engender greater levels of tenure security and associated increases in farm level investment. One policy implication of this finding is that registration efforts may benefit from focusing initial efforts on regions or areas where perceptions of tenure security are more attenuated: e.g., perhaps in farming regions near urbanizing areas. Moreover, this study suggests that rental markets promote landholding equity for production purposes. However, there are significant obstacles to the smooth functioning of these markets in Pakistan. More research is needed to confirm that the nature of the transactions costs households face in the rental market. Finally, future research can work to identify factors that allow landless farmers to gain greater access to the rental market.

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APPENDIX

Table 17. Summary description of Pakistan agro-climatic zones

Agro-climatic zones	Description	Districts	Households
Rice/Wheat Punjab	Well irrigated and fertile soil; used to cultivate water intensive Basmati rice during Kharif and wheat during Rabi	Gujranwala, Kasur, Sheikhupura	136
Cotton/Wheat Punjab	Cotton belt of Punjab. Favourable climate for cotton (dry sunny days).	Bahawal Nagar, Khanewal, Multan, Rahim Yar Khan, Vehari	207
Mixed Punjab	Mix of cotton, sugarcane (particularly in Faisalabad), maize, and pulses grown in this region. Well irrigated by the tributaries of the Indus River	Faisalabad, Jhang, Sardogha	117
Low Intensity Punjab	Less developed irrigation with rugged terrain. Hardier crops such as pulses or maize are grown here together with wheat.	Bakkhar	73
Barani Punjab	Rain-fed subsistence farming agriculture. The rugged uneven terrain makes cultivation and irrigation difficult	Attock, Chawal	71
Cotton/Wheat Sindh	These agriculturally rich districts, irrigated by the mighty Indus are used for the cultivation of cotton with wheat combination.	Hyderabad, Khairpur, Khirpur, Sanghar	134
Rice Other Sindh	Irrigated rice is almost exclusively grown in this region with sugarcane where irrigation allows.	Dadu, Jaccobabad, Thatta	209
Khyber Pukhtunkhwa (KPK)	Mountainous region with cold winters unsuitable for agriculture. The alluvial plains of Charsada, Swabi, Peshawar and Mardan are better suited with wheat, maize and sugarcane being the principal commercial crops.	Mansera, Nowshera	108
Balochistan	Subsistence agriculture is supported by traditional methods of irrigation (underground canals). Plateaus and mountain ranges.	N/A	N/A
Total		23	1055

Source: Based on Pinckney (1989) and Ahmed (2015)

Table 18. List of districts by province

District code	District name	Province
1	Kasur	Punjab
2	Bhakkar	Punjab
3	Khanewal	Punjab
4	Attock	Punjab
5	Vehari	Punjab
6	Jhang	Punjab
7	Dera Ghazi Khan	Punjab
8	Bahawalnagar	Punjab
9	Rahim Yar Khan	Punjab
10	Multan	Punjab
11	Faisalabad	Punjab
12	Sargodha	Punjab
13	Thatta	Sindh
14	Dadu	Sindh
15	Sanghar	Sindh
16	Jacobabad	Sindh
17	Hyderabad	Sindh
18	Nowshera	KPK
19	Mansehra	KPK
20	Gujranwala	Punjab
21	Sheikhupura	Punjab
22	Chakwal	Punjab
23	Khairpur	Sindh

Figure 6: Map of Pakistan with four provinces and four federally administered territories

Source: http://www.worldmap1.com/pakistan-map.asp

Table 19. Regression results with land rented in (acres) as the dependent variable and district fixed effects

	(1) OLS	(2) Tobit APE
Land owned	-0.144***	-0.316***
	(0.0255)	(0.0519)
Number of household members	0.140***	0.109***
	(0.0433)	(0.0304)
Head of household gender	-0.711	-0.897
	(0.644)	(0.720)
Household head age (years)	0.0203	0.0269
	(0.0583)	(0.0388)
Household head age squared (years)	-0.000135	-0.000235
	(0.000609)	(0.000401)
Bullock ownership (yes=1)	-0.534	-0.576
	(0.759)	(0.677)
Tractor ownership (yes=1)	3.375***	2.605***
	(0.756)	(0.461)
Q20 District Code=2	3.712***	2.703***
	(0.923)	(0.731)
Q20 District Code=3	-0.0314	-0.179
	(0.472)	(0.464)
Q20 District Code=4	-0.437	-0.437
	(0.447)	(0.567)
Q20 District Code=5	-0.119	-0.200
	(0.790)	(0.571)
Q20 District Code=6	0.542	-0.101
	(0.493)	(0.453)
Q20 District Code=8	3.237**	1.618**
	(1.315)	(0.808)
Q20 District Code=9	-0.877	-1.275**
	(0.703)	(0.499)
Q20 District Code=10	-1.012*	-1.038*
	(0.595)	(0.608)
Q20 District Code=11	-0.334	-0.679
	(0.605)	(0.511)
Q20 District Code=12	0.514	0.0298
	(0.561)	(0.506)
Q20 District Code=13	0.663	0.591
	(0.410)	(0.377)

Q20 District Code=14	0.753*	1.021**
	(0.452)	(0.405)
Q20 District Code=15	4.660***	2.656***
	(1.398)	(0.768)
Q20 District Code=16	2.835***	1.698***
	(0.498)	(0.402)
Q20 District Code=17	2.548***	1.758***
	(0.488)	(0.403)
Q20 District Code=18	0.573	0.333
	(0.612)	(0.469)
Q20 District Code=19	0.158	-0.507
	(0.995)	(0.570)
Q20 District Code=20	-0.741	-0.793
	(0.498)	(0.488)
Q20 District Code=21	1.574**	1.205**
	(0.717)	(0.537)
Q20 District Code=22	-0.985**	-1.542***
	(0.401)	(0.427)
Q20 District Code=23	1.078**	0.437
	(0.504)	(0.423)
Constant	-0.307	
	(1.340)	
Observations	1027	1027

Note: Asterisks (***, **, *) indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Robust standard errors are reported in parentheses.
*Yes=1 identifies households who indicate using their own tractor or bullocks for cultivation.
District 1 is the omitted.
Colum 3 reports conditional average partial effects. Unconditional average partial effect for land owned is – 0.390.

District 1 is omitted

Table 20. Regression results with land rented in (acres) as the dependent variable and household labour heterogeneity

	(1)	(2)
	OLS	Tobit APE
Land owned (acres)	-0.145***	-0.311***
	(0.0250)	(0.0529)
Number of adult males(> 14 years)	0.300**	0.225***
	(0.127)	(0.0853)
Number of female (>14 years)	-0.110	-0.0540
	(0.0979)	(0.0793)
Number of children (<14 years)	0.238***	0.169***
	(0.0729)	(0.0472)
Head gender (Fem =1)	-0.139	-0.538
	(0.531)	(0.697)
Head age (years)	0.0299	0.0374
	(0.0550)	(0.0378)
Household head age squared (years)	-0.000215	-0.000326
	(0.000586)	(0.000391)
Bullock ownership (yes=1)*	-0.239	-0.287
	(0.671)	(0.670)
Tractor ownership (yes=1)*	3.434***	2.492***
	(0.808)	(0.479)
Rice/wheat Punjab	0.0200	0.288
	(0.560)	(0.395)
Low Intensity Punjab	3.394***	2.321***
	(0.980)	(0.539)
Cotton/Wheat Punjab	0.131	-0.0413
	(0.600)	(0.415)
Barani Punjab	-1.169**	-1.918***
	(0.520)	(0.554)
Mixed Punjab	-0.0658	-0.255
	(0.532)	(0.416)
Rice/Other Sindh	1.060**	1.078***
	(0.514)	(0.335)
Cotton/Wheat Sindh	1.643***	1.192***
	(0.562)	(0.353)
Constant	-0.271	
	(1.300)	
Observations	1027	1027

Note: Asterisks (***, **, *) indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Robust standard errors are reported in parentheses.
*Yes=1 identifies households who indicate using their own tractor or bullocks for cultivation.