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The Impact of Institutional Arrangements on Farmland Rents in India: A Ricardian Analysis

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Abstract

In addition to environmental factors, the welfare of farming communities in most developing countries depends largely on the credibility of organizations that regulate, implement, and protect different institutional arrangements for facilitating coordination between people. This study investigates whether people's confidence in such organizations is reflected in farmland rents in India. Using data from the India Human Development Surveys, Ordinary Least Squares regression results indicate a positive relationship between farmland rents and a constructed index of confidence in different organizations. Upon accounting for the potential endogeneity in this index, Two Stage Least Squares results reveal an even stronger and significant impact. The instrument selected to address the endogeneity in the confidence index is men's exposure to mass-media in the household, where both indexes are constructed by using the method of Principal Component Analysis. The findings of this work support the critical importance of continued investment in regional and national entities that oversee and implement various institutional arrangements for facilitating greater cooperation within farming communities.

Keywords: Ricardian Analysis; Confidence in institutions; Developing countries; Farm-rents

Introduction

Absent significant corruption, the presence of functioning local and national organizations like governments, banks, courts and councils, law enforcement agencies, etc. that work to sustain the rights of people, plays an important role in promoting welfare in a given region. Collectively viewed, these entities uphold various rules and arrangements, enforce social norms, and shared strategies for facilitating better coordination between different groups (Crawford and Ostrom, 1995). Greater confidence in such organizations, which implement the

institutional arrangements,[1] can enhance cooperation between people and enrich social capital,[2] which in-turn may generate economic development.

The institutional context of agricultural development is crucial for the successful operation of any local or regional system, (Bromley, 1982). In Zimbabwe, for example, largely unregulated historical customs related to the distribution of land and constitutional rights of agriculturists, act as major economic challenges for rural development, (Chavunduka and Bromley, 2010). Social norms[3] as a part of the informal rules and arrangements, relating to various agriculture activities, help minimize conflict between people and waste of scarce resources. Therefore, in addition to environmental factors (e.g., rainfall, soil fertility, temperature), the welfare of individuals involved in agriculture and other allied activities, largely depends on these institutional arrangements. This implies that people's confidence in various organizations, that implement such rules and regulations, plays an essential role for them to capably maximize the benefits of agricultural exchanges.

Renting of agricultural farmlands is common in developing countries. In the context of India, landowners generally rent out their lands for farming, as they tend to be averse towards the risks associated with agriculture (Driver, 1949:40; Tongia, 2019). Whereas, for small, and marginal farmers, cropping in a rented farmland is the only option, as they are less likely to own lands themselves. However, there exists debate over whether both groups benefit from such exchange of farmlands, (Tongia, 2019). While landowners can exploit farmers by regulating the quantity, quality, and share of output, availability of irrigation sources, by imposing stringent controls on cultivation methods, farmers, on the other hand, may violate the informal agreements with landowners, causing them serious losses. This is particularly relevant in cases where either group is deeply associated with unions or political parties, that may influence local agrarian arrangements. In this context, while Dev (2012) suggests that small farmers face significant challenges in accessing inputs, and in marketing or selling of produce, in many cases, both landowners and tenants (farmers) remain heavily involved in cropping on a given piece of farmland, thus sharing the production risk, (Chaudhuri and Maitra, 2000). Hence, the institutional arrangements. as overseen and implemented by different entities that vary across communities, villages, or regions, both formal and informal, are critical in this kind of marginal agriculture setup.

The objective of this work is to investigate whether people's confidence in the institutional arrangements is capitalized into farmland rents in rural India, for lands dedicated towards the production of three broad crop-types in the country - Rabi, Summer, and Kharif.[4] By using data from two rounds of the India Human Development Survey (IHDS, 2004–05 and 2011–

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[1] *Ostrom (2005) defines institutions as rules that humans use when interacting within a wide variety of social settings, North (1990:3) defines institutional arrangements as the-rules-of-the-game, or humanly devised constraints that shape social interaction. Generally, we will use the term institutional arrangements to help the reader distinguish between institutions (the rules, both formal and informal) and the organizations and entities that implement rules.*

[2] *Social capital is defined as networks, shared norms, values, or understandings that facilitate co-operation within or among groups, (OECD, 2001: 41)*

[3] *Social norms specify what actions are regarded by a set of persons as proper/ correct, or improper/ incorrect (Coleman, 1990: 243)*

[4] *The Indian cropping system is divided into (i) Kharif - crops grown during June-November and heavily dependent on monsoon and summer rainfall (June–September). (ii) Rabi - crops grown during October-April. Also, known as winter or spring crops, excessive rainfall in the winter months (December–February) impedes the cultivation of Rabi crops, but enhances that of Kharif crops. (iii) Summer – crops grown during March-May, require warm and dry weather, and do not primarily depend on rainfall.*

12), (Desai et al., 2005, 2011-12), the Ricardian method of analysis (RA),[5] is adopted to model farmland rents. Controlling for a variety of factors, the RA explores the hypothesis that greater confidence in both local and national organizations raises farmland rents in rural India. The assertion is that confidence in organizations represents confidence in institutional arrangements – the accepted rules-of-the-game for how things function in a rural agrarian community. A confidence index (as a proxy for confidence in institutional arrangements) is constructed and used as the primary explanatory variable. Information on the responding household's (for a given land parcel) participation in different community groups, respective land areas, the primary mode of irrigation, are included as controls. It is assumed that expressed rents taken from the survey adequately represent market prices, and that rent payers or receivers for a given land parcel can identify the land size and the primary mode of irrigation, (Joshi et al., 2017). As well, state-wise data on monthly rainfall and village-level information on cattle prices, distance to nearest bus-stop, railway-station, market, banks, or credit societies are used as controls. Rainfall data are obtained from the Indian Meteorological Department (IMD, 2004-05 and 2011-12).

Results from a log-linear Ordinary Least Squares (OLS) model indicate mixed evidence on a positive relationship between farmland rents and the constructed index of confidence in organizations while controlling for other factors. However, from the preferred Two-Stage Least Squares model (TSLS), which accounts for the potential endogeneity in this confidence index, results indicate a larger and significant impact on farmland rents. For the TSLS regressions the confidence index is instrumented by a different index of men's exposure to mass-media (newspapers, radio, and TV).

In the following sections, a background on the role of institutional regulations in economic development is presented first, followed by a review of papers that utilize the Ricardian (or Hedonic) method of analyzing variations in property values. Sections 3 and 4 describe the data and present the empirical strategies that are adopted. Section 5 highlights the instrument that is used for the second empirical strategy. Results are shown in section 6, while section 7 discusses the findings, and section 8 concludes the research.[6]

Literature Review

There exists a large literature connecting institutional arrangements and economic development. By one argument, organizations that implement these arrangements encourage economic growth by creating effective constraints on powerholders and limiting the rents they can capture, (Acemoglu et al., 2004). Hence, it is important for both developing and developed countries to prioritize the strengthening of organizations that promote resource management practices in agriculture, by implementing proper regulations, (Gatzweiler et al., 2001). Similarly, Adelman and Morris (1979), and Ferrini (2012) discuss that for successful economic development, arrangements like commercial tenancy rules, contract enforcement, increased availability of information, development of transportation systems, noninterventionist government policies, expansion of exports, etc., that are overseen by different government entities, play important roles.

Scholars like Philippus (2013), Udry (2009), Binswanger et al. (1989) argue that governance deficiencies lead to the failure of agricultural development initiatives in different

[5] *The Ricardian Analysis technique is analogous to the Hedonic Pricing Method that is utilized to study variations in property rents or prices, (Mendelsohn et al., 1984).*

[6] *A tabular representation of the workflow is shown in Table A6.*

countries through problems like, lack of access to credit organizations, or crop insurance services, incomplete property rights. Similarly, Premarathne (2016) highlights on how weak and informal institutional regulations negatively influence farmers' decisions on agricultural production and marketing, whereas, Vaidyanathan (1985) discusses how institutional aspects in villages enhance coordination between people and allow easy resource mobilization for efficient regional planning in India.

Another extensive strand of literature focuses on how historical regulations or events (through their impact on the development of different institutional arrangements and organizations) affect economic performances in different countries. For example, Acemoglu et al. (2001) hypothesize that mortality rates of European settlers in different colonies led to the formation of early institutional mandates, that persisted to form the basis of current norms in these regions. Banerjee and Iyer (2005) argue that non-landlord farm arrangements in past decades in India, render significant impact on income and productivity in later periods. Other notable works that emphasize the role of historical events and the formation of different rules and regulations, in promoting development include, Bertocchi and Canova (1997), Valencia Caicedo (2019), Bardhan (2006), Iyer (2004), Alesina and Giuliano (2015).

This research adopts the Ricardian approach/ Ricardian Analysis (RA)[7] as introduced in Mendelsohn et al. (1994), which is based on the assumptions of rational utility-maximizing farmers, competitive markets, uniform interest rate, and capital gains for all land parcels. As a prominent example employing this method, Sanghi and Mendelsohn (2008) conduct a cross-sectional analysis to estimate agricultural climate sensitivity in Brazil and India. Similarly, Schlenker and Roberts (2009) examine the effect of weather on yields for three different crops majorly produced in the US.

There are a variety of RA applications in developing country contexts. Kunwar and Bohara (2017) present an RA application of climate sensitivity of farmland values in Nepal. They also estimate the effects of socioeconomic factors on self-reported farmland values. Similarly, Thapa and Joshi (2010) examine the relationship between net farm revenue and climate variables in Nepal, Joshi et al. (2017) report a significant impact of irrigation infrastructure, community membership, on self-assessed farmland values in Nepal. Esmaeili and Shahsavari (2011) analyze variations in agricultural land prices arising from irrigation infrastructure in Iran. They find water availability as the most important factor affecting farmland prices, in addition to land structure, and different neighborhood characteristics.

In an important recent study, Ortiz-Bobea (2020)[8] proposes the use of RA for farmland rents, arguing that rents reflect expected agricultural profits, more accurately than farmland prices. Ortiz-Bobea (2020) uses longitudinal data on rental prices from two different periods and compares the outcomes with the traditional method of using land prices. Results show that the RA estimates of climate change on rents become increasingly large and negative over time.

While there exist significant prior work applying RA in India (Dinar et al., 1998; Mishra and Sahu, 2014; Singh et al., 2014; Mandal and Nath, 2017; Birthal et al., 2014), the role of

[7] *This method assumes that land rents reflect expected productivity of agriculture (as first posited by Ricardo, 1817). It estimates cross-sectional variation of land revenues that can be explained by factors like climate change, economic regulations etc.*

[8] *Ortiz-Bobea (2020) presents two different RAs; (i) based on farmland prices from the US Census of Agriculture (1950–2012), (ii) based on cropland/pasture cash rents (2009–2016). He finds that changes in farmland prices are correlated with climate, and that omitted nonfarm influences grow over time. However, cropland cash rents strongly reflect agricultural "fundamentals" without exhibiting significant influences from nonfarm factors.*

confidence in institutional arrangements, or confidence in organizations that regulate, implement, and protect the arrangements, has been largely overlooked, especially, in the critical context of farm rents. This analysis addresses this gap in the literature, by focusing on the argument, that the welfare of farming communities in low-income or marginal land settings depends largely on the credibility of such organizations (associated with agriculture, justice, and credit). In this context, using two rounds of household-level nationally representative data with information on confidence in local and national organizations (to proxy confidence in institutions), community participation, and land characteristics, combined with data on rainfall, this analysis attempts to determine variations in self-reported farmland rents in India.

Data and Empirical Strategy

Data from two rounds of the India Human Development Survey (IHDS, 2004–05 and IHDS – II, 2011-12) are used for the RA of farmland rents. These nationally representative surveys allow 42,152 households (27,579 rural and 14,573 urban) across 33 states and union territories, 384 districts, to be tracked over the two rounds. The data are treated as repeated cross-sectional. Both rounds provide detailed individual and household-level information on health, education, employment, economic status, social capital, village infrastructure, wage levels, panchayat (local village council) composition, etc. This richness permits analyses of associations across a range of social and economic conditions. Additionally, state-wise information on monthly rainfall (during Rabi, Kharif, and Summer cropping seasons) are obtained from the Indian Meteorological Department, (IMD, 2004-05 and IMD, 2011-12).

In the analysis, the sample is restricted to rural areas in India. This is because, (a) agriculture and allied activities are primarily dominant in these areas as compared to their urban counterparts, (b) renting of agricultural lands are generally passed across generations, such that both groups are more inclined towards dealing with a familiar individual located in their village or neighborhood, thus ruling out the possibility of rural-urban exchanges, and (c) landowners and farmers tend to reside on or near the land in which they work (Joshi et al., 2017; Ortiz-Bobea, 2020), and most of these lands are majorly located in rural regions. Furthermore, data are restricted to farmlands dedicated to the production of Rabi, Summer, and Kharif crops. The surveys ask specific questions to each household about a given land area for which they may be receiving or paying rents, and that may be cultivated with one (or multiple) of the above crop types. Hence, the unit of observation is a parcel (piece) of land.[9] According to the data, the number of lands (for which rent was received or paid for) for production of Rabi, Summer, or Kharif crops is 3,686 units in 2004 – 05, and 3,346 units in 2011–12.

Included farmland-level information are, the total area in acres (LANDAREA) and primary mode of irrigation (IRRIGATION). These modes include, PRIVATE WELL, GOVERNMENT WELL, OTHER WELL TYPES, RIVER or CANAL, POND or TANK, and OTHER WATER FACILITIES. In circumstances where households failed to report the kind of irrigation facility available, the major source of irrigation in the neighborhood (or Primary-Sampling-Unit) has been assigned. Rural community groups play important roles in updating people about, new farming techniques, new agricultural inputs and farming equipment, sources of credit, variations in climate, risk-avoidance measures, various other issues, etc. The IHDS present information on households' participation in associations like a youth club, sports group, trade union, business group, self-help group, credit group, religious group, caste association,

[9] *A household may be involved in exchanges for multiple parcels, in case of which, relevant information of the household has been assigned to each land units.*

development group, agricultural co-operative. While the presence of youth clubs, business groups are low in rural areas, households' participation in religious groups or caste associations are less relevant for agricultural productivity. Hence in the analyses, only participation in CREDIT GROUP, DEVELOPMENT GROUP, and COOPERATIVE GROUP are included.

Confidence in organizations (CONF.INDEX) is the primary explanatory variable in this research. It is treated as a proxy for confidence in institutional arrangements that generate social coordination between people. Similar to eliciting information on community participation, the IHDS ask household respondents about their confidence[10] in various entities including politicians – to fulfill promises; police – to enforce the law; state governments – to look after people; newspapers – to print the truth; village panchayats (local village council or cabinet that governs a village) – to implement public projects; schools – to educate children; hospitals – to provide treatment; courts – to mete out justice; and banks - to keep money safe. In this analysis, an index of confidence in organizations is constructed for politicians, banks, police, courts, and village panchayats (local village council or cabinet that governs a village) using the method of Principal Component Analysis (PCA).[11] It is assumed that people's confidence in these entities perfectly represent their confidence in the rules, arrangements, or shared strategies that they implement and protect.

Distant access for households to facilities like markets, health centers, schools, transportation facilities, ration shops[12] etc., is costly, and thus an impediment for economic development. It is common in RAs to include distance-based variables, which may result in both positive and negative impacts on farmland rents, (Joshi et al., 2017; Kunwar and Bohara, 2017). IHDS presents village-level information on distance to BUSSTOP, RAILWAY (railway station), MARKET, CREDIT ORGANIZATION (banks or credit societies), which are used in this work. Additionally, cattle like COWS and BUFFALOES are widely used for farming activities. Therefore, the prices of these animals may affect farm rents as well. Hence, village-level information on these prices is used in the analysis.

For estimation, the log-linear specification[13] of farm rental price (FARMRENTS) can be given as:

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[10] *On a scale of 0 – 2, where 0=no confidence and 2=high confidence.*

[11] *Since some of these indicators may be correlated with each other, using each as an independent control variable may not be a sound practice. PCA helps increase interpretability of individual factors and minimizes information loss, by creating new uncorrelated variables that maximize variance. This method generates multiple components from the individual factors all of which may be used as explanatory variables. In this work, the component that explains the highest degree of variation in the factors has been used, (Zee, 2014; Bartholomew, 2010).*

[12] *Ration shops are associated with the Public Distribution System in India, which provides staple grains and other basic necessities at subsidized rates, (Drèze and Khera, 2013).*

[13] *Logarithmic transformation is a widely used method of transforming a highly skewed variable (FARMRENTS) into a more normalized form. This strategy accounts for situations where a non-linear relationship exists between the independent and dependent variables, which leads to the violation of the linearity assumption of OLS, (Gujarati and Porter, 2009). It is common for both Hedonic and Ricardian models to use log-transformed values of property prices/ rents. Figure A2 presents credible evidence that Log (FARMRENTS) represents a normal distribution, as compared to the raw values of this variable. Hence, using Log (FARMRENTS) in the regression models is more plausible than using FARMRENTS.*

$$Ln(FARMRENTS)_{dhsr} = \beta_0 + \beta_1(CONF.INDEX)_{dhsr} + \beta_2(CP)_{dhsr} + \beta_3(LANDAREA)_{dhsr} + \beta_4(IRRIGATION)_{dhsr} + \beta_5(SR)_{dhsr} + \beta_6(DI)_{dhsr} + \beta_7(C)_{dhsr} + \sigma_d + \varepsilon_{dhsr} \quad (1)$$

Where: h is a household in district d, state s and survey round r, Ln (FARMRENTS) is the natural log of annual farmland rents for a given land-parcel (piece), CONF.INDEX is the index of confidence in local and national organizations (implying confidence in institutional arrangements). CP represents a vector of community participation by the household in various groups (CREDIT, DEVELOPMENT or COOPERATIVE GROUP); LANDAREA is the total reported acre of land, for which the household pays or receives a rent, that are dedicated towards production of Rabi, Kharif, and Summer crops; IRRIGATION is a categorical variable indicating the type of irrigation that is primarily available for a given parcel of land. Furthermore, millimeters of rainfall during the cropping seasons of the three crop-types are represented by the vector SR – (SUMMERRAIN, KHARIFRAIN and RABIRAIN), DI is a vector of village-level variables on distance to different amenities (BUSSTOP, RAILWAY, MARKET and CREDIT ORGANIZATIONS), and C is a vector of cattle prices (COWS and BUFFALOES). σ_d represents district fixed effects, and the white-noise error term is denoted by ε_{dhs}.

$Log - linear\ OLS$ regressions are run separately for the two survey rounds (2004 – 05 and 2011 – 12), and also for the models that pool the two rounds together. In the latter cases, fixed effects for years are used. Additionally, an Instrumental Variable (IV) strategy,[14] characterized by the Two Stage Least Squares (TSLS) method, is adopted to address the potential endogeneity in CONF.INDEX. In this case, men's exposure to mass-media (as a different index constructed using the similar technique of PCA) is used as an instrument to explain variation in CONF.INDEX. Exposure to mass-media (MEDIAEXPOSURE) is assessed by the frequency at which men in the household watch TV (WATCHTV), listen to radio (LISTENTORADIO) and read newspapers (NEWSPAPER).

For estimation, the log-linear specification of farmland rents, in two different stages, representing an IV strategy, the Stage I equation (equation 2)[15] can be stated as:

$$CONF.INDEX_{dhsr} = \alpha_0 + \alpha_1(MEDIAEXPOSURE)_{dhsr} + \alpha_2(CP)_{dhsr} + \alpha_3(LANDAREA)_{dhsr} + \alpha_4(IRRIGATION)_{dhsr} + \alpha_5(SR)_{dhsr} + \alpha_6(DI)_{dhsr} + \alpha_7(C)_{dhsr} + \sigma_d + \upsilon_{dhsr} \quad (2)$$

Here, MEDIAEXPOSURE is the instrument and CONF.INDEX is the endogenous variable. Table 3 in this analysis reports the Stage II (TSLS)[16] results. The TSLS regressions are only run for the pooled data.

To assess the role of confidence in institutions indicated by confidence in both local and national organizations (CONF.INDEX), against the null of no effect, the alternate hypothesis can be presented as:

[14] *Similar to Brunnschweiler (2008)*

[15] *CONF.INDEX is instrumented with an index of men's exposure to mass media (MEDIAEXPOSURE).*

[16] *The TSLS method is used in case of endogenous explanatory variables in a linear regression framework. This approach accommodates the use of instrumental variables (IV), that are correlated with the endogenous variables but not with the error term of the model. Such that, the IV can affect the outcome in the 2nd stage, only through its effect on the endogenous variable (or the 1st stage outcome), (Angrist and Pischke, 2009).*

$$H_0: B_{CONF.INDEX} = 0 \qquad H_A: B_{CONF.INDEX} > 0 \tag{3}$$

The expectation is that greater confidence in both local and national organizations leads to increased farmland rents. As stated earlier, small, and marginal farmers, who account for 82 percent of the entire farming community in India, (Food and Agricultural Organization of UN, 2020) mostly operate as either tenants or sharecroppers, since they are less likely to own lands, and also sustaining lands, during periods when cropping activities are unfavorable, is costly. In contrast, farmland owners do not engage in farming directly and rent out parcels to small-scale farmers.

To mediate apparent future disputes between the parties, it is necessary for such agricultural exchanges to be formally recognized in contracts through organizations like panchayats, civil or sessions courts,[17] state authorities. Despite generating transactions costs, requiring careful paperwork through different regulations and institutional proceedings, and consuming a formidable amount of time, these institutional proceedings raise the credibility of such exchanges by protecting the rights of both parties and more importantly by ensuring suitable farmland rents.

However, in most rural areas of the country, farmland exchanges are informal and rest on mutual agreements by both parties. Informal understandings primarily benefit landowners as they can prevent their assets from being entangled in legal conflicts that may arise in the future. Additionally, as both groups generally want to avoid transactions costs associated with different institutional proceedings, despite increases in the costs of vulnerabilities, informal understandings ensure easy identification and matching of landowners and tenants. Such instances are more profound for households that own undocumented parcels of farmlands (no proof of ownership), that may have been acquired illegally (higher occurrences in rural areas). Farmers, on the other hand, benefit by renting lands that are cheap as they require less paperwork and by not being bound by contracts, in case of which the costs of violating mutual agreements are low. Since such risks tend to be low in exchanges coordinated by both local and national organizations that implement different institutional arrangements, it can be hypothesized that people's confidence in organizations to mitigate any possible disputes between parties, would render a positive impact on farmland rents.

Contextually, informal and unrecognized land tenure systems are widely considered as factors that hinder development, primarily through channels like, lack of equal access to different facilities, lack of coordination between parties, inefficient implementation of regulations, tenurial insecurity, (Bellemare, 2012, 2008; Holden, Otsuka and Place 2008; Shaban, 1987; Unruh, 2006; Ono and Kidokoro, 2020). But it is important to highlight that, despite the above and many other drawbacks, rural agricultural exchanges, that traditionally ensure optimal outcomes for involved parties, extensively thrive on informal and unrecognized arrangements. This in-turn suggests that informal land or agricultural arrangements may not be an entirely deterring factor for economic development, but they may lead to less desirable outcomes when overlapped by more recent progressive agrarian rules, or regulations.

4. Descriptive Statistics

Table 1 presents the descriptive statistics (mean and standard deviation) for the rounds of 2004–05, 2011-2012 and for the pooled data. Household-level information include CONF.INDEX, percentage of households that participate in community groups –

[17] *Civil courts deal with disputes related to civil law, whereas sessions courts deal with criminal cases.*

DEVELOPMENT, COOPERATIVE, and CREDIT GROUPS. Additionally, the instrument (MEDIAEXPOSURE) used in this analysis is constructed at the household level. In this case, the indicators of the frequency at which men in the household watch television, listen to the radio, or read newspapers, are used to construct this index. This table reports the percentage of households with men never reading/ watching/ listening, sometimes reading/ watching/ listening, and regularly reading/ watching/ listening to the radio, television, or newspapers.

Land-level information include – the dependent variable, FARMRENTS (for lands dedicated towards the production of Rabi, Kharif, and Summer crops), LANDAREA - total size of land in acres; primary mode of irrigation (IRRIGATION). These modes include, PRIVATE WELL, GOVERNMENT WELL, OTHER WELL TYPES, RIVERS/ CANALS, PONDS OR TANKS and OTHER WATER FACILITIES.

Seasonal rainfall (in millimeters) during the three cropping seasons indicated by the estimates of RABIRAIN, KHARIFRAIN and SUMMERRAIN. It is seen how rainfall during these seasons affect annual FARMRENTS for lands dedicated towards cultivation of these crops. Additionally, village-level information comprises mean distance (in kilometers) from village to nearest BUSSTOP, RAILWAY, MARKET, CREDIT ORGANIZATIONS or banks.[18] Additionally, the lowest price of COWS and BUFFALOES are used as controls. Since, these animals are widely used in the farming process, their prices can play an important role in determining FARMRENTS.

[18] *Household-level information are not available on these factors.*

Table 1. Descriptive Statistics

VARIABLES	DEFINITIONS	2004-05 MEAN	2004-05 SD	2011-2012 MEAN	2011-2012 SD	Pooled MEAN	Pooled SD
FARMRENTS (USD)	Annual Farm Rent for a land parcel in USD	112.77	638.98	293.07	1039.9	198.57	858.24
CONF.INDEX	Index of Confidence in Institutional Arrangements constructed using Principal-Component-Analysis (See appendix)	0.0635	1.1918	0.0281	1.3005	0.0482	1.2230
Household-Level Controls							
CP (Community Group Participation)							
CREDITGROUP	Member of Credit/Savings Group, 1= If Member and 0= Otherwise	0.0583	0.2344	0.0700	0.255	0.0637	0.2442
DEVELOPMENTGROUP	Member of Development Group or NGO, 1= If Member and 0= Otherwise	0.0122	0.1098	0.0095	0.0973	0.0109	0.1040
COOPERATIVE	Member of Agricultural, Milk, or Other Co-Operative, 1=If Member and 0= Otherwise	0.0499	0.2178	0.0540	0.2262	0.0519	0.2218
Land, Irrigation and Rainfall							
LA (land area), IRRIGATION and SR (Seasonal rainfall)							
LANDAREA	Total farmland area in Acres	9.406	45.140	5.159	14.338	7.3854	34.209
KHARIFRAIN	Rainfall in June, July, August, and September, in mm	605.67	399.16	974.02	567.48	780.94	520.15
SUMMERRAIN	Rainfall in March, April and May, in mm	80.741	126.26	64.954	63.756	73.230	101.74
RABIRAIN	Rainfall in January and February, in mm	28.706	27.729	13.256	19.307	21.354	25.295
IRRIGATION	Six types of Irrigation facilities:						
	Other irrigation facility, 1=YES, 0= Otherwise	0.1440	0.3511	0.0322	0.1767	0.0908	0.2874
	Private Well facility, 1=YES, 0= Otherwise	0.5282	0.4992	0.5956	0.4908	0.5602	0. 4963
	Other Well facility, 1=YES, 0= Otherwise	0.0960	0.2946	0.1261	0.3320	0.1103	0.3133
	Government Well facility, 1=YES, 0= Otherwise	0.1030	0.3041	0.0101	0.1003	0.0588	0.2354
	River/Canal facility, 1=YES, 0= Otherwise	0.0141	0.1179	0.1814	0.3854	0.0937	0.2914
	Pond/Tank facility, 1=YES, 0= Otherwise	0.1144	0.3184	0.0543	0.2268	0.0858	0.2802

continued

Village-Level Controls							
DI (Distance to Amenities) and C (Cattle Prices)							
BUSSTOP	Distance to nearest Bus-Stop in Kilometers	2.2460	3.5582	2.5762	3.8709	2.4031	3.7137
RAILWAY	Distance to nearest Railway Station in Kilometers	22.463	21.375	25.896	28.562	24.097	25.110
MARKET	Distance to nearest Market in Kilometers	6.8956	6.8131	6.3873	6.0152	6.6537	6.4504
CREDITCOOP	Distance to nearest Bank/ credit society in Kilometers	4.8242	5.2202	5.1751	4.9835	4.9911	5.1116
COWS	Lowest price of cows (In USD)	84.03	64.42	150.73	139.24	108.45	111.17
BUFFALOES	Lowest price of buffaloes (In USD)	140.24	70.31	331.85	187.40	219.27	173.36
Instrumental Variable							
MEDIAEXPOSURE	Index of exposure to mass media of men in the household. Constructed using Principal-Component-Analysis. Three different indicators have been used that report the frequency at which men get their exposure to each.						
		0.3516	0.4775	-	-	0.1843	0.3877
	Television: 0=Never watches TV	0.3629	0.4809	0.3060	0.4609	0.3358	0.4723
	1=Sometimes watches TV	0.2854	0.4516	0.6939	0.4609	0.4798	0.4996
	2=Regularly watches TV	0.4489	0.4974	0.6766	0.4678	0.5573	0.4967
	Radio: 0=Never listens radio	0.3944	0.4888	0.2746	0.4464	0.3374	0.4729
	1=Sometimes listens radio	0.1565	0.3634	0.0487	0.2153	0.1052	0.3068
	2=Regularly listens radio	0.5629	0.4960	0.5379	0.4986	0.5510	0.4974
	Newspaper: 0=Never reads newspaper	0.2959	0.4565	0.3475	0.4762	0.3205	0.4667
	1=Sometimes reads newspaper	0.1410	0.3481	0.1144	0.3184	0.1284	0.3345
	2=Regularly reads newspaper						
	Observations (N)	3,686		3,346		7,032	

Farmrents for 2004–05 have been inflation adjusted for 2011–12. This table reports the actual (non–inflation adjusted) values for each round of survey, except for the pooled data. Farm-rents values have been converted from INR to USD by using exchange rate for 2005 (1USD = 44.1 INR) and 2012 (1USD=52.82INR)

Validity of Instrument

The instrument selected to address potential endogeneity in CONF.INDEX is a different index of men's exposure to mass-media (MEDIAEXPOSURE) in the household. Indicators of mass-media represent how frequently men read newspapers, watch TV, or listen to the radio. This index is created in the same manner (using PCA) as CONF.INDEX.

Exposure to mass-media, plays critical role in the dissemination of information in both developed and developing countries, primarily by advising people of their constitutional rights and duties, providing information about major events occurring both locally and in different parts of the country, (Schmidt, 2009; Castro-Herrero, Nir and Skovsgaard, 2018; Bartels, 1993; Slater and Rasinsky, 2005; Héricourt and Spielvogel, 2012; Chakraborty et al., 2018). These works commonly suggest that greater media-exposure significantly affects people's knowledge of new policies, mandates, the passage of acts, norms of doing business and enforcement of contracts, regulations associated with different activities. Also, newspapers, TV, and radio play important roles in apprising people about the proceedings of courts, police, village panchayats (local village councils), political parties, banks, police, etc. Therefore, it can be safely assumed that exposure to mass-media can substantially influence people's confidence in different organizations that oversee the implementation of different institutional mandates. Such that, with higher exposure to mass-media, people's confidence in the entities, that oversee the rules-of-the-game, increases, which in-turn leads to improvements in farmland rents.

Given the patriarchal nature of both rural and urban societies in India, which discriminates against women, it is traditionally the men who take major household decisions. Furthermore, despite high numbers of rural women being involved in agriculture, gender-discrimination implies that decisions regarding farms, rents, farming equipment, irrigation management are majorly taken by the men in the household (Ghosh and Ghosh, 2014). This explains the rationale for choosing the instrument only for men.

Using each indicator of media-exposure as separate instruments may lead to selection issues arising from heterogeneity in men's access to TV, newspapers, or radio. This occurs because one would fail to capture the substitutability in attaining information from time spent watching TV, listening to radio, or reading newspapers. Also, the frequency at which the above activities are conducted may be highly correlated. In this case the Stage I estimates would be biased. PCA helps create a holistic index of men's exposure to mass-media, by reducing the dimensionality of the data (reducing the number of variables in the final index). It selects the most important features from the three variables that capture maximum information on MEDIAEXPOSURE of men.

In the IV (TSLS) regression, F-statistics (for detection of weak IV) and the Stage I impact of MEDIAEXPOSURE on CONF.INDEX are reported. The TSLS model in this research is perfectly identified as it includes one endogenous and instrumental variable. Since activities like reading newspapers, watching TV, or listening to radio depend on individual habits and preferences, these being directly or indirectly (through channels other that CONF.INDEX) reflected in farmland rents are less likely. Contextually, this analysis shows that variations in farmland rents rely heavily on people's confidence in organizations that protect the rules, norms, and shared strategies, which in-turn vary with people's exposure to information from

newspapers, TV, or radio. Hence, both the principles of Exclusion Restriction and Relevance Condition appear to be satisfied.[19]

Results

This section is divided into two parts; (a) presents the Ordinary Least Squares (OLS) estimates of log-linear model of FARMRENTS; and (b) presents the Two Stage Least Squares TSLS estimates of the log-linear model of FARMRENTS. All regressions include household-level controls of community participation; state-level information on rainfall; land-level information on area and the primary mode of irrigation; village-level controls on animal prices and distance to various amenities.[20] Furthermore, the regressions incorporate fixed effects for each district and report robust standard errors. Pooled specifications include fixed effects for years. The primary finding from these two tables is that the OLS results present a positive impact of CONF.INDEX in the pooled model, whereas TSLS results using the pooled data indicate a larger and significant impact of CONF.INDEX on the outcome.

(a) OLS: In Table 2, the coefficients for 2004-05 are reported in column (1), the percentage of change in FARMRENTS, due to a unit increase in the explanatory variables, are reported in column (2). For 2011-2012 the relevant estimates are presented in columns (3) and (4), whereas the latter two columns report the results for the pooled regression model.

It can be inferred that in 2004-05 a unit increase in CONF.INDEX leads to a 6.1 percent decline (statistically insignificant) in FARMRENT.[21] Also, LANDAREA leads to a statistically significant decline in the outcome. Households' participation in CREDIT, DEVELOPMENT, or COOPERATIVE groups affect FARMRENTS in a positive and statistically significant manner. Furthermore, the impact of rainfall during the farming seasons of Rabi, Kharif, and Summer, are small. An increase in distance to BUSSTOP generates a negative and significant impact of 6.1 percent on FARMRENTS, whereas distances to RAILWAY, MARKET, CREDIT ORGANIZATION do not affect FARMRENTS significantly.

Estimated coefficients for 2011-2012 suggest that a unit increase in CONF.INDEX leads to an increase in FARMRENT by around 11 percent. The effect of a unit increase in LANDAREA on the outcome is positive at 0.6 percent for this survey-round. Furthermore, in the case of community participation, only the coefficient of COOPERATIVE GROUP is statistically significant in nature. Rainfall during the Rabi cropping season leads to a positive and significant impact on FARMRENTS. An increase in distance to RAILWAY generates a negative and significant impact of 1.2 percent on FARMRENTS, whereas the impact of an increasing distance to MARKET, is positive and statistically significant.

[19] *MEDIAEXPOSURE is not an indicator of households' access to TV, Radio or Newspapers. It represents men's exposure to media or how frequently men in the household watch TV, read Newspapers or listen to Radio.*

[20] *Since factors like village-level information on cattle prices, and land-level information on primary mode of irrigation, are added to estimate the true nature of the impact of CONF.INDEX on FARMRENTS, independently these factors are of less importance in this study, and hence the coefficients are not reported in the tables.*

[21] *For the coefficient of CONF.INDEX -0.0326, the percentage change can be obtained by, exp (-0.0326) =0.9679. Then subtract one from this number and multiply by 100. Thus, for a unit increase in CONF.INDEX, FARMRENTS decrease by 6.1 percent, (Benoit, 2011)*

As stated earlier, data for both the IHDS rounds are used in the pooled regressions of columns (3), and (4). As well, despite the coefficient being positive in magnitude (6.2 percent) CONF.INDEX does not affect FARMRENTS in a significant manner. An increase in LANDAREA by one unit generates a negative impact on the outcome. Furthermore, households' participation in CREDIT, DEVELOPMENT, or COOPERATIVE groups affect FARMRENTS in a positive and manner, where the coefficient is statistically insignificant for DEVELOPMENT groups. Rainfall during the Rabi and Summer cropping season, leads a positive and significant impact on FARMRENTS, at 0.1 percent, and 1.8 percent. As well, increasing distances to BUSSTOP, and CREDIT ORGANIZATION do not significantly affect FARMRENTS, significantly.

(b) TSLS: Table 3 shows the estimates for the TSLS specification, where CONF.INDEX is instrumented with an index of men's exposure to mass-media (MEDIAEXPOSURE). It reports the F-STAT for Stage I (for detection of weak instruments) and the estimates of the effect of MEDIAEXPOSURE on CONF.INDEX. The TSLS specification is adopted for the pooled data in this case, and includes controls for households' participation in community groups, land, rainfall, and village-level information. Estimates from this table can be compared with columns (5), and (6) in Table 2.

From the Stage II estimates in column (3), and (4) of Table 3, it can be observed, that addressing the potential endogeneity in people's confidence in different organizations, leads to a huge and significant improvement in FARMRENTS. Such that, a unit increase in the CONF.INDEX leads to more than six-times increase (6.135) in FARMRENTS as compared to an insignificant impact and lower impact, when the method of instrumentation is not adopted (Table 2). Additionally, a unit increase in LANDAREA appears to affect the outcome in a significant and negative manner, whereas households' participation in different community group raises FARMRENTS. Similarly, rainfall in the Summer and Rabi cropping seasons positively affect the outcome at magnitudes of 0.3 and 1.8 percent. FARMRENTS significantly.

Table 2. OLS Estimates of Farm Rents

	Dependent variable - Log of Farm Rents					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	2004 - 05	% Change	2011 - 12	% Change	Pooled	% Change
CONF. INDEX	-0.0620	-0.061	0.105	0.110	0.0613	0.062
	(0.0658)		(0.0712)		(0.0525)	
LAND AREA	-0.00381***	-0.004***	0.00553	0.006	-0.00244**	-0.002**
	(0.000918)		(0.00852)		(0.000961)	
Community Participation						
CREDIT GROUP	1.185***	2.271***	-0.0417	-0.040	0.523*	0.687*
	(0.379)		(0.384)		(0.275)	
DEVELOPMENT GROUP	1.259*	2.522*	0.888	1.430	0.891	1.438
	(0.678)		(0.986)		(0.607)	
COOPERATIVE GROUP	0.704*	1.021*	1.989***	6.308***	1.497***	3.468***
	(0.406)		(0.531)		(0.362)	
Rainfall						
SUMMER RAIN	0.00157	0.001	0.000755	0.0007	0.00131*	0.001*
	(0.00133)		(0.00174)		(0.000780)	
KHARIF RAIN	-0.000324	-0.001	-0.000760***	-0.000***	-0.000539***	-0.001***
	(0.000469)		(0.000234)		(0.000184)	
RABI RAIN	-0.00240	-0.002	0.0214***	0.239***	0.0182***	0.018***
	(0.00447)		(0.00682)		(0.00382)	
Distance to						
BUS STOP	-0.0631***	-0.061***	0.0252	0.025	-0.00913	0.009
	(0.0223)		(0.0273)		(0.0174)	
RAILWAY STATION	-0.00285	0.003	-0.0123***	-0.012***	-0.00487*	-0.005*
	(0.00429)		(0.00366)		(0.00289)	
MARKET	0.00495	0.005	0.0418**	0.042**	0.0219*	0.021*
	(0.0137)		(0.0204)		(0.0118)	
CREDIT ORGANIZATION	0.0140	0.014	-0.00450	-0.004	-0.00229	-0.002
	(0.0165)		(0.0245)		(0.0149)	
Constant	4.256***		8.243***		4.739***	
	(1.216)		(0.752)		(1.286)	
N	3,686		3,346		7,032	
R^2	0.136		0.172		0.137	
District FE	✓		✓		✓	
Year FE					✓	

*Note: Analysis done using STATA 16. Robust standard errors in parentheses. All models include controls for Cattle prices - minimum price of cows and buffaloes in the village, and for the primary source of irrigation for the land. Significance assessed at *** p<0.01, ** p<0.05, * p<0.1*

Table 3 also reports significant and positive Stage I estimates of the effect of MEDIAEXPOSURE on CONF.INDEX at 7.3 percent, thus indicating the relevance of the instrument in this model. An F-STAT exceeding 10 implies that MEDIAEXPOSURE is not a weak instrument for this analysis. In this context, the Hausman-Wu statistics are not reported, as the endogeneity in CONF.INDEX has been discussed earlier, and the presented literature also highlight on several exogenous factors that affect the functioning of different institutional arrangements (or organizations) in different countries. Conclusively, upon comparing the

pooled models of Table 2 and Table 3, where several factors are controlled for, it can be stated that the TSLS model, which accounts for the potential endogeneity in CONF.INDEX, is preferable than the OLS model.

Discussion

This work draws motivation from the literature that focuses on the vulnerabilities that farmers and landowners are subjected to, due to their involvement in the rural agrarian system of their country (Harvey et al., 2014; Rosenzweig et al., 2014; Menapace, 2015; Ullah et al., 2016; Poulsen et al., 2015). These vulnerabilities primarily comprise, lack of access to agricultural facilities, lack of proper infrastructure (e.g., water for irrigation, agricultural equipment), lack of crop-protection provisions against unfavorable climate changes, conflicts with the other party, violation of discussed agreements, poverty, deterred access to food. Consequently, the results of this work contribute to a growing literature that is relevant for strategies on how such shocks (or vulnerabilities) can be mitigated, thus ensuring optimal outcomes for the involved parties, (Duong et al., 2019; Meuwissen et al., 2001; Ahsan et al., 2011; Ghimire et al., 2021).

The analysis fails to reject the primary hypothesis that people's confidence in different organizations, that oversee the implementation of various institutional arrangements, leads to an increase in farm rents. While numerous studies highlight the benefits of strong and powerful institutions, that ensure better coordination between different communities, (Rode, 2013; Peng and Jiang, 2010; Krammer, 2015; Chang, 2010; Chang and Evan, 2005; Acemoglu, Gallego, and Robinson, 2014; Acemoglu and Robinson, 2010), their role in affecting farmland prices have largely been overlooked. Especially so, in the context of developing countries, where agriculture acts as a predominant source of livelihood.

From the two econometric models, the Ordinary Least Squares (OLS) results in Table 2 indicate that the degree of responsiveness of FARMRENTS to a unit change in CONF.INDEX has improved positively from 2004–05 to 2011-12. This finding is encouraging in the fact that local and national organizations like courts, police, village panchayats (local village council or cabinet), local political parties have evolved to become more effective in implementing mandates or institutional arrangements that enhance greater coordination between people. Whereas the Two Stage Least Squares (TSLS) results in Table 3 represent an even stronger and significant impact of CONF.INDEX on FARMRENTS. Therefore, in developing countries like India, agricultural exchanges are required to be formally identified in contracts by panchayats, sessions courts, and other state authorities. Despite generating transactions costs or requiring careful paperwork through different institutional regulations and proceedings, a formal agreement, coordinated by organizations that oversee the implementation of different institutional arrangements, lends more credibility to agricultural exchanges as compared to a casual understanding between parties. These institutional arrangements protect people from the vulnerabilities associated with an informal exchange of farmlands and play a critical role to enhance greater coordination between them.

Table 3. TSLS Estimates of Farm Rents (Pooled Data for 2004-05 and 2011-12)				
Dependent Variables – Log of Farm Rents (Stage II), CONF. INDEX (Stage 1)				
Instrument – MEDIA EXPOSURE (Men's exposure to Newspapers, Radio and TV in household)				
VARIABLES	(1)	(2)	(3)	(4)
	Stage I	% Change	Stage II	% Change
CONF.INDEX	X	X	1.965**	6.135**
			(0.937)	
MEDIA EXPOSURE	0.0704***	0.073***	X	X
	(0.0191)			
LAND AREA			-0.00372***	-0.003***
			(0.00135)	
Community Participation				
CREDIT GROUP			0.237	0.267
			(0.353)	
DEVELOPMENT GROUP			0.448	0.565
			(0.755)	
COOPERATIVE GROUP			1.640***	4.155***
			(0.395)	
Rainfall				
SUMMER RAIN			0.00322**	0.003**
			(0.00132)	
KHARIF RAIN			-0.000857***	-0.001***
			(0.000250)	
RABI RAIN			0.0179***	0.018***
			(0.00426)	
Distance to				
BUS STOP			0.00291	0.002
			(0.0213)	
RAILWAY STATION			-0.00212	-0.002
			(0.00342)	
MARKET			0.0225	0.022
			(0.0138)	
CREDIT ORGANIZATION			0.0139	0.0139
			(0.0177)	
Constant			4.176***	
			(1.426)	
N	7,032		7,032	
R^2	0.072			
F Statistic	13.58***			

*Note: Analysis done using STATA 16. Robust standard errors in parentheses. CONF. INDEX is the endogenous variable. All models include district and year fixed effects, controls for Cattle prices - minimum price of cows and buffaloes in the village, and for the primary source of irrigation for the land. Significance assessed at *** p<0.01, ** p<0.05, * p<0.1*

The hypotheses about community participation may be stated in the same manner, such that both OLS and TSLS show mostly positive and significant improvements in FARMRENTS due

to households' participation in DEVELOPMENT, CREDIT or COOPERATIVE groups. Community participation plays an important role in aiding farming communities to gain valuable information about new technology, better methods to sell products, ways to access markets, sources of accessing credits, (Bhuyan, 2002; Lawlor et al., 2013; Kalra, 2013; Woldu, 2015; Olwande and Mathenge, 2012). However, unlike organizations that oversee the implementation of different institutional arrangements, community groups (like the above) may fail to protect people from the vulnerabilities associated with an exchange of agricultural property, especially farmlands. Furthermore, across the two pooled models, it is found, that rainfall during the months when Rabi and Summer crops are grown, significantly affects FARMRENTS; distance to amenities like BUUSSTOPS, RAILWAY MARKET, CREDIT ORGANIZATION do not consistently report significant coefficients in both cases; the size of land leads to a significant decline in FARMRENTS.

In Table 4, column (1) shows the annual marginal implicit rents (A-MIR) for some selected variables from the TSLS model. CONF.INDEX reports a huge improvement in FARMRENTS with an estimated A-MIR of $1248.12. An increase in LANDAREA, available for cultivation, leads to a negative change in FARMRENT values by less than one percent, with an estimated A-MIR of $174.40. Households' participation in CREDIT GROUP presents an A-MIR of $221.63, whereas the A-MIR for COOPERATIVE GROUP participation is $901.88. In column (3) the monthly MIR (M-MIR) of CONF.INDEX is around 113 percent of the monthly Rural Poverty Line (RPL) of $91.5 for a five-member household, whereas the M-MIR for other factors that explain variations in FARMRENTS (from Table 3) are less than the monthly RPL. The former is a highly relevant finding, such that higher confidence in organizations that implement different institutional arrangements, would generate improvements in FARMRENTS, that exceed the minimum required income for sustenance above the RPL.

Table 4. Marginal Implicit Rents (MIR) in USD for Pooled data

Variable	(1) A-MIR	(2) M-MIR	(3) M-MIR per acre	(4) Relevance of M-MIR
CONF.INDEX	1248.12	104.01	18.25	Around 113 % of Rural Poverty Line
LANDAREA	174.40	14.53	2.551	Around 16 % of Rural Poverty Line
CREDIT GROUP	221.63	18.46	3.241	Around 20 % of Rural Poverty Line
DEVELOPMENT GROUP	273.77	22.81	4.003	Around 25 % of Rural Poverty Line
COOPERATIVE GROUP	901.88	75.15	13.19	Around 82 % of Rural Poverty Line

Note: Estimates are reported for the TSLS model. MIR are in USD for 2011–12 (1 USD = 52.84 INR). The mean farm rent for pooled data is USD 174.93 for 2011–12 (rents for 2004–05 have been inflated to 2011–12). The mean land area in the pooled data is 5.698 acres. Daily Rural Poverty Line (RPL) is USD 0.61 per capita in 2012. This implies that for a household of 5 members (calculated mean from IHDS), the minimum monthly amount to consume basic goods is USD 91.5

Conclusions

This study applies the Ricardian Approach (RA) to investigate the impact of a constructed index of confidence in local and national organizations on annual farm rents in rural India, while controlling for other factors. These organizations and entities implement and protect

various institutional arrangements, both formal and informal, that provide the structure of low-income farming communities in rural India. Moving beyond physical characteristics, the analysis contributes to the overall debate regarding how the welfare of small and marginalized farmers and landowners in India can be positively affected by strong and progressive institutional mandates. The primary testable hypothesis of a positive effect on farmland rents generated by increasing confidence in institutional arrangements (proxied by confidence in different organizations), is not rejected. Other factors included in the analysis, to estimate the true impact on farmland rents, are households' participation in community groups, land area, mode of irrigation, seasonal rainfall (during the cultivation of the above crop types), village-level information on cattle prices and distance to different amenities.

Econometric results from Log–linear OLS regression present a positive and insignificant impact of confidence in organizations in the initial pooled model; however, the preferred TSLS results indicate a positive and significant impact of this index on farmland rents. In the latter case, to control for endogeneity, CONF.INDEX is instrumented by a different index of the responding household's men's exposure to mass-media (newspapers, radio, and TV).

There are several limitations of this analysis. First, it is based on two rounds of survey responses, and land rents are self-reported rather than being observed. Second, in the analyses, state-wise rainfall measures are used, as opposed to more granular rainfall measures (e.g., geo-spatial information for each land-parcel). Third, information on mode of irrigation is not available for numerous households in the survey. Thus, the major mode of irrigation in the neighborhood for each observation is assigned to such cases. By recognizing these limitations, it is hoped that this initial effort can spur needed additional research, with more micro-level, geospatial data, to explore the importance of confidence in institutional arrangements in developing countries like India.

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Appendix

Principal Component Analysis (PCA) is a data organization method to re-express multivariate data with fewer dimensions. Basically, the method reduces the information available from a large number of correlated variables to different linear combinations (components) that are loaded with each of the original variables. These components (preferably the one with the highest factor loadings) are used for data-analysis. The first principal component is the linear combination of the original variables that has maximum variance (among all linear combinations). It accounts for as much variation in the data as possible.

In our case, we have used PCA to construct an index for people's confidence in different organizations (E.g., Politicians, Police, Courts, Village Panchayats, or village councils, and Banks). Table A1 summarizes individual responses for each of the above factors and shows the percentage of people who have voted "High Confidence", "Some Confidence", or "No Confidence" to each. Table A2 presents the correlation matrix for each of these variables.

Table A1. Response of Confidence in different organizations

Variables	High Confidence (%)	Some Confidence (%)	No Confidence (%)
Politicians	10.94	35.85	53.21
Police	21.69	50.51	27.8
Courts	61.29	27.93	10.78
Village Panchayats	33.30	46.07	20.63
Banks	90.29	7.09	2.62

Note: Analysis done using STATA 16. *Shows the percentage response of different levels of confidence in different organizations.*

Table A2. Variable Correlation

	Politicians	Police	Courts	Panchayats	Banks
Politicians	1.0000				
Police	0.3299	1.0000			
Courts	0.0973	0.2133	1.0000		
Panchayats	0.2200	0.2070	0.1692	1.0000	
Banks	0.0042	0.1308	0.3594	0.0786	1.0000

Note: Analysis done using STATA 16. *Shows the correlation between each variable*

Table A3 presents the constructed Principal components (using STATA 16). The general rule is to proceed with the components that report Eigen values above 1. In our case Components 1 and 2 are suitable candidates to be included in the analysis. However, Component 1 explains 34 percent of the variation of the original data. Therefore, we have used Component 1 (CONF.INDEX) as the primary explanatory variable.

Table A3. Principal Components			
Components	Eigen Values	Proportion	Cumulative
1	1.73692	0.3474	0.3474
2	1.17327	0.2347	0.5820
3	0.82038	0.1641	0.7461
4	0.645	0.1290	0.8751
5	0.6244	0.1249	1.0000

Note: Analysis done using STATA 16. Shows the principal components among the explanatory variables used in the analysis and their respective eigen values

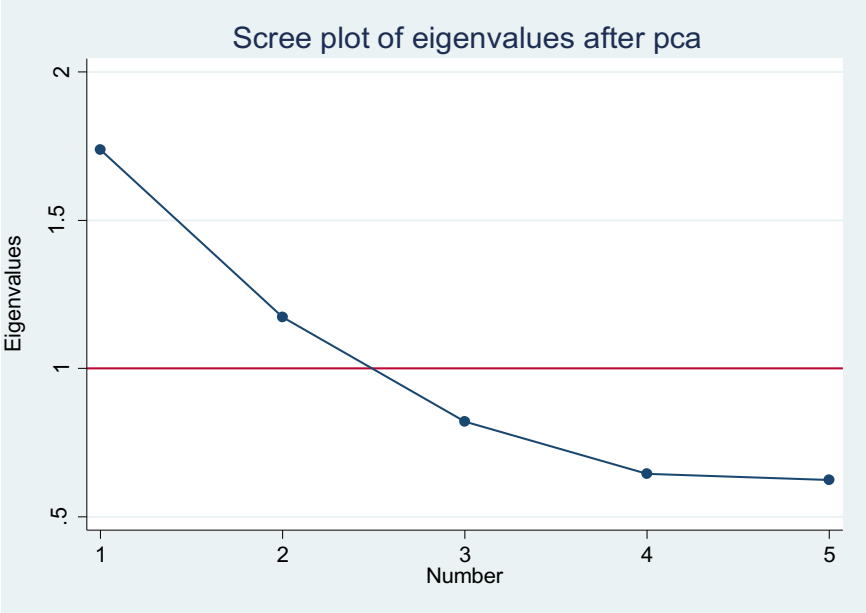

Figure A1. Eigen values for each of the components

Table A4 compares the two components. We can see that Component 1 is loaded with information from each of the original variables, whereas Component 2 does not contain information for Police and Village Panchayats. Therefore, Component 1 appears to be the more preferred candidate for inclusion in the analysis.

Table A4. Factor Loadings		
	Component 1	Component 2
Politicians	0.4232	-0.5247
Police	0.5154	
Courts	0.4853	0.4548
Panchayats	0.4227	
Banks	0.3757	0.6273

Note: Analysis done using STATA 16. *Shows the factor loadings of the main explanatory variables into the components*

The Kaiser-Meyer-Olkin (KMO) Test is a measure of how suited the survey data is for Principal Component Analysis. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic is a measure of the proportion of variance among variables that might be common variance. Total value >.50 indicates the relevance of PCA in this analysis.

Table A5. Kaiser-Meyer-Olkin measure of sampling adequacy

	KMO
Politicians	0.5868
Police	0.6306
Courts	0.5890
Panchayats	0.7006
Banks	0.5517
Overall (Total Value) 0.6051	

Note: Analysis done using STATA 16. *Shows the Kaiser-Meyer-Olkin measure of sampling adequacy in which an overall value of 0.5 or greater represents the relevance of PCA in this analysis*

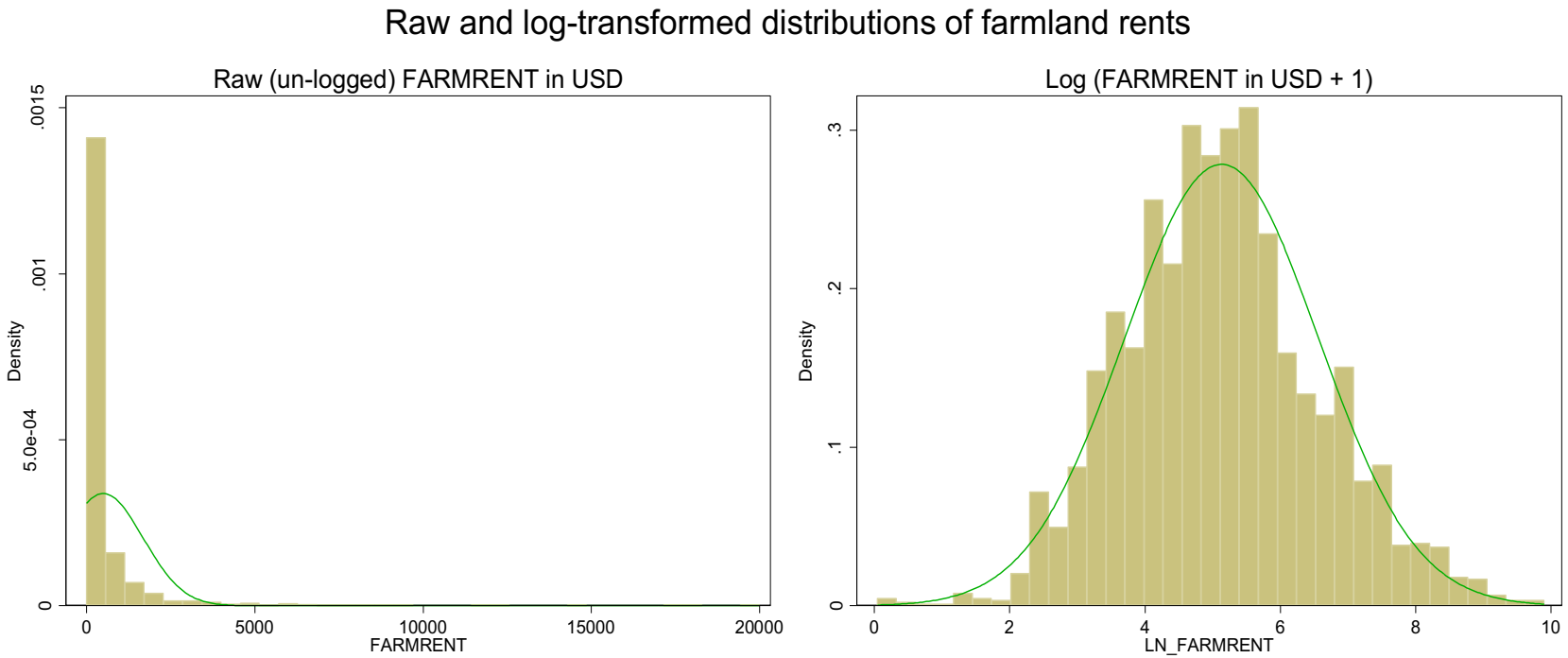

Figure A2. Created using STATA16. Raw and log-transformed distributions of farmland rents. See footnote 13

Table A6: Flow Chart	
1. Introduction	Presents overall outline and structure of the paper
2. Literature Review	Presents relevant findings from literature
3. Data and Empirical Strategy	• Ordinary Least Square (OLS) • Two-Stage Least Square (TSLS)
4. Descriptive Statistics	Table 1-Shows the descriptive statistics of the variables used in the analysis
5. Validity of Instruments	Defending Relevance and Exclusion restrictions for the instruments used in the analysis
6. Results	• Table 2-OLS Estimates Results • Table 3-TSLS Estimates Results
7. Discussion	Discusses findings of the analysis and prospects.
8. Conclusion	Concluding Remarks

Note: Shows the flow chart of the paper explaining each section content briefly. See footnote 6

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