

Fallow Lengths and the Structure of Property Rights

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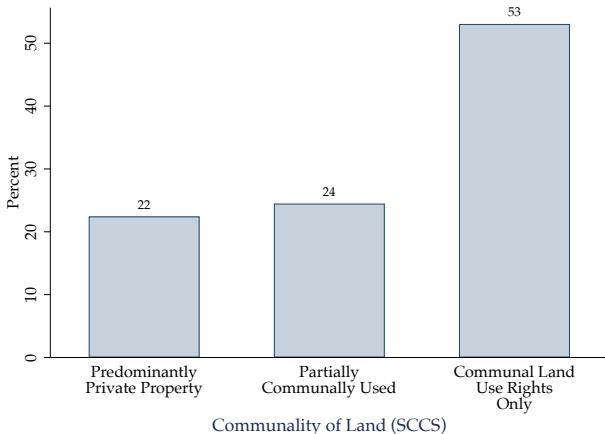
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- ▶ In many contemporary Western societies, **private property rights** are the predominant way of organizing land rights
- ▶ Yet, many societies do not develop private property rights over land; instead, many societies have **communal property rights**

Communal Land in the SCCS



Notes: Figure presents a histogram for the "Community of Land" variable for societies in the Standard Cross-Cultural Sample (SCCS), and ethnographic dataset created by anthropologists meant to be representative of societies prior to European contact from Murdock and White (1969). N=98.

- ▶ **Land Rights:** a bundle of rights regarding the access, use, and transfer of land
- ▶ **Private Property Rights:** all land rights for given plot are held by a sole individual or by a nuclear family (as a single household)
- ▶ **Communal Property Rights:** several or all land rights are held by a community
 - > Community is defined as a collective group of people who can either be extended families, clans, villages, or ethnic group
 - > Individuals often have exclusive rights on the land that they are currently cultivating but, once the land is under fallow, the land can be reallocated (López, 1998; Deininger and Feder, 2001; Goldstein and Udry, 2008)

- ⇒ Origins: Why did some societies develop communal land rights instead of private rights?
- ⇒ Consequences: What are the implications for development policies?

- ▶ We focus on the **structure** of land rights
- ▶ This focus is separate from the **security** of land rights
 - > Security implies that rights are well defined and guaranteed
- ▶ Strong evidence that security of land rights matters for development (e.g., Goldstein and Udry, 2008; Galiani and Schargrodsky, 2011; Deininger et al., 2011)
 - > Private and communal rights can vary in how secure they are depending on the context (Platteau, 1996; Deininger and Feder, 2001; Brasselle et al., 2002)
- ▶ Less evidence for the structure on land rights
- ▶ **Empirical challenge:** property rights evolve endogenously

- ▶ We build on insights from Boserup (1965) and Demsetz (1967):
- ▶ Societies with longer fallow requirements for crops were more likely to have communal land rights
- ▶ **Fallowing** = agricultural practice where previously cultivated land is allowed to lie idle in order to let it recover its fertility
 - > “Oldest and most widespread agro-forestry practice” (Young, 1989)
 - > Fallow periods that are too short lead to low soil fertility, more erosion, and lower productivity (López, 1998; Goldstein and Udry, 2008)

- ▶ We build on insights from Boserup (1965) and Demsetz (1967):
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 - > “Oldest and most widespread agro-forestry practice” (Young, 1989)
 - > Fallow periods that are too short lead to low soil fertility, more erosion, and lower productivity (López, 1998; Goldstein and Udry, 2008)
- ▶ **Intuition:** land with longer fallow requirements is costlier to protect individually and benefits from communal management and protection *in the absence of a strong state*

Fallow Land



- ▶ This argument was summarized by Demsetz (1967):

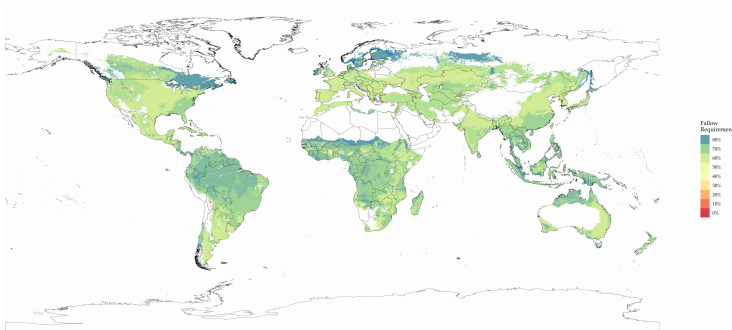
*“Once a crop is grown by the more primitive agricultural societies, it is necessary for them to abandon the land for several years to restore productivity [i.e., **fallow land**].*

***Property rights in land among such people would require policing cost for several years during which no sizable output is obtained...** Among these people it is common to find property rights to the crops, which, after harvest, are portable, but not to the land.*

The more advanced agriculturally based primitive societies are able to remain with particular land for longer periods, and here we generally observe property rights to the land as well as to the crops.”

Map of Fallow Requirements

- ▶ Construct an ecological measure of the fallowing requirement for the most suitable staple crop across grid cells using FAO models
 - > Based on soil type, temperature, and climate (Fischer et al., 2012)
- ▶ Fallow Requirement: percentage of time during the fallow-cropping cycle that land should remain fallow



Notes: The map presents the fallowing requirement for the maximum caloric suitability crop with low inputs and no irrigation across the world in 5' by 5' grid cells. The fallowing requirement for a crop is defined as the optimal percentage of time during the fallow-cropping cycle that land must be under fallow. Cells shaded in white represent regions where the land is not suitable for agriculture. [▶ Details](#)

- ▶ Why did some societies have communal property rights?
 - Combine ethnographic and ecological data to show that communal rights are more common in places with longer fallow requirements

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- ▶ What are the consequences for development policy?
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 - Combine ethnographic and ecological data to show that communal rights are more common in places with longer fallow requirements
- ▶ What are the consequences for development policy?
 - Land titling projects are less successful
- ▶ What are the mechanisms?
 - > ↓ inequality & ↓ land-related conflict, especially in weak states

- ① An Origin: Fallow Requirements
 - Data: Ethnographic Data
 - Measuring Land Rights
 - Empirical Strategy
 - Fallow Requirements & Communal Land Rights
- ② A Consequence: Policy Mismatch
- ③ Mechanisms
- ④ Conclusion

1. Standard Cross-Cultural Sample (SCCS):

- > Very detailed questions related to land rights
- > Sample of 186 societies from the Ethnographic Atlas (EA)
- > Chosen to be representative of the full EA sample, and to be culturally and historically independent from other societies [▶ Map](#)

2. Ethnologue:

- > Link modern groups to ancestral characteristics to examine modern outcomes [▶ Map](#)

- ▶ **Communality of Land:** measures the extent to which land was organized via communal land rights
 - 1 = Predominantly Private Property
 - 2 = Partially Communally Used
 - 3 = Communal Land Use Rights Only

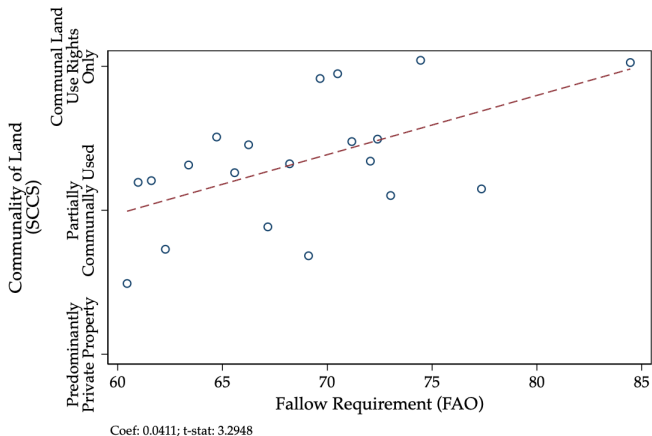
- ▶ **Cropping Index:** described as a “rough indicator for fallowing” that records the amount of land used each year in agriculture
 - > Use it to validate the FAO Fallow Requirements

- ▶ Examine relationship between fallowing requirement and land rights by estimating the following equation:

$$y_{sc} = \beta \text{Fallow Requirement}_{sc} + \mathbf{X}'_{sc}{}^G \Gamma + \mathbf{X}'_{sc}{}^H \Phi + \delta_{r(c)} + \varepsilon_{sc}$$

- ▶ y_{sc} is the outcome of interest (e.g., communal land rights) for society s
- ▶ $\text{Fallow Requirement}_{sc} = \%$ of fallow-cropping cycle that land must be fallow
 - > Defined using the maximum CSI crop of a society s
 - > Use a 100 km buffer around the society's centroid
- ▶ $\mathbf{X}'_{sc}{}^G$ is a vector of geographic covariates at the society-level; $\mathbf{X}'_{sc}{}^H$ is a vector of historical pre-colonial ethnographic covariates; $\delta_{r(c)}$ represent continent fixed effects

- ▶ Reverse causality: Use an ecological measure of fallowing
- ▶ Omitted variables: Variables that affect both fallow length and land rights might bias our results. Therefore, we include a number of controls sequentially:
 1. **Continent FEs**: continent fixed effects
 2. **Geography and Climate**: temperature, precipitation, land suitability, latitude, longitude, elevation, plough suitability
 3. **Disease Suitability**: Tsetse fly suitability, malaria ecology index
 4. **Crop FEs**: max CSI-crop fixed effects
 5. **Ethnographic**: centralization, settlement density, presence of large animals
- ▶ Measurement error: Validate fallow requirement measure using proxies for fallowing intensity historically ▶ and today ▶



⇒ ↑ Fallow requirements strongly associated with ↑ communal land rights

Table 1: Effect of Fallow Requirement on Communal Land Rights

	Dependent Variable:					
	<i>Communality of Land Rights</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	0.043*** (0.013) [0.013]	0.039*** (0.014) [0.013]	0.035*** (0.013) [0.012]	0.038*** (0.014) [0.013]	0.036** (0.015) [0.013]	0.035** (0.015) [0.013]
Continent FEs	N	Y	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y	Y
Disease Controls	N	N	N	Y	Y	Y
Crop FEs	N	N	N	N	Y	Y
Ethnographic Controls	N	N	N	N	N	Y
Outcome Mean	2.33	2.33	2.33	2.33	2.33	2.34
Adjusted R2	0.098	0.113	0.131	0.115	0.201	0.267
Beta Coef.	0.329	0.296	0.269	0.286	0.276	0.266
Observations	88	88	88	88	88	86

Notes: The unit of observation is a society in the Standard Cross Cultural Survey (SCCS). Robust standard errors in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. The dependent variable *Communality of Land Rights* is a 1 to 3 categorical variable, where 1=land is predominantly private property, 2=land is partially communally used, and 3=communal land use rights only. *Geography Controls* include centroid longitude, centroid latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop in each society. *Ethnographic Controls* includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ ↑ Fallow requirements strongly associated with ↑ communal land rights

Table 2: Fallow Requirements and Influence of Traditional Leaders

	Dependent Variable:			
	Influence of Traditional Leaders in:			
	Governing Community [0-3]		Allocating Land [0-3]	
	(1)	(2)	(3)	(4)
<i>Fallow Requirement</i>	0.010*** (0.004) [0.003]	0.010*** (0.004) [0.003]	0.012*** (0.004) [0.004]	0.011*** (0.004) [0.004]
Country FEs	Y	Y	Y	Y
Individual Controls	Y	Y	Y	Y
Geography Controls	Y	Y	Y	Y
Disease Controls	Y	Y	Y	Y
Crop FEs	Y	Y	Y	Y
Ethnographic Controls	N	Y	N	Y
Outcome Mean	2.83	2.83	2.65	2.65
Adjusted R2	0.111	0.111	0.120	0.120
Beta Coef.	0.044	0.046	0.050	0.048
Observations	39,156	39,156	39,044	39,044
Clusters	630	630	630	630

Notes: The unit of observation is a respondent in the Afrobarometer Surveys round 8. Standard errors that are two-way clustered by country and ethnologue group are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. All regressions control for a respondent's age, age squared and gender. Enumeration areas' latitude and longitude included in every specification. *Geographic Controls* include longitude, latitude, average rainfall, average temperature, elevation, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop in each society. *Ethnographic Controls* includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development for the ethnologue group of each Enumeration Area. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ ↑ Fallow requirements associated with ↑ role of local leaders in land allocation in present day Africa

- ① An Origin: Fallow Requirements
- ② A Consequence: Policy Mismatch
Property Rights & Titling Success
- ③ Mechanisms
- ④ Conclusion

Land reform in Africa is challenging the power of chiefs

Activists want to give communities more of a say



IMAGE: PANOS

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MANY AN INVESTOR has taken the road east from Freetown, the capital, into the heart of Sierra Leone seeking land for plantations or mines. Their journey invariably takes them to the door of a local chief. A system based on private land titles reaches no farther inland than the salty sea air.

So it goes in many parts of Africa, where roughly three-quarters of land is under customary ownership. In theory, that means it is managed by communities in line with tradition. But there is no consensus about how that should work in practice. Which community? Whose tradition? Should decisions be made by chiefs, families or individuals?

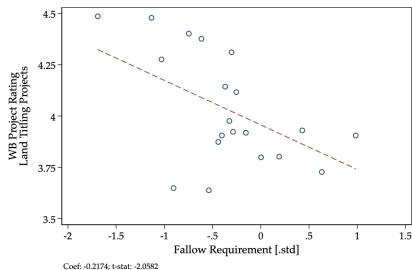
- ▶ How does the presence of communal property rights for land influence the success of land titling policies?
- ▶ We examine this using World Bank project data (AidData, 2017)
 - > Covers World Bank funded projects between 1995 and 2014 and includes information on the location, project sector, and description
 - > Subset of these projects are given an outcome rating
 - > Use information on project sectors and project description to classify whether projects involved land titling or not
 - > Exclude urban land titling projects

Table 3: Effect of Fallow Requirement on World Bank Project Success

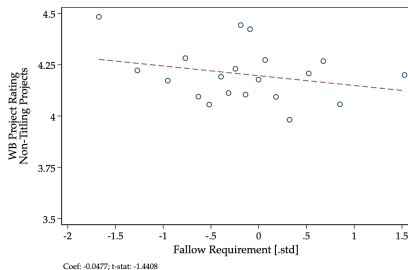
	Dependent Variable:					
	World Bank Project Rating [1-5]					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i> × <i>Land Titling Project</i>	-0.362*** (0.086) [0.056]	-0.344*** (0.086) [0.055]	-0.287*** (0.087) [0.052]	-0.246*** (0.087) [0.051]	-0.241*** (0.088) [0.051]	-0.230*** (0.091) [0.051]
Continent FEs	N	Y	Y	Y	Y	Y
Project Sector FEs	N	N	Y	Y	Y	Y
Project Year FEs	N	N	Y	Y	Y	Y
Geography Controls	N	N	N	Y	Y	Y
Disease Controls	N	N	N	Y	Y	Y
Crop FEs	N	N	N	Y	Y	Y
Ethnographic Controls	N	N	N	N	Y	Y
Country FEs	N	N	N	N	N	Y
Outcome Mean	4.20	4.20	4.20	4.20	4.20	4.20
Adjusted R2	0.016	0.038	0.128	0.150	0.153	0.271
Beta Coef.	-0.058	-0.055	-0.046	-0.039	-0.039	-0.037
Observations	29,483	29,483	29,427	29,427	29,427	29,426
Clusters	1,653	1,653	1,653	1,653	1,653	1,652

Notes: The unit of observation is a project-ethnologue pair. Standard errors are clustered at the ethnologue level and presented in parentheses. The dependent variable *World Bank Project Rating* is a variable ranging from 1 to 6, where 1 = a project was rated as highly unsatisfactory, 2 = unsatisfactory, 3 = moderately unsatisfactory, 4 = moderately satisfactory, 5 = satisfactory, and 6 = highly satisfactory. *Land Titling Project* is an indicator variable equal to 1 if the project description mentions land titling. *Geography Controls* include longitude, latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop. *Ethnographic Controls* includes settlement complexity, political centralization, and historical presence of large animals. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ ↑ Fallow requirements ⇒ ↓ success of land titling projects



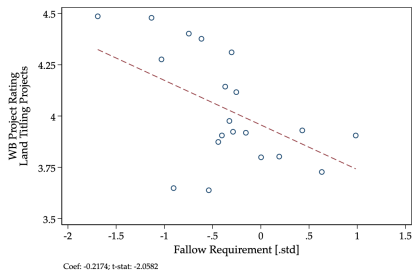
a. Land Titling Projects



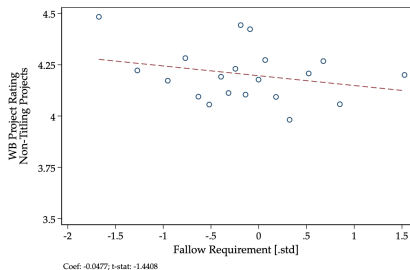
b. Non-Land Titling Projects

Notes: The figure presents binscatters between the World Bank project success rating for projects related to land titling (a.) or projects not related to land titling (b.), and fallowing requirements. The unit of observation is a project-ethnologue pair. The bottom-left of each figure presents the estimated bivariate coefficient and t-statistic. Standard errors are clustered at the ethnologue level. The regressions control for latitude and longitude and include continent, project sector, and project year fixed effects.

⇒ Effect concentrated in land projects; no effect in non-land projects



a. Land Titling Projects



b. Non-Land Titling Projects

Notes: The figure presents binscatters between the World Bank project success rating for projects related to land titling (a.) or projects not related to land titling (b.), and following requirements. The unit of observation is a project-ethnologue pair. The bottom-left of each figure presents the estimated bivariate coefficient and t-statistic. Standard errors are clustered at the ethnologue level. The regressions control for latitude and longitude and include continent, project sector, and project year fixed effects.

- ⇒ Effect concentrated in land projects; no effect in non-land projects
- ⇒ Driven low scores for local implementation rather than technical banking scores ▶
- ⇒ Driven by early projects (pre-2005); effects muted once WB evolved its land policy (Deininger and Binswanger, 1999) ▶

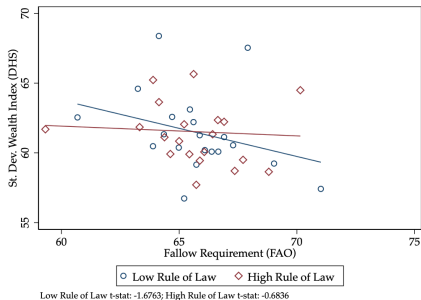
- ① An Origin: Fallow Requirements
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- ▶ Why might there be low demand for privatization in places with longer following?
- ▶ Explore two related mechanisms:
 - 1 Social insurance and inequality
 - 2 Conflict reduction

- ▶ Goldstein and Udry (2008) note the following in their study of fallowing choices under communal land rights in Ghana:

“We interpret the resilience of this system of land tenure to its crucial and flexible role in redistributing resources in the face of unobserved variations in need...”

This system may provide important insurance in times of need and a remarkable degree of social stability due to the redistribution of land within rural communities.”



(a) Inequality

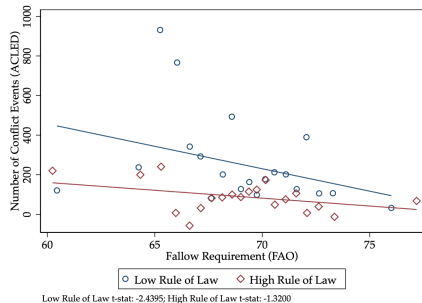


Figure 1: (b) Conflict

⇒ ↑ Fallow requirements are associated with ↓ inequality & ↓ conflict, especially in countries with weak Rule of Law (WB Governance Indicators)

⇒ Fallow requirements are not associated with less security or lower development

- ▶ Security
- ▶ Income

- ① An Origin: Fallow Requirements
- ② A Consequence: Policy Mismatch
- ③ Mechanisms
- ④ Conclusion

- ▶ Test hypothesis from Boserup and Demsetz that fallow lengths affect structure of property rights over land: longer fallow lengths lead to more communal property rights
- ▶ Longer fallow lengths associated with:
 - > less effective land-titling interventions
 - > less inequality and less conflict
- ▶ Provide insight into the economics of property rights
- ▶ Tailoring land policies to local institutions may be important for the design of land titling policies in settings with weak states

Thank you!

- ▶ We appreciate any comments: emontero@uchicago.edu

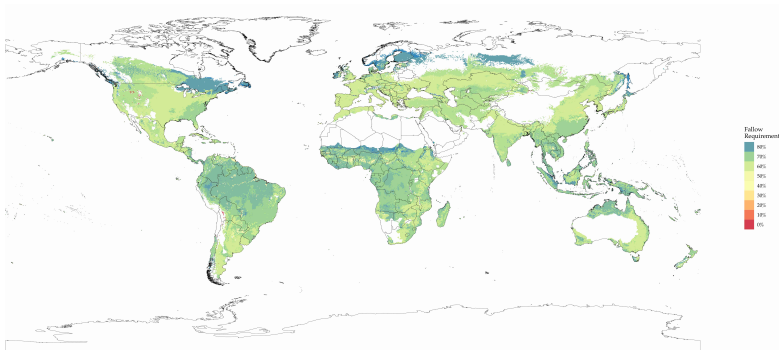
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- ▶ Use FAO data and models to construct the fallow requirements for the maximum caloric suitable crop across locations
- ▶ FAO estimates fallow requirements as a non-linear function of:
 - > local soil types
 - > temperature
 - > length of growing season
 - > climate
 - > crop type
- ▶ Fallow requirement: percentage of time during the fallow-cropping cycle the land should be under fallow for a given crop
 - = Probability in a given year that land will be fallow land instead of under cultivation
 - > e.g. A fallow requirement of 75% for land cultivated for 5 years \Rightarrow land must lay fallow for 15 years

Map of Fallow Requirement



Notes: The map presents the fallowing requirement for the maximum caloric suitability crop with low inputs and no irrigation across the world in 5' by 5' grid cells. The fallowing requirement for a crop is defined as the optimal percentage of time during the fallow-cropping cycle that land should be under fallow. Cells shaded in white represent regions where the land is not suitable for agriculture.

► Details

► Inputs

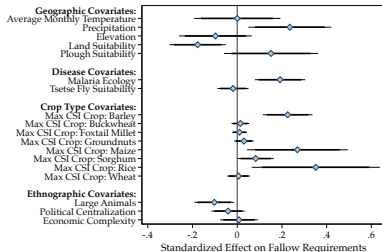
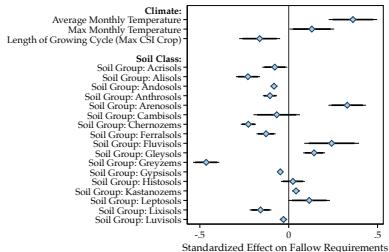
- ▶ The FAO does not provide a closed-form equation for Fallow Requirements; instead, it provides detailed values under different parameters
 - > Based on detailed studies on how soil conditions impact degradation and production (Nye and Greenland, 1960; Young and Wright, 1978, 1980; FAO/IIASA, 1991)
 - > Defined for four crop groups: cereals, legumes, roots and tubers, and long term annuals/perennials

Figure 2: Fallow Requirements FAO Formula Example

FAO 1990 Soil Unit		Crop Group	Temp	Fallow requirements (%) for low input farming																			
Symbol	Code			Temperature Regimes																			
				Tropics				Tropics				Seasonal Climates				Seasonal Climates							
				Average annual temperature >25 °C				Average annual temperature 20-25 °C				Average temperature hottest month >20 °C				Average temperature hottest month <20 °C							
Length of growing period (days)				Length of growing period (days)				Length of growing period (days)				Length of growing period (days)											
			<60	60-120	120-180	180-270	<60	60-120	120-180	180-270	<60	60-120	120-180	180-270	<60	60-120	120-180	180-270					
AC	18	2	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
AC	18	3	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
AC	18	4	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACH	19	1	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACH	19	2	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACH	19	3	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACH	19	4	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACF	20	1	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACF	20	2	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACF	20	3	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACF	20	4	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACu	21	1	>25	75	70	65	65	75	70	65	60	60	70	70	65	60	60	70	75	70	65	65	75
ACu	21	2	>25	75	70	65	65	75	70	65	60	60	70	70	65	60	60	70	75	70	65	65	75
ACu	21	3	>25	75	70	65	65	75	70	65	60	60	70	70	65	60	60	70	75	70	65	65	75
ACu	21	4	>25	75	70	65	65	75	70	65	60	60	70	70	65	60	60	70	75	70	65	65	75
ACp	22	1	>25	90	85	80	80	90	85	80	75	75	85	85	80	75	75	85	90	85	80	80	90
ACp	22	2	>25	90	85	80	80	90	85	80	75	75	85	85	80	75	75	85	90	85	80	80	90
ACp	22	3	>25	90	85	80	80	90	85	80	75	75	85	85	80	75	75	85	90	85	80	80	90
ACp	22	4	>25	90	85	80	80	90	85	80	75	75	85	85	80	75	75	85	90	85	80	80	90
ACg	23	1	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACg	23	2	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACg	23	3	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85
ACg	23	4	>25	85	80	75	75	85	80	75	70	70	80	80	75	70	70	80	85	80	75	75	85

Notes: Presents a snapshot of the FAO fallow requirement formulas for various soil type, crop type, and climate condition settings under the low-input use model.

Correlates of the Fallow Requirement



▶ Return: Map

▶ Return: SCCS Results

- ▶ Historically, land titling interventions common
- ▶ Colonial regimes pursued land titling and privatization schemes, e.g.:
 - > Belgians in Congo ▶
 - > British in Kenya
- ▶ Often ineffective and met with resistance

- ▶ Starting in the late 1930's, Belgian's implemented land reorganization scheme
- ▶ Original goal was to move from collective land tenure to private land ownership (Clement, 2014)
- ▶ An estimated 210,000 farmers and their families allotted plots by 1959 – about half of original goal
- ▶ Customary land tenure organized by clans; realized privatization efforts would upset local leaders
- ▶ Instead, settled for individual cultivation



Figure 3: 1952, Bamena, Uele District

- ▶ View that private land rights essential led to multiple land titling reforms, especially across Africa and Latin America
- ▶ In 2005, the World Bank was supervising a portfolio of more than \$1 billion (USD) worth of land administration projects (Galiani and Schargrodsky, 2011)
- ▶ Some of these titling reforms have had mixed results (e.g., see Vendryes, 2014, for a review)

- ▶ Honduras Land Administration Project, implemented between 2004-2010, \$34 million
- ▶ Goals: “land regularization, titling, and registration” and “institutional strengthening”
- ▶ Implementation halted among the Garífuna - who filed a formal complaint against the bank, saying:

“the Bank had not taken into consideration the rights and interests of the Garífuna people in the design, appraisal and implementation of the Project, and as a result their land rights and collective tenure traditions were under threat.”

- ▶ Why might fallow lengths impact the structure of property rights?

- ▶ Why might fallow lengths impact the structure of property rights?
- ▶ **Intuition:** Longer fallow requirements make communal land ownership more beneficial
- ▶ Communal property rights provide a solution to providing protection during fallow periods
 - > **Key assumption 1:** Longer fallow periods increases cost of protection in both private and communal property rights regimes
 - > Under communal property rights, communities provide these protection costs together rather than individuals alone
 - > **Key assumption 2:** Returns to scale in the provision of protection
 - > Individuals choose to monitor or not, with some chance of losing land in both regimes

- ▶ This argument was summarized by Demsetz (1967):

“Once a crop is grown by the more primitive agricultural societies, it is necessary for them to abandon the land for several years to restore productivity [i.e., fallow land].

Property rights in land among such people would require policing cost for several years during which no sizable output is obtained... Among these people it is common to find property rights to the crops, which, after harvest, are portable, but not to the land.

The more advanced agriculturally based primitive societies are able to remain with particular land for longer periods, and here we generally observe property rights to the land as well as to the crops.”

1. Above a certain threshold length of fallow, the communal regime is preferred to the private regime \Rightarrow returns to scale in monitoring become more valuable

1. Above a certain threshold length of fallow, the communal regime is preferred to the private regime \Rightarrow returns to scale in monitoring become more valuable
2. The communal regime reduces inequality \Rightarrow individuals that have high monitoring costs and choose to freeride can still benefit in the communal regime from group monitoring, in effect providing redistribution across members in the communal regime

1. Above a certain threshold length of fallow, the communal regime is preferred to the private regime \Rightarrow returns to scale in monitoring become more valuable
2. The communal regime reduces inequality \Rightarrow individuals that have high monitoring costs and choose to freeride can still benefit in the communal regime from group monitoring, in effect providing redistribution across members in the communal regime
3. Communal land rights reduce conflict \Rightarrow reduce social unrest through redistribution (above) and because greater monitoring provided under regime

Summary of Conceptual Framework Predictions

	<i>Prediction:</i>	<i>Empirics:</i>
Main Prediction: ↑ Fallow Requirements	↑ Communal Land Rights	Prevalence of Communal Land Rights
Secondary Predictions: ↑ Fallow Requirements:	↓ Interest in Private Rights	Success of World Bank Land Titling Projects
	↓ Inequality & Unrest	Income Inequality, Conflict Events

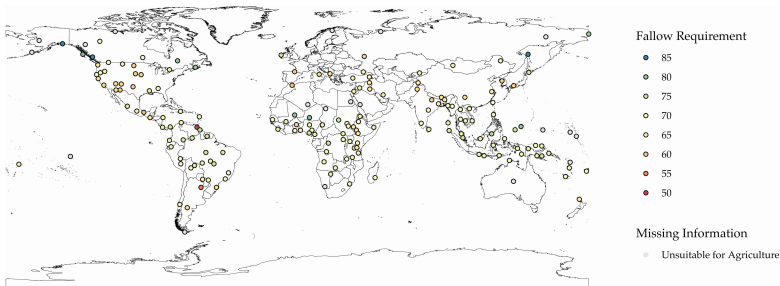
▶ Return: Fallow Requirements as a Driver of Property Rights

- ▶ Goldstein and Udry (2008) note the following in their study of fallowing choices under communal land rights in Ghana:

“We interpret the resilience of this system of land tenure to its crucial and flexible role in redistributing resources in the face of unobserved variations in need...”

This system may provide important insurance in times of need and a remarkable degree of social stability due to the redistribution of land within rural communities.”

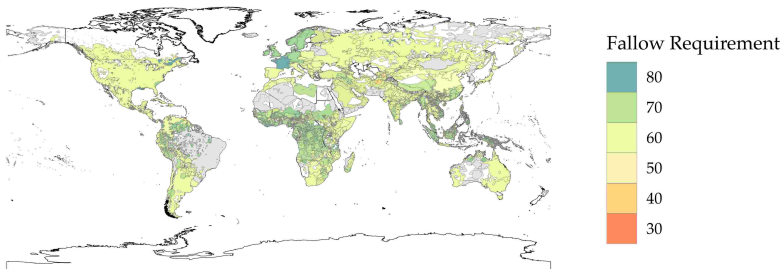
Figure 4: Fallow Requirements Across SCCS Societies



Notes: Map presents the fallow requirement – optimal percentage of time during the fallow-cropping cycle that land must be under fallow – for the maximum caloric suitability crop for each group in the SCCS. Grey dots represent groups where the land is not suitable for agriculture.

- ▶ Link EA societies to current language groups using the Ethnologue data as in Alesina et al. (2013) and Giuliano and Nunn (2018):

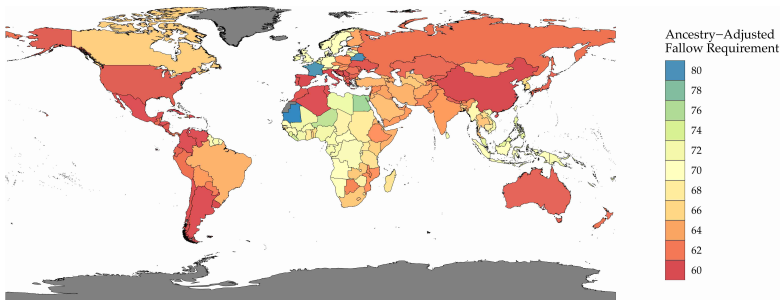
Figure 5: Fallow Requirements Across Language Groups Today



Notes: Map presents the fallow requirement – optimal percentage of time during the fallow-cropping cycle that land must be under fallow – for the maximum caloric suitability crop for each language group in the Ethnologue linked to the EA. Grey areas represent groups where the land is not suitable for agriculture.

- ▶ Construct measures of fallow requirements at the country level using the ancestry- and population-adjusted method developed by Alesina et al. (2013) and Giuliano and Nunn (2018)

Figure 6: Ancestry-Adjusted Fallow Requirements



Notes: Map presents the ancestry-adjusted fallow requirement – percentage of time during the fallow-cropping cycle that land must be under fallow – for the maximum caloric suitability crop for each country using the methodology from Giuliano and Nunn (2018). Grey areas represent groups where the land is not suitable for agriculture.

Maximum Caloric Suitable Crop

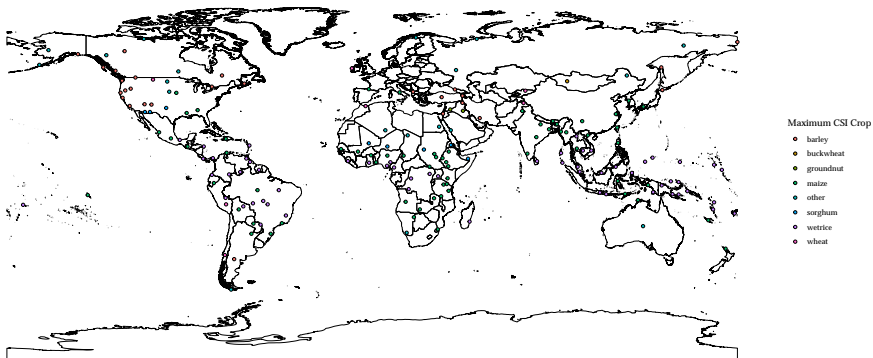
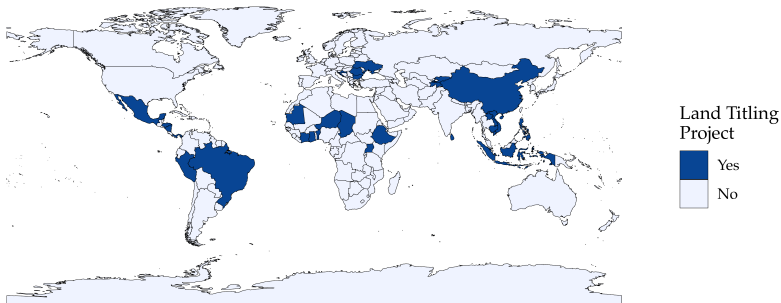
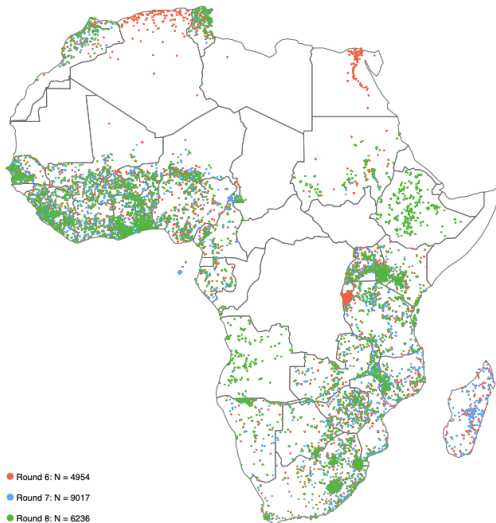


Figure 7: Map of World Bank Titling Projects Sample



Notes: The map presents the set of countries that have had at least one World Bank land titling project in the Aid Data sample.

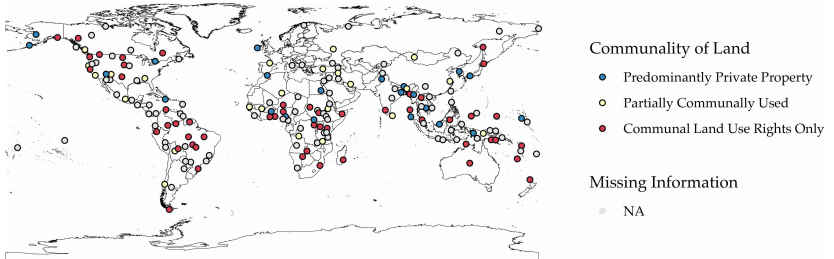
Afrobarometer Sample



- ▶ **Private Property** e.g. Tiv (Nigeria), “Within the minimal tar, every piece of cultivated ground from the largest yam field to the most insignificant patch of cassava can be referred to as belonging to a person, or to the people of such and such a compound situated within the minimal tar” (Bohannan, 1957, p. 31)
- ▶ **Partially Communal** e.g. Bambara (Mali)“Ownership of land does not exist...Each family has a right of use, uncertain in principle but permanent in fact, over the lands assigned to it in the domain of the genie-protector..Following the land for several years is permitted. The family exploiting the land may use it in any way, and its right is as complete as possible, short only of alienating it. The family may lease, cede, or pawn its usufruct.” (Monteil, 1924, p. 205)

- ▶ **Communal** e.g. Tanala (Madagascar) “the ultimate ownership of land was vested in the village. Each village owned a definite territory whose limits were established at the time it was founded...” (Linton, 1933, p. 128)

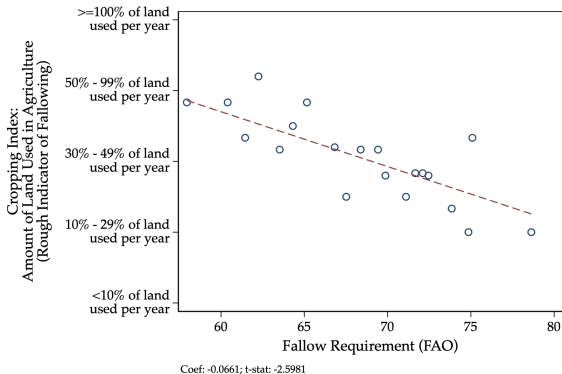
Communal Land Rights Across SCCS societies



Notes: Map presents the extent to which land rights are organized communally in the SCCS.

▶ Return: SCCS

FAO Fallowing Requirement & Observed Land Use in SCCS



⇒ ↑ Fallow requirements predict ↑ historical fallowing intensity across societies

▶ Table

▶ More

Table 4: Effect of Fallow Requirement on Contemporary Fallowing Practices

	Dependent Variable:				
	Contemporary Fallowing Practices [0-2]				
	(1)	(2)	(3)	(4)	(5)
<i>Fallow Requirement</i>	0.013** (0.006) [0.006]	0.012* (0.007) [0.007]	0.012* (0.006) [0.007]	0.015** (0.006) [0.007]	0.014** (0.007) [0.007]
Country FEs	Y	Y	Y	Y	Y
Geography Controls	N	Y	Y	Y	Y
Disease Controls	N	N	Y	Y	Y
Crop FEs	N	N	N	Y	Y
Ethnographic Controls	N	N	N	N	Y
Outcome Mean	0.72	0.72	0.72	0.72	0.72
Adjusted R2	0.044	0.048	0.052	0.057	0.057
Beta Coef.	0.112	0.104	0.101	0.133	0.125
Observations	10,744	10,744	10,744	10,744	10,744
Clusters	121	121	121	121	121

Notes: The unit of observation is a plot in the *An agricultural survey for more than 9,500 African households survey* (Waha et al., 2016). Two-way clustered standard errors by country and ethnologue group are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. Geographic Controls include longitude, latitude, average rainfall, average temperature, elevation, and agricultural suitability. Disease Controls include malaria suitability and tsetse suitability. Crop FEs are fixed effects for the maximum caloric suitability crop in each society. Ethnographic Controls includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development for the ethnologue group of each Enumeration Area. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ ↑ Fallow requirements associated ↑ land under fallow in present day Africa

Table 5: Effect of Fallow Requirement on Amount of Land Used For Agriculture in SCCS (Rough Indicator for Fallowing)

	Dependent Variable:					
	<i>Amount of Agricultural Land Used</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	-0.122*** (0.029) [0.029]	-0.105*** (0.034) [0.032]	-0.125*** (0.040) [0.035]	-0.127*** (0.038) [0.033]	-0.133*** (0.032) [0.026]	-0.135*** (0.039) [0.030]
Continent FEs	N	Y	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y	Y
Disease Controls	N	N	N	Y	Y	Y
Crop FEs	N	N	N	N	Y	Y
Ethnographic Controls	N	N	N	N	N	Y
Outcome Mean	3.00	3.00	3.00	3.00	3.00	2.98
Adjusted R2	0.179	0.210	0.249	0.238	0.310	0.324
Beta Coef.	-0.438	-0.376	-0.448	-0.454	-0.477	-0.491
Observations	63	63	63	63	63	61

Notes: The unit of observation is a society in the Standard Cross Cultural Survey (SCCS). Robust standard errors in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. The dependent variable *Amount of Agricultural Land Used* is a 1 to 5 categorical variable, where 1=<10% of agricultural land used per year, 2=10-29% of agricultural land used per year, 3=30-49% of agricultural land used per year, 4=50-99% of agricultural land used per year, and 5= \geq 100% of agricultural land used per year. *Geography Controls* include centroid longitude, centroid latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs*

Fallow Requirements & Communal Land Rights: SCCS

Table 6: Effect of Fallow Requirement & Land Suitability on Communal Land Rights

	Dependent Variable:					
	<i>Communality of Land Rights</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	0.043*** (0.013) [0.013]	0.039*** (0.014) [0.013]	0.035*** (0.013) [0.012]	0.038*** (0.014) [0.013]	0.036** (0.015) [0.013]	0.035** (0.015) [0.013]
<i>Land Suitability</i>			-0.158 (0.346) [0.317]	-0.119 (0.354) [0.320]	0.108 (0.361) [0.315]	0.280 (0.343) [0.291]
Continent FEs	N	Y	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y	Y
Disease Controls	N	N	N	Y	Y	Y
Crop FEs	N	N	N	N	Y	Y
Ethnographic Controls	N	N	N	N	N	Y
Outcome Mean	2.33	2.33	2.33	2.33	2.33	2.34
Adjusted R2	0.098	0.113	0.131	0.115	0.201	0.267
Beta Coef.	0.329	0.296	0.269	0.286	0.276	0.266
Observations	88	88	88	88	88	86

Notes: The unit of observation is a society in the Standard Cross Cultural Survey (SCCS). Robust standard errors in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. The dependent variable *Communality of Land Rights* is a 1 to 3 categorical variable, where 1=land is predominantly private property, 2=land is partially communally used, and 3=communal land use rights only. *Geography Controls* include centroid longitude, centroid latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop in each society. *Ethnographic Controls* includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ ↑ Fallowing requirements strongly associated with ↑ communal land rights

Table 7: Effect of Fallow Requirement on Communal Land Rights: Ordered Logit

	Dependent Variable:					
	<i>Communality of Land Rights</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	0.127*** (0.046)	0.112** (0.050)	0.095** (0.044)	0.101** (0.047)	0.116* (0.064)	0.115** (0.057)
Continent FEs	N	Y	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y	Y
Disease Controls	N	N	N	Y	Y	Y
Crop FEs	N	N	N	N	Y	Y
Ethnographic Controls	N	N	N	N	N	Y
Outcome Mean	2.33	2.33	2.33	2.33	2.33	2.34
Pseudo R2	0.063	0.097	0.147	0.151	0.248	0.334
Observations	88	88	88	88	88	86

⇒ ↑ Fallow requirements strongly associated with ↑ communal land rights

Table 8: Effect of Fallow Requirement on Communal Land Rights

	Dependent Variable:					
	<i>Intensity of Agriculture</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	-0.052** (0.023) [0.023]	-0.058*** (0.020) [0.019]	-0.035 (0.024) [0.023]	-0.039 (0.025) [0.024]	-0.038 (0.025) [0.024]	-0.029 (0.025) [0.022]
Continent FEs	N	Y	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y	Y
Disease Controls	N	N	N	Y	Y	Y
Crop FEs	N	N	N	N	Y	Y
Ethnographic Controls	N	N	N	N	N	Y
Outcome Mean	3.47	3.47	3.47	3.47	3.47	3.46
Adjusted R2	0.029	0.199	0.201	0.193	0.206	0.487
Beta Coef.	-0.186	-0.206	-0.126	-0.140	-0.134	-0.100
Observations	167	167	167	167	167	154

Notes: The unit of observation is a society in the Standard Cross Cultural Survey (SCCS). Robust standard errors in parentheses. The dependent variable *Intensity of Agriculture* is a 1 to 6 categorical variable, with higher values related to more intensive agricultural production. *Geography Controls* include centroid longitude, centroid latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop in each society. *Ethnographic Controls* includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ Longer fallow requirements are associated with more extensive agriculture, consistent with Boserup (1965)

- ▶ Explore whether relationship between fallow requirements and land rights continues to hold in more contemporary measures of land rights
- ▶ Use data from the *Comparative Constitutions Project* (Elkins et al., 2009)
- ▶ Examine five different measures of property rights (that each measure a different dimension of property rights):
 - > We define indicator variables equal to one if a constitution grants individual rights to:
 - 1 Transfer property,
 - 2 Own property,
 - 3 Testate property (right to give property at death), and
 - 4 Inherit property
 - > Additionally, construct an **index for private property rights** = the average of the four measures

Table 9: Fallow Requirements and Property Rights in Constitutions

	Dependent Variable: Right to [...] in Constitution								Index of	
	Transfer Property		Own Property		Testate Property		Inherit Property		Property Rights	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Fallow Requirement</i>	-0.016*** (0.005)	-0.007 (0.010)	-0.013** (0.006)	-0.015** (0.007)	-0.008** (0.004)	-0.011 (0.007)	-0.011 (0.009)	-0.008 (0.010)	-0.014*** (0.003)	-0.013** (0.005)
Continent FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Geography Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ethnographic Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Outcome Mean	0.22	0.22	0.82	0.82	0.10	0.10	0.09	0.09	0.35	0.35
Num. of Clusters	122	122	122	122	121	121	121	121	123	123
Observations	8188	8188	8024	8024	8288	8288	8079	8079	8633	8633
Beta Coef.	-.083	-.038	-.065	-.075	-.042	-.054	-.057	-.04	-.072	-.065
R ²	0.185	0.243	0.183	0.248	0.079	0.098	0.162	0.223	0.153	0.207

Notes: OLS estimates with robust standard errors clustered at the country level are reported in parentheses. The unit of observation is a country's constitution in a given year. Data are from the *Comparative Constitutions Project* (Elkins et al., 2009). Across specifications, outcomes are dummy variables equal to one if a constitution grants rights to (1-2) transfer property, (3-4) own property, (5-6) testate property, and (7-8) inherit property. The outcome variable in columns 9 and 10 is a property rights index computed as the average of the other four variables. Odd columns control for ancestry-adjusted geographic characteristics (latitude, longitude, elevation, land suitability, malaria) and ethnographic controls (settlement complexity, mean size of local community, political complexity, historical reliance on pastoralism and historical reliance on agriculture). Every specification controls for the log number of years since a constitution was first written, the total number of amendments made to each constitution, year dummies and continent fixed effects. The sample is restricted to countries where all groups practiced agriculture to varying degrees and for which information on fallow time is available. * p < 0.1; ** p < 0.05; *** p < 0.01

⇒ Longer fallow requirements have a negative and statistically significant relationship with various measures for individual property rights today

Table 10: Effect of Fallow Requirement on World Bank Project Success:
Rating Sub-Components

	Dependent Variable:									
	World Bank Project Rating [1-5]									
	Bank Quality at Entry		Bank Quality of Supervision		Overall Bank Quality		Local Implementing Agency		Government	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
<i>Fallow Requirement</i> × <i>Land Titling Project</i>	-0.005 (0.015)	0.003 (0.015)	0.006 (0.021)	0.002 (0.020)	-0.003 (0.016)	0.004 (0.017)	-0.040* (0.023)	-0.048** (0.021)	-0.048*** (0.017)	-0.056*** (0.018)
Continent FEs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Project Sector FEs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Project Year FEs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Geography Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Disease Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Crop FEs	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ethnographic Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Country FEs	N	Y	N	Y	N	Y	N	Y	N	Y
Outcome Mean	4.21	4.21	4.21	4.21	4.20	4.20	4.21	4.21	4.20	4.20
Adjusted R2	0.174	0.274	0.257	0.326	0.243	0.318	0.155	0.255	0.144	0.256
Beta Coef.	-0.050	0.028	0.054	0.016	-0.025	0.041	-0.380	-0.465	-0.465	-0.539
Observations	29,191	29,190	29,123	29,122	29,466	29,465	29,046	29,045	28,636	28,635
Clusters	1,653	1,652	1,652	1,651	1,654	1,653	1,652	1,651	1,637	1,636

Notes: The unit of observation is a project-ethnologue pair. Standard errors are clustered at the ethnologue level and presented in parentheses. The dependent variable *World Bank Project Rating* is a variable ranging from 1 to 6, where 1 = a project was rated as highly unsatisfactory, 2 = unsatisfactory, 3 = moderately unsatisfactory, 4 = moderately satisfactory, 5 = satisfactory, and 6 = highly satisfactory. *Land Titling Project* is an indicator variable equal to 1 if the project description mentions land titling. *Geography Controls* include longitude, latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop. *Ethnographic Controls* includes settlement complexity, political centralization, and historical presence of large animals. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ ↑ Fallow requirements ⇒ ↓ ratings for local implementation; no effect on technical bank components

Table 11: Effect of Fallow Requirement on World Bank Project Success:
Effects by Early vs. Later Projects

	Dependent Variable:	
	<i>World Bank Project Rating [1-5]</i>	
	<i>Pre-2005</i>	<i>Post-2005</i>
	(1)	(2)
<i>Fallow Requirement</i> × <i>Land Titling Project</i>	-0.048** (0.023)	-0.012 (0.017)
Continent FEs	Y	Y
Project Sector FEs	Y	Y
Project Year FEs	Y	Y
Geography Controls	Y	Y
Disease Controls	Y	Y
Crop FEs	Y	Y
Ethnographic Controls	Y	Y
Country FEs	Y	Y
Outcome Mean	4.24	4.06
Adjusted R2	0.290	0.290
Beta Coef.	-0.464	-0.115
Observations	23,342	6,084
Clusters	1,538	680

Notes: The unit of observation is a project-ethnologue pair. Standard errors are clustered at the ethnologue level and presented in parentheses. The dependent variable *World Bank Project Rating* is a variable ranging from 1 to 6, where 1 = a project was rated as highly unsatisfactory, 2 = unsatisfactory, 3 = moderately unsatisfactory, 4 = moderately satisfactory, 5 = satisfactory, and 6 = highly satisfactory. *Land Titling Project* is an indicator variable equal to 1 if the project description mentions land titling. *Geography Controls* include longitude, latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suit-

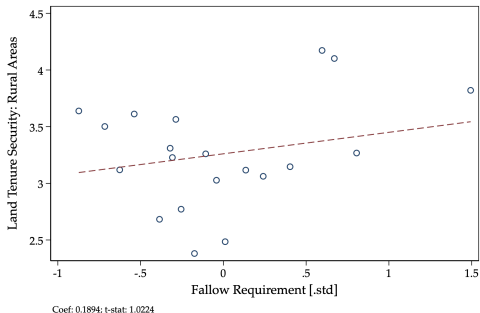
Table 12: Effect of Fallow Requirements on World Bank Project Selection

	Dependent Variable:					
	Any Project		Land Titling Project		Rated Project	
	(1)	(2)	(3)	(4)	(5)	(6)
Fallow Requirement	-0.001 (0.028) [0.028]	-0.005 (0.030) [0.031]	-0.005 (0.009) [0.009]	-0.005 (0.009) [0.009]		
Continent FEs	Y	Y	Y	Y	Y	Y
Geography Controls	Y	Y	Y	Y	Y	Y
Disease Controls	Y	Y	Y	Y	Y	Y
Crop FEs	Y	Y	Y	Y	Y	Y
Ethnographic Controls	N	Y	N	Y	N	Y
Outcome Mean	0.60	0.60	0.56	0.56		
Adjusted R2	0.275	0.285	0.696	0.696		
Beta Coef.	-0.001	-0.010	-0.010	-0.009		
Observations	224	224	56,358	56,358		
Clusters	224	224	134	134		

Notes: The unit of observation is a country in columns 1 and 2, and a world bank project in columns 3, 4, 5, and 6. Standard errors clustered by country in parentheses. The dependent variable in columns 1 and 2, *Any Project*, is an indicator variable equal to 1 if the country had at least one world bank project in the Aid Data sample. The dependent variable in columns 3 and 4, *Land Titling Project*, is an indicator variable equal to 1 if a world bank project is a land titling project. The dependent variable in columns 5 and 6, *Rated Project*, is an indicator variable equal to 1 if a world bank project has an outcome rating. *Geography Controls* include centroid longitude, centroid latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop in each society. *Ethnographic Controls* includes the presence of large domesticated animals, an index of settlement density, and an index of political development. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ No significant relationship between fallow requirements and probability of having any World Bank project or having a World Bank project rated

Figure 8: Fallow Requirements & Land Security: Institutional Profiles Dataset



Notes: The figure presents binscatters between the fallow requirements and the extent of land tenure security in rural areas in the Institutional Profiles Database. The unit of observation is a country. Regressions control for latitude, longitude, and continent fixed-effects. The bottom-right of each figure presents the estimated bivariate coefficient and t-statistic. Standard errors are clustered at the country level.

⇒ Longer fallow requirements do not seem to be associated with more land insecurity

Table 13: Effect of Fallow Requirement on Conflict

	Dependent Variable:					
	<i>Number of Conflict Events</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	-10.183** (4.217) [4.236]	-10.854*** (3.907) [3.976]	-10.726*** (3.921) [3.982]	-10.559** (4.151) [4.200]	-10.213*** (3.945) [3.694]	-8.854** (3.596) [3.635]
Country FEs	Y	Y	Y	Y	Y	Y
Geography Controls	N	Y	Y	Y	Y	Y
Disease Controls	N	N	Y	Y	Y	Y
Crop FEs	N	N	N	Y	Y	Y
Ethnographic Controls	N	N	N	N	Y	Y
Population Controls	N	N	N	N	N	Y
Outcome Mean	142.46	142.67	142.67	142.67	142.67	152.33
Outcome SD	1460.68	1461.76	1461.76	1461.76	1461.76	1537.24
Adjusted R2	0.157	0.158	0.159	0.161	0.191	0.194
Beta Coef.	-0.032	-0.034	-0.034	-0.033	-0.032	-0.026
Observations	6,718	6,708	6,708	6,708	6,708	5,997

⇒ ↑ Fallow requirements (⇒ ↑ communal land rights) ⇒ ↓ conflict

Table 14: Effect of Fallow Requirement on Jurisdictional Hierarchy

	Dependent Variable:					
	<i>Extent of Jurisdictional Hierarchy</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	-0.026 (0.016) [0.016]	-0.021 (0.013) [0.013]	0.008 (0.016) [0.015]	0.014 (0.017) [0.016]	0.019 (0.017) [0.016]	0.013 (0.016) [0.015]
Continent FEs	N	Y	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y	Y
Disease Controls	N	N	N	Y	Y	Y
Crop FEs	N	N	N	N	Y	Y
Ethnographic Controls	N	N	N	N	N	Y
Outcome Mean	2.14	2.14	2.14	2.14	2.14	2.14
Adjusted R2	0.009	0.247	0.276	0.288	0.290	0.440
Beta Coef.	-0.124	-0.097	0.038	0.066	0.091	0.062
Observations	165	165	165	165	165	152

Notes: The unit of observation is a society in the Standard Cross Cultural Survey (SCCS). Robust standard errors in parentheses. The dependent variable *Extent of Jurisdictional Hierarchy* measures the degree of jurisdictional hierarchy beyond the local level, ranging from 0=no levels, to 5=four levels. *Geography Controls* include centroid longitude, centroid latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop in each society. *Ethnographic Controls* includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ Longer Fallow Requirements not associated with less centralization (lower jurisdictional hierarchy); Testing Boserup “downstream” hypothesis, but relationship is weak

Table 15: Effect of Fallow Requirement on Jurisdictional Hierarchy

	Dependent Variable:					
	<i>Extent of Jurisdictional Hierarchy</i>					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	-0.005** (0.002)	-0.005** (0.002)	-0.004 (0.003)	-0.001 (0.003)	-0.001 (0.003)	-0.000 (0.003)
Continent FEs	N	Y	Y	Y	Y	Y
Geography Controls	N	N	Y	Y	Y	Y
Disease Controls	N	N	N	Y	Y	Y
Crop FEs	N	N	N	N	Y	Y
Ethnographic Controls	N	N	N	N	N	Y
Outcome Mean	0.24	0.24	0.24	0.24	0.24	0.24
Adjusted R2	0.003	0.203	0.221	0.247	0.251	0.290
Beta Coef.	-0.066	-0.061	-0.048	-0.008	-0.010	-0.001
Observations	1,021	1,021	1,021	1,021	1,021	1,003

Notes: The unit of observation is a society in the EA. Robust standard errors in parentheses. The dependent variable *Extent of Jurisdictional Hierarchy* measures the degree of jurisdictional hierarchy beyond the local level, ranging from 0=no levels, to 5=four levels. *Geography Controls* include centroid longitude, centroid latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop in each society. *Ethnographic Controls* includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ Longer Fallow Requirements are associated with less centralization (lower jurisdictional hierarchy) but relationship is weak and not robust to crop types

- ▶ Hypothesis: Communal land rights may reduce inequality because they are more flexible and can reallocate to those in need
- ▶ Data: Use Demographic and Health Survey (DHS) data to explore whether longer fallow requirements are associated with differences in average income and inequality
 - > 123 surveys spanning 47 countries across Asia, Latin America, and Africa

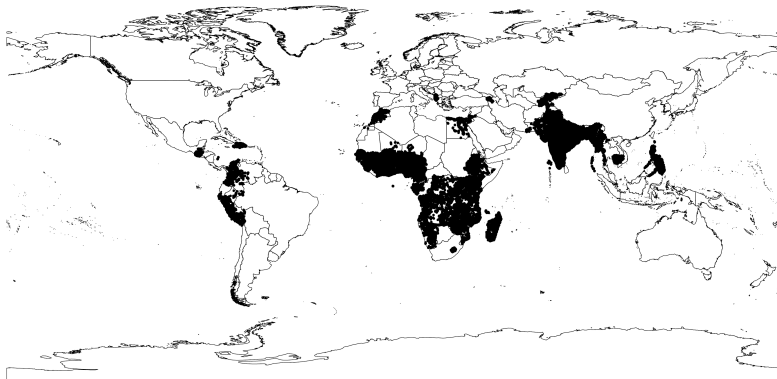


Table 16: Effect of Fallow Requirement on Income and Inequality

	Dependent Variable: ... of DHS Wealth Score					
	Inter-Quartile Range		Standard Deviation		Average	
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	-0.545*** (0.190) [0.323]	-0.509*** (0.189) [0.320]	-0.401*** (0.114) [0.242]	-0.398*** (0.122) [0.240]	-1.018 (0.645) [0.760]	-0.641 (0.719) [0.749]
Country-Year FEs	Y	Y	Y	Y	Y	Y
Geography Controls	Y	Y	Y	Y	Y	Y
Disease Controls	Y	Y	Y	Y	Y	Y
Crop FEs	Y	Y	Y	Y	Y	Y
Ethnographic Controls	N	Y	N	Y	N	Y
Population	N	Y	N	Y	N	Y
Outcome Mean	78.23	78.93	62.87	63.46	-2.80	-0.86
Outcome SD	101.61	104.63	77.04	79.43	165.79	170.17
Adjusted R2	0.539	0.541	0.625	0.627	0.222	0.218
Beta Coef.	-0.024	-0.021	-0.023	-0.022	-0.027	-0.016
Observations	66,167	61,773	66,169	61,775	66,169	61,775
Clusters	114	114	114	114	114	114

Notes: The unit of observation is a DHS cluster. Standard errors that are two-way clustered by country-survey wave and ethnologue group are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. In Panel A, the outcome variable is the standard deviation of the DHS wealth score. In Panel B, the outcome variable is the inter-quartile range of the DHS wealth score. In Panel C, the outcome variable is the average DHS wealth score. All regressions control for cluster size and rural-urban status. Geography Controls include longitude, latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. Disease Controls include malaria suitability and tsetse suitability. Crop FEs are fixed effects for the maximum caloric suitability crop in each society. Population includes log population for each ethnologue group. Ethnographic Controls includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development for the ethnologue group of each DHS cluster. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

⇒ ↑ Fallow requirements ⇒ ↓ income inequality

Table 17: Effect of Fallow Requirement on Night Light Density

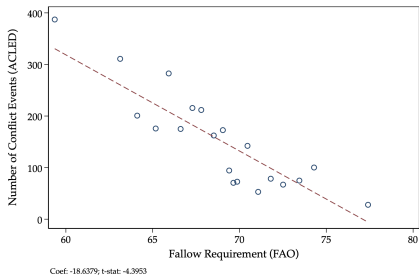
	Dependent Variable:					
	Log(Night Light Density + 1)					
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Fallow Requirement</i>	0.001 (0.002) [0.002]	0.003 (0.002) [0.002]	0.003 (0.002) [0.002]	0.003 (0.002) [0.002]	0.002 (0.002) [0.002]	0.002 (0.002) [0.002]
Country FEs	Y	Y	Y	Y	Y	Y
Geography Controls	N	Y	Y	Y	Y	Y
Disease Controls	N	N	Y	Y	Y	Y
Crop FEs	N	N	N	Y	Y	Y
Ethnographic Controls	N	N	N	N	Y	Y
Population Controls	N	N	N	N	N	Y
Outcome Mean	0.22	0.22	0.22	0.22	0.22	0.22
Adjusted R2	0.318	0.331	0.331	0.333	0.354	0.355
Beta Coef.	0.007	0.028	0.029	0.029	0.023	0.023
Observations	3,825	3,825	3,825	3,825	3,734	3,734
Clusters	143	143	143	143	142	142

Notes: The unit of observation is an ethnologue group. Standard errors that are clustered by ethnologue group are presented in parentheses and Conley (1999) standard errors calculated using a 100 km cut-off window are presented in brackets. The dependent variable $\text{Log}(\text{Night Light Density} + 1)$ is defined as the log of the mean night light intensity plus one in the VIIRS data per ethnologue group in 2018. *Geography Controls* include centroid longitude, centroid latitude, average rainfall, average temperature, elevation, plough suitability, and agricultural suitability. *Disease Controls* include malaria suitability and tsetse suitability. *Crop FEs* are fixed effects for the maximum caloric suitability crop in each society. *Ethnographic Controls* includes the presence of large domesticated animals, the proportion of the local environment that is tropical or subtropical, an index of settlement density, and an index of political development. *Population Controls* includes log population density for each group. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

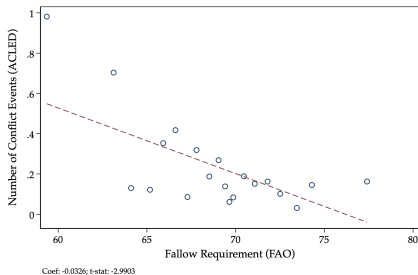
⇒ No significant relationship between fallow requirements and night light density

- ▶ Hypothesis: a potential benefit of communal land rights is that they might provide social insurance and reduce conflict
- ▶ Data: ACLED conflict data to explore whether communal land rights are better at mediating conflict, especially in weak states
 - > Data covers 1997-2021 for Africa, 2016-2021 for Latin America, and 2018-2021 for other countries
- ▶ Look at all types of conflict, but also follow the methodology in Eberle et al. (2020) to construct measures of “land-related” violence (using “notes” in ACLED data)

Fallow Requirements & Conflict



(a) All Conflict

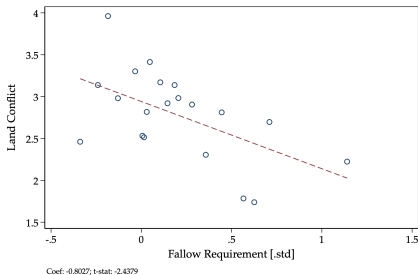


(b) Land-Related Conflict

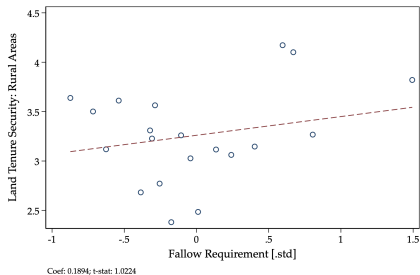
⇒ ↑ Fallow requirements (⇒ ↑ communal land rights) ⇒ ↓ conflict

- ▶ Institutional Profiles Database: Expert-coded country-level measures of “severity of land-related conflict” & “security of rural land”

Fallow Requirements, Conflict, & Security: IPD Data



(a) Conflict



(b) Tenure Security

⇒ ↑ Fallow requirements ⇒ ↓ conflict & no reduction in tenure security