Appendix for Land Inequality and Rural Unrest: Theory and Evidence from Brazil

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TABLE A1. Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Land Invasions (Count)	0.07	0.49	0	31	144768
Land Invasions (Dummy)	0.04	0.19	0	1	144768
Land Invasions (Families)	8.6	91.66	0	12540	144768
Land Grants (Count)	0.06	0.42	0	22	144768
Land Grants (Families Settled)	6.05	74.22	0	7318	144768
Land Grant Area	531.84	15897.28	0	2450381	144768
Neighboring Reforms	2.08	4.22	0	81	144638
Neighboring Expropriations	1.5	3.34	0	81	144638
Neighboring Recognitions	0.38	1.73	0	49	144638
Neighboring Expropriations In-State	1.15	2.72	0	81	144638
Neighboring Expropriations Out-of-State	0.35	1.37	0	44	144638
Neighboring Recognitions In-State	0.3	1.51	0	49	144638
Neighboring Recognitions Out-of-State	0.08	0.77	0	29	144638
Neighboring Invasions	3.43	9.13	0	152	144638
Cumulative Reforms	0.83	2.63	0	78	144768
Land Inequality (Gini)	0.71	0.13	0.01	0.99	142324
Percent Rural	0.42	0.24	0	1	143188
log(Agricultural Productivity)	4.18	1.46	0	9.13	144454
log(Income Per Capita)	5.24	0.76	3.22	7.58	143190
Municipality with Rural Assassinations (Dummy)	0.09	0.29	0	1	145490
Rural Assassinations in the Past (Dummy)	0.06	0.23	0	1	145490
Rural Assassinations (Count)	0.12	0.87	0	31.5	145490
Municipal Guard Exists	0.12	0.33	0	1	145490
Municipal Guard Personel per Capita	0	0	0	0.37	136915
Municipal Guard Aids Military Police	0.64	0.48	0	1	8768
Political Business Connection (Dummy)	0.01	0.12	0	1	61519
Political Business Connection (Count)	0.07	1.06	0	48	61519
Political Business Connection (Area)	76.01	2820.09	0	195309	61508
MST supported Invasions	0.02	0.12	0	1	144768
Sugar Dependence	0.09	0.21	0	1	117584
Cattle Dependence	1.64	1.14	0	10.21	133979
Soy Dependence	0.08	0.18	0	1	117621
Coffee Dependence	0.06	0.16	0	1	117634
Left Governor	0.21	0.41	0	1	138716
Right Governor	0.16	0.37	0	1	138716
Δ Land Gini	0.01	0.09	-0.74	0.73	142246
Number of Farms smaller 1ha / larger 100ha	0.56	0.86	0	1.89	145490

Typology of Land Reforms

The way in which land is obtained for the purposes of distribution is key to our theoretical argument and empirical strategy. We leverage two main types of land reform in the manuscript: expropriations of private land and the recognition of settlements on public lands. Expropriations are overwhelmingly conducted by the federal government, whereas recognitions largely stem from public lands that are mostly held by states.

This broad distinction is made by categorizing the somewhat more diverse ways in which land is obtained (forma obtenção) for the purposes of land reform. These data are collected for each land grant both by INCRA as well as by the CPT (and, consequently, are in the Dataluta dataset). Table A2 enumerates every way in which land can be obtained for the purpose of land reform and how we categorize these ways for the purposes of our analysis. The overwhelming number of land reforms that have been completed, 8,004 out of 8,918 (note that 305 of the 9,223 were still under review), come in the form of expropriations of private lands and recognitions of public lands. Consider expropriations. Not only do 62% of transfers occur through typical *desapropriaçoes* in which private landowners are indemnified in cash and government bonds according to the market value of their property, but in select cases expropriations occur via confiscation (where no payment is made, typically due to involvement in illicit activities), collection (when back taxes are owed and charged toward the indemnification payment), reversion (typically due to illegal or fake land titles), or with payment in kind rather than cash.

Table A2. Land Reform Typology

Obtainment	**Obtainment**	**Classification**	**Frequency**
Adjudicação	Adjudication	Recognition	28
Arrecadação	Collection	Expropriation	734
Cessão	Cession	Transfer/Incorp.	19
Compra	Purchase	Purchase	532
Confisco	Confiscation	Expropriation	38
Dação	Payment in kind	Expropriation	6
Desapropriação	Expropriation	Expropriation	5,544
Discriminação	Reclamation	Transfer/Incorp.	59
Doação	Donation	Transfer/Incorp.	141
Em Obtenção	Under Review	N/A	305
Incorporação	Incorporation	Transfer/Incorp.	7
Outros	Other	N/A	24
Reconhecimento	Recognition	Recognition	1,625
Reversão de Domínio	Reversion	Expropriation	29
Transferência	Transfer	Transfer/Incorp.	132

As discussed on p. 16 of the manuscript,

Table A2 includes two categories – purchase and transfer/incorporation – that we do not include in our analysis. This is for two reasons. First, it is not *a priori* clear from a theoretical standpoint what invaders should learn from these activities (and, therefore, whether they should yield spillover effects to land invasions or not). In some cases, for instance, INCRA's ex ante negotiated purchase of a private property for settlement may incentivize more invasions; in other cases, because such purchases can either be very costly or arise when a landowner has no heirs to pass the property onto and therefore voluntarily sells it to the state, they can appear ad hoc in nature, such that similar circumstances are unlikely to transpire in neighboring regions. Second, many purchases and transfers entail coordination between state and federal actions (e.g., public land transfers between different levels of government). In any case, these categories, along with unclassified reforms, only constitute 10% of all land reforms that were completed from 1988–2013.

Table A3 displays the number of cases of land reform in each state according to how the land was obtained for the purposes of reform. As is evident, different states demonstrate different patterns when it comes to obtaining land. Figure A2 visualizes part of that information by comparing the number of public recognitions and private expropriations by state over time.

Once land is obtained for the purposes of land reform, a diverse set of settlement/project types can ensue. A variety of state, federal, and in select cases municipal agencies can be involved. However, a key distinction remains the source of the land rather than the management of a project: because different levels of government have access to different tools when it comes to obtaining land for the purposes of transferring it to squatters, would-be land invaders care most about the likelihood that squatting will yield benefits in the form of access to land.

The settlement/project types are as follows: Assentamento Federal, Assentamento Agroextrativista Federal, Assentamento Estadual, Assentamento Municipal, Programa Cédula Da Terra, Assentamento Estadual Sem Convênio, Assentamento Casulo, Colonização, Assentamento Dirigido, Assentamento Rápido, Especial De Assentamento, Colonização Oficial, Especial De Colonização, Integrado De Colonização, Assentamento Conjunto, Área De Regularização Fundiária, Assentamento Quilombola, Projeto De Desenvolvimento Sustentável, Reserva Extrativista, Território Remanescentes De Quilombos, Assentamento Florestal, Floresta Nacional, Reserva De Desenvolvimento Sustentável, Reassentamento De

Barragem, Reconhecimento De Assentamento Fundo De Pasto, Terra Indígena, Reconhecimento De Projeto Publicode Irrigação, Assentamento Agroindustrial, and Floresta Estadual. Generally speaking, the governmental level of the agency managing a specific land settlement project maps closely onto the origins of the land itself. For instance, of the 5,544 cases of *desapropriação*, 5,521 projects were managed by the federal government through INCRA. This is also true in every case of *confisco*, *reversão de domínio*, and *dação*, and in 703 of 734 cases of *arrecadação*.

TABLE A3. Land Reform Types by State

	State																										
Reform Type	AC	AL	AM	AP	BA	CE	DF	ES	GO	MA	MG	MS	MT	PA	PB	PE	PI	PR	RJ	RN	RO	RR	RS	SC	SE	SP	TO	Total
Adjudication			1													23		1	1			1				1		28
Cession				1										1	1	1							4			11		19
Collection	50		62	33					1	37		3	93	230		8		3	1		79	63				4	67	734
Confiscation					1								1			33	2										1	38
Donation	1	2	8		8	6		2	5	10	7	3	1	4		42	21	5			2	2	3	6	2		1	141
Expropriation	61	111	11		503	399	1	66	349	525	312	120	305	435	252	414	239	257	52	276	80		133	112	167	98	266	5544
Incorporation		1		1										3							1						1	7
Other	1				3			1			5	1		6		1						1		1			4	24
Payment in kind	1															4								1				6
Purchase	2	57	2		8	5		4	43	13	22	64	29	33	15	30	45	33		10	12		49	21	12	7	16	532
Reclamation	1		21	1					1					34						1								59
Recognition	37	1	36	9	166	40	11	22	42	313	54	12	146	41	33	36	186	19	16	9	26		148	20	34	141	27	1625
Reversion												2	1	10							16							29
Transfer	2	3					2		3	92	2			8	1		3	5	6				1			4		132
Under Review			3											302														305
Total	156	175	144	45	689	450	14	95	444	990	402	205	576	1107	302	592	496	323	76	296	216	67	338	161	215	266	383	9223

FIGURE A1. Land Invasions and Land Reforms in Brazil, 1988–2013

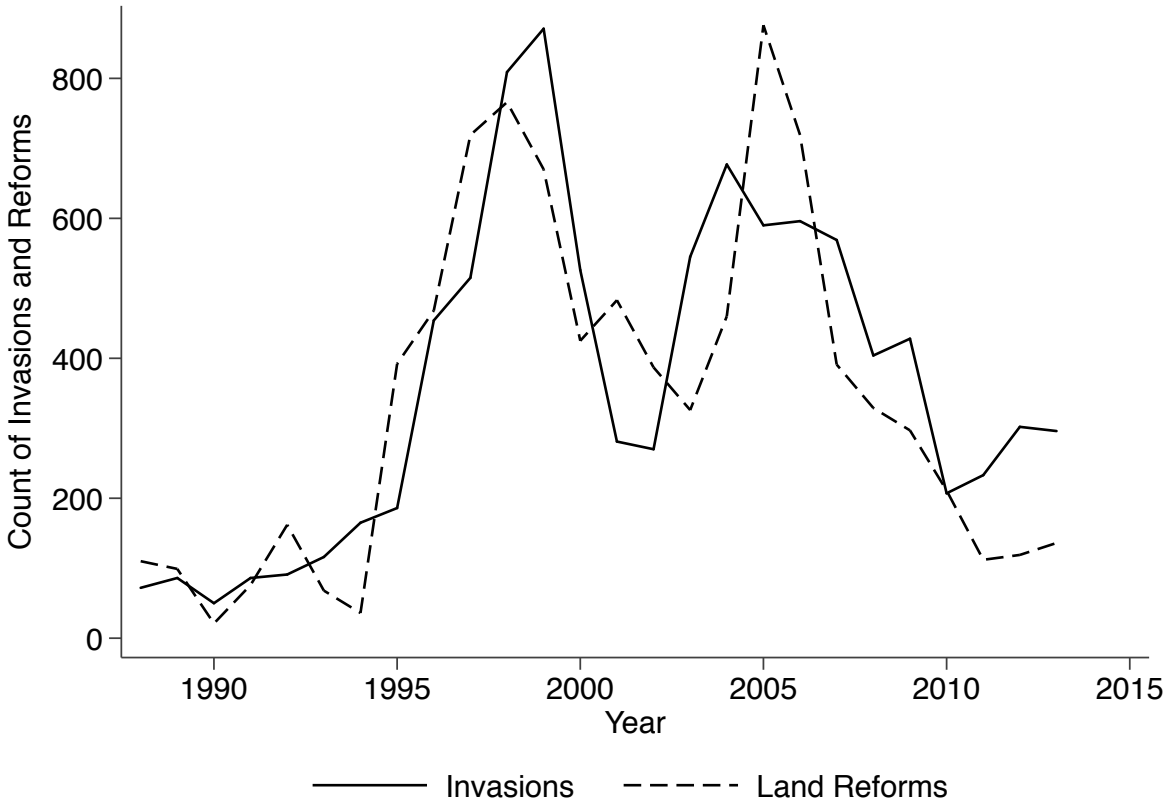

FIGURE A2. Public Recognitions vs. Private Expropriations by State, 1988–2013

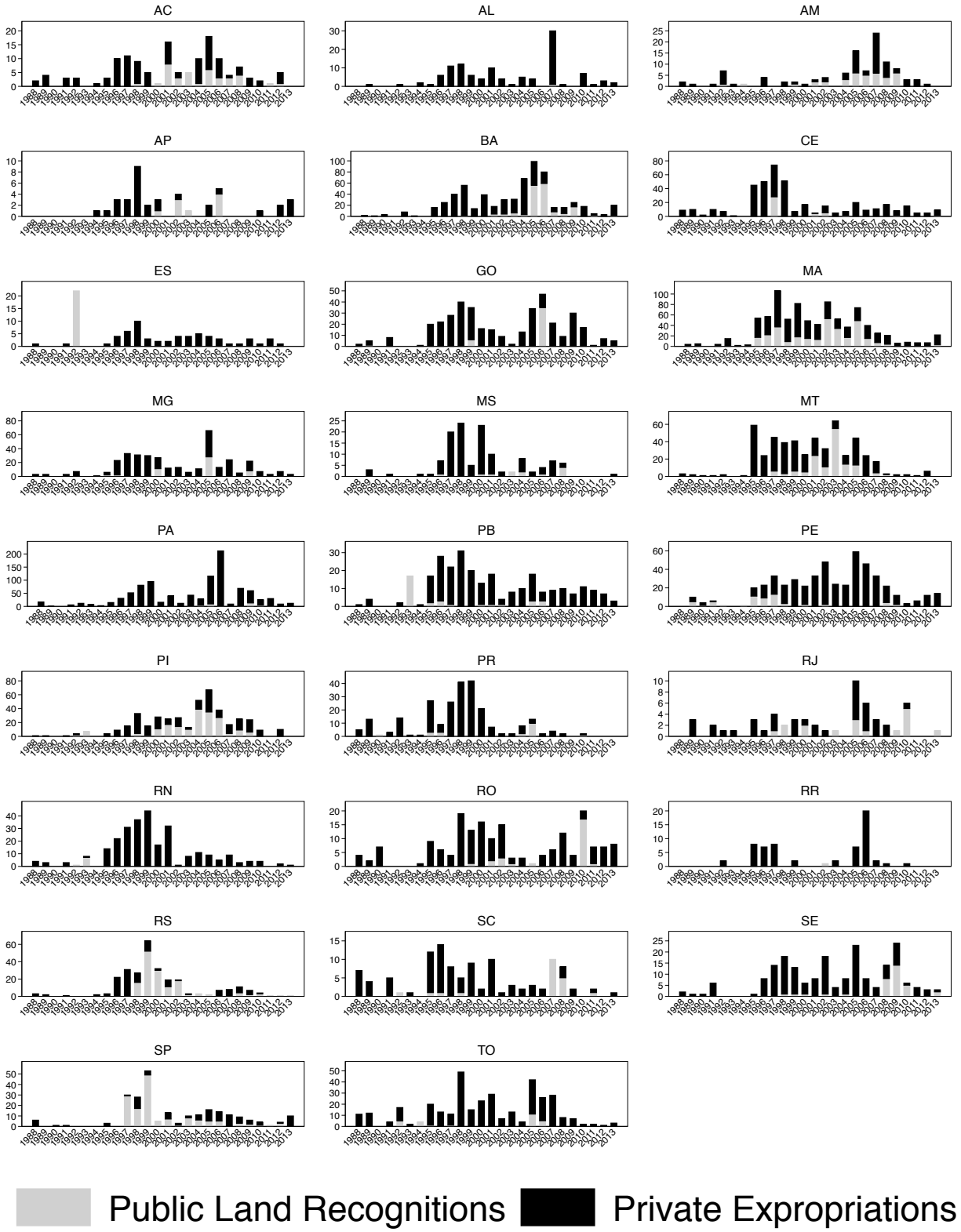

TABLE A4. Determinants of Land Invasions in Brazil, 1988–2013:
Including Municipal Fixed Effects as Robustness Check

Invasions Measure as DV:	Full Sample						$\|\Delta$Land Gini$\| < 0.005$	
	Count	Families	Count	Families	Count	Families	Count	Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Land Gini	4.062***	3.920***	1.247***	1.989***	1.671***	2.437***	2.503***	3.422***
	(0.268)	(0.240)	(0.262)	(0.227)	(0.304)	(0.249)	(0.596)	(0.397)
Neighboring Reforms	1.075***	1.274***	0.902***	1.016***	0.595***	0.825***	0.807***	1.201***
	(0.152)	(0.139)	(0.156)	(0.138)	(0.165)	(0.147)	(0.247)	(0.216)
Land Gini*Neighboring Reforms	-1.007***	-1.190***	-0.587***	-0.690***	-0.505**	-0.691***	-0.760**	-1.131***
	(0.193)	(0.177)	(0.199)	(0.176)	(0.211)	(0.186)	(0.316)	(0.274)
Percent Rural	-0.693***	-0.575***	-0.803***	-0.612***	-0.203	-0.354***	-0.559**	-0.648***
	(0.138)	(0.107)	(0.151)	(0.101)	(0.178)	(0.113)	(0.248)	(0.159)
log(Ag Productivity)	0.058***	0.095***	0.091***	0.126***	0.053**	0.101***	0.044	0.108***
	(0.019)	(0.017)	(0.018)	(0.016)	(0.021)	(0.018)	(0.029)	(0.025)
log(Income per capita)	0.302***	0.290***	0.234***	0.258***	0.395***	0.302***	0.405***	0.306***
	(0.062)	(0.048)	(0.031)	(0.028)	(0.077)	(0.050)	(0.107)	(0.071)
Time Trend	YES	YES	NO	NO	YES	YES	YES	YES
Fixed Effects	NO	NO	YES	YES	YES	YES	YES	YES
Observations	137141	137141	43004	42226	43004	42226	24338	23884

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality for regression without municipal fixed effects). Constants estimated but not reported. All independent variables are lagged by one period. "Neighboring Reforms" are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 7 – 8 are restricted to municipalities in which the landholding gini changed by less than 0.005 annually from 1996 to 2006. Models 1 – 2 include municipal random effects and models 3 – 8 include municipal fixed effects.

TABLE A5. Determinants of Land Invasions in Brazil, 1988–2013:
Using Two-Year Lags as Robustness Check

	Full Sample					Municipalities where $\lvert\Delta$Land Gini$\rvert < 0.005$					
Dependent Variable:	Invasion Count			Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11
Land Gini	5.658***	5.494***	6.045***	5.261***	8.209***	7.414***	7.050***	10.143***	2.244***	2.827**	3.138***
	(0.364)	(0.357)	(0.430)	(0.317)	(0.741)	(0.651)	(0.497)	(1.155)	(0.602)	(1.414)	(0.391)
Neighboring Reforms		0.397***	1.039***	1.015***	1.935***	1.160***	1.443***	2.289***	0.173	-0.004	0.657***
		(0.033)	(0.227)	(0.172)	(0.466)	(0.303)	(0.230)	(0.633)	(0.248)	(0.295)	(0.221)
Land Gini*Reforms			-0.840***	-0.869***	-2.099***	-1.052***	-1.459***	-2.521***	-0.168	0.056	-0.618**
			(0.296)	(0.221)	(0.607)	(0.393)	(0.297)	(0.837)	(0.315)	(0.378)	(0.280)
Percent Rural	-0.690***	-0.631***	-0.633***	-0.501***	-1.236***	-1.018***	-0.880***	-1.466***	-0.439*	-0.053	-0.544***
	(0.208)	(0.204)	(0.204)	(0.172)	(0.328)	(0.308)	(0.230)	(0.391)	(0.251)	(0.518)	(0.161)
log(Ag Productivity)	0.032	0.044*	0.047*	0.067***	0.120**	0.055	0.082**	0.125	0.078***	0.088**	0.129***
	(0.025)	(0.024)	(0.025)	(0.024)	(0.050)	(0.038)	(0.039)	(0.078)	(0.030)	(0.036)	(0.026)
log(Income per capita)	0.454***	0.555***	0.562***	0.623***	0.382**	0.473**	0.486***	0.574**	0.411***	0.640***	0.283***
	(0.161)	(0.160)	(0.159)	(0.121)	(0.194)	(0.198)	(0.167)	(0.261)	(0.107)	(0.219)	(0.072)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	MUNI	MUNI	MUNI
Observations	131685	131685	131685	131685	131685	74657	74559	74657	23176	23176	22741

* $p<0.10$, ** $p<0.05$, *** $p<0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by **two periods**. "Neighboring Reforms" are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 6-11 are restricted to municipalities in which the landholding Gini changed by less than 0.005 annually from 1996 to 2006.

TABLE A6. Identifying Spillover Effects of Land Reforms on Land Invasions, 1988–2013: Using Two-Year Lags as Robustness Check

	All Land Invasions							First Instances of Land Invasions		
								Ever in Muni	Prior Period in Region	Ever in Region
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Neighboring Expropriations	0.391***									
	(0.036)									
Neighboring Recognitions out of State	0.025	-0.001	-0.017	0.007	0.226	-0.051	-0.011	0.318	-1.769	-4.096
	(0.088)	(0.087)	(0.088)	(0.088)	(0.594)	(0.673)	(0.672)	(0.764)	(1.083)	(3.056)
Neighboring Expropriations in State		0.308***	0.295***							
		(0.036)	(0.036)							
Neighboring Expropriations out of State		0.330***	0.305***							
		(0.068)	(0.068)							
Neighboring Recognitions in State			0.351***							
			(0.056)							
Relevant Neighboring Reforms				0.365***	1.074***	0.754***	0.851***	0.725***	1.120***	2.238***
				(0.029)	(0.203)	(0.203)	(0.188)	(0.263)	(0.266)	(0.415)
Land Gini*Relevant Neighboring Reforms					-0.914***	-0.737***	-0.723***	-0.550	-1.100***	-2.570***
					(0.260)	(0.260)	(0.241)	(0.336)	(0.333)	(0.536)
Land Gini*Neighboring Recognitions out of State					-0.288	-0.163	-0.027	-0.330	2.127	4.672
					(0.786)	(0.873)	(0.885)	(1.005)	(1.366)	(3.607)
Land Gini	5.541***	5.536***	5.476***	5.478***	6.053***	5.822***	5.364***	5.027***	6.262***	5.569***
	(0.358)	(0.357)	(0.357)	(0.358)	(0.415)	(0.394)	(0.401)	(0.392)	(0.485)	(0.550)
Percent Rural	-0.616***	-0.614***	-0.617***	-0.619***	-0.623***	-0.480**	-0.777***	-0.651***	-0.627***	-0.759**
	(0.204)	(0.204)	(0.204)	(0.204)	(0.204)	(0.193)	(0.199)	(0.198)	(0.220)	(0.316)
log(Ag Productivity)	0.043*	0.041*	0.041*	0.043*	0.046*	0.043*	0.031	0.053**	0.061**	0.066*
	(0.025)	(0.025)	(0.024)	(0.024)	(0.025)	(0.025)	(0.022)	(0.026)	(0.028)	(0.037)
log(Income per capita)	0.541***	0.542***	0.567***	0.566***	0.573***	0.662***	0.461***	0.382***	0.859***	1.024***
	(0.159)	(0.159)	(0.160)	(0.160)	(0.158)	(0.152)	(0.145)	(0.141)	(0.180)	(0.207)
Neighboring Invasions						0.508***				
						(0.038)				
Cumulative Reforms							0.199***			
							(0.012)			
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	131685	131685	131685	131685	131685	131685	131685	108999	99034	57360

* $p<0.10$, ** $p<0.05$, *** $p<0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by **two periods**. "Relevant Neighboring Reforms" are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Model 8 is restricted to the subset of municpalities that have not previously experienced a land invasion. Model 9 is restricted to the subset of municpalities that had no land invasions within a 50km radius in the previous year. Model 10 is restricted to the subset of municpalities that have never had any land invasions within a 50km radius in prior years.

TABLE A7. Sensitivity of Spillover Effects to Controls for Agricultural Production, 1988–2013

	Model 1	Model 2	Model 3	Model 4	Model 5
Neighboring Recognitions out of State	0.087	0.497	0.318	0.320	0.276
	(0.579)	(0.579)	(0.577)	(0.571)	(0.592)
Relevant Neighboring Reforms	1.445***	1.573***	1.623***	1.544***	1.517***
	(0.207)	(0.211)	(0.212)	(0.211)	(0.207)
Land Gini*Relevant Neighboring Reforms	-1.289***	-1.450***	-1.516***	-1.418***	-1.406***
	(0.265)	(0.270)	(0.270)	(0.270)	(0.264)
Land Gini*Neighboring Recognitions out of State	-0.030	-0.461	-0.296	-0.268	-0.229
	(0.757)	(0.752)	(0.752)	(0.744)	(0.771)
Land Gini	6.418***	6.929***	7.080***	6.889***	6.599***
	(0.405)	(0.406)	(0.421)	(0.410)	(0.398)
Percent Rural	-0.600***	-0.650***	-0.496**	-0.480**	-0.467**
	(0.202)	(0.196)	(0.201)	(0.197)	(0.194)
log(Ag Productivity)	-0.112***	-0.087**	-0.146***	-0.113***	-0.092**
	(0.042)	(0.041)	(0.044)	(0.041)	(0.045)
log(Income per capita)	0.621***	0.503***	0.712***	0.726***	0.578***
	(0.154)	(0.148)	(0.158)	(0.152)	(0.144)
Cattle Dependence	0.119***				0.245***
	(0.040)				(0.046)
Soy Dependence		1.413***			1.906***
		(0.202)			(0.232)
Sugar Dependence			0.185		0.489***
			(0.158)		(0.154)
Coffee Dependence				-1.387***	-0.863***
				(0.323)	(0.315)
Time Trend	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES
Observations	127608	116826	116791	116839	116776

* $p<0.10$, ** $p<0.05$, *** $p<0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. "Relevant Neighboring Reforms" are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants in municipalities within a 100km radius. All reform count measures are log-transformed. The agricultural dependency measure for cattle production is the logged ratio of the number of cattle per square kilometer. The remaining dependency measures are the shares of cultivated land in a municipality used to grow the respective crop.

TABLE A8. Sensitivity to Potential Endogeneity in Land Inequality, 1988–2013

Dependent Variable:	Invasion Count			Invasion Dummy			Invasion Families		
Change in Land Gini:	$\|\Delta\|<0.005$	$\|\Delta\|<0.003$	$\|\Delta\|<0.001$	$\|\Delta\|<0.005$	$\|\Delta\|<0.003$	$\|\Delta\|<0.001$	$\|\Delta\|<0.005$	$\|\Delta\|<0.003$	$\|\Delta\|<0.001$
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Land Gini	7.834***	8.027***	8.135***	7.403***	7.380***	7.513***	11.256***	10.962***	16.257***
	(0.635)	(0.824)	(1.355)	(0.505)	(0.657)	(1.251)	(1.140)	(1.217)	(1.770)
Neighboring Reforms	1.707***	1.803***	2.291***	1.869***	1.972***	2.221***	2.997***	3.055***	4.357***
	(0.320)	(0.405)	(0.523)	(0.242)	(0.298)	(0.491)	(0.542)	(0.605)	(0.689)
Land Gini*Neighboring Reforms	-1.576***	-1.628***	-2.354***	-1.805***	-1.867***	-2.245***	-3.196***	-3.173***	-5.310***
	(0.414)	(0.521)	(0.667)	(0.315)	(0.387)	(0.640)	(0.705)	(0.783)	(0.886)
Percent Rural	-1.047***	-1.516***	-1.208**	-0.911***	-1.256***	-0.958**	-1.507***	-2.042***	-3.472***
	(0.294)	(0.355)	(0.470)	(0.228)	(0.259)	(0.410)	(0.411)	(0.493)	(0.960)
log(Ag Productivity)	0.033	-0.026	-0.128**	0.071*	0.028	-0.044	0.243***	0.214**	0.082
	(0.038)	(0.042)	(0.064)	(0.040)	(0.046)	(0.067)	(0.072)	(0.087)	(0.117)
log(Income per capita)	0.486**	0.492**	1.322***	0.485***	0.451**	1.003***	0.454*	0.312	0.593
	(0.193)	(0.233)	(0.389)	(0.168)	(0.192)	(0.309)	(0.260)	(0.299)	(0.588)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	77752	52704	18040	77650	52628	17913	77752	52704	18040

* $p<0.10$, ** $p<0.05$, *** $p<0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. "Neighboring Reforms" are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed.

TABLE A9. Sensitivity to Removing Interpolated Variables, 1988–2013

Sample:	Non-Interpolated Land Gini			Dropping Interpolated Variables "Percent Rural" and "log(Income per capita)"								
	Years 1996 and 2006 only			Full Sample			Municipalities where $\|\Delta$Land Gini$\| < 0.005$					
Dependent Variable:	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Land Gini	7.715***	5.981***	16.111***	6.168***	5.504***	9.291***	7.774***	7.425***	11.739***	2.220***	3.150**	3.026***
	(0.744)	(0.627)	(1.285)	(0.398)	(0.317)	(0.675)	(0.597)	(0.490)	(1.115)	(0.581)	(1.350)	(0.384)
Neighboring Reforms	1.981***	1.630***	4.335***	1.324***	1.327***	2.733***	1.526***	1.701***	3.346***	0.813***	0.760***	1.150***
	(0.463)	(0.366)	(0.678)	(0.222)	(0.166)	(0.424)	(0.319)	(0.241)	(0.540)	(0.248)	(0.292)	(0.214)
Land Gini*Neighboring Reforms	-2.104***	-1.801***	-5.274***	-1.091***	-1.161***	-2.942***	-1.383***	-1.617***	-3.702***	-0.806**	-0.655*	-1.142***
	(0.589)	(0.466)	(0.891)	(0.289)	(0.216)	(0.538)	(0.414)	(0.315)	(0.705)	(0.317)	(0.375)	(0.272)
log(Ag Productivity)	0.057	0.077*	0.242***	0.106***	0.115***	0.282***	0.107***	0.126***	0.334***	0.068**	0.061*	0.171***
	(0.047)	(0.043)	(0.094)	(0.025)	(0.025)	(0.047)	(0.038)	(0.039)	(0.067)	(0.029)	(0.035)	(0.025)
Percent Rural	-0.423	-0.744**	-0.405									
	(0.330)	(0.298)	(0.636)									
log(Income per capita)	0.431*	0.234	0.756*									
	(0.243)	(0.206)	(0.450)									
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	MUNI	MUNI	MUNI
Observations	10878	10846	10878	137197	137197	137197	77752	77650	77752	24338	24338	23884

* $p<0.10$, ** $p<0.05$, *** $p<0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. "Neighboring Reforms" are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 1–3 are restricted to agricultural census years in which the land Gini is available. Models 7–12 are restricted to municipalities in which the landholding Gini changed by less than 0.005 annually from 1996 to 2006.

TABLE A10. Sensitivity to Clustering Standard Errors by Mesoregion, 1988–2013

	Full Sample					Municipalities where |ΔLand Gini| < 0.005				
Dependent Variable:	Invasion Count			Invasion Dummy	Invasion Families	Invasion Count	Invasion Dummy	Invasion Families	Invasion Count	Invasion Families
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
Land Gini	5.603***	5.424***	6.225***	5.493***	8.930***	7.834***	7.403***	11.256***	2.503***	3.422***
	(0.688)	(0.660)	(0.753)	(0.592)	(0.824)	(1.253)	(1.000)	(0.911)	(0.596)	(0.397)
Neighboring Reforms		0.529***	1.447***	1.398***	2.574***	1.707***	1.869***	2.997***	0.807***	1.201***
		(0.055)	(0.331)	(0.261)	(0.422)	(0.458)	(0.368)	(0.597)	(0.247)	(0.216)
Land Gini*Neighboring Reforms			-1.203***	-1.219***	-2.707***	-1.576***	-1.805***	-3.196***	-0.760**	-1.131***
			(0.407)	(0.331)	(0.516)	(0.593)	(0.472)	(0.769)	(0.316)	(0.274)
Percent Rural	-0.731***	-0.651**	-0.657**	-0.557**	-1.067**	-1.047***	-0.911***	-1.507***	-0.559**	-0.648***
	(0.278)	(0.261)	(0.259)	(0.226)	(0.416)	(0.375)	(0.293)	(0.503)	(0.248)	(0.159)
log(Ag Productivity)	0.031	0.047	0.051	0.066*	0.225***	0.033	0.071	0.243***	0.044	0.108***
	(0.038)	(0.037)	(0.037)	(0.035)	(0.062)	(0.053)	(0.051)	(0.066)	(0.029)	(0.025)
log(Income per capita)	0.374	0.525**	0.531**	0.589***	0.303	0.486	0.485*	0.454	0.405***	0.306***
	(0.275)	(0.263)	(0.259)	(0.225)	(0.334)	(0.303)	(0.270)	(0.432)	(0.107)	(0.071)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	STATE	STATE	STATE	STATE	STATE	STATE	STATE	STATE	MUNI	MUNI
Observations	137141	137141	137141	137141	137141	77752	77650	77752	24338	23884

* $p<0.10$, ** $p<0.05$, *** $p<0.01$ (two-tailed). Standard errors in parentheses (clustered by mesoregion). Constants estimated but not reported. All independent variables are lagged by one period. "Neighboring Reforms" are a weighted sum of all land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Models 6-10 are restricted to municipalities in which the landholding Gini changed by less than 0.005 annually from 1996 to 2006.

TABLE A11. Sensitivity
of Spillover Effects of Land Reforms on Land Invasions to Inclusion of Spatial Lags, 1988–2013

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Neighboring Land Invasions (t-1)	0.607***	0.499***	0.475***	0.269***	0.182***	0.378***
	(0.038)	(0.036)	(0.037)	(0.022)	(0.024)	(0.023)
Neighboring Land Invasions (t-2)		0.192***	0.191***	0.032	0.092***	0.047**
		(0.035)	(0.033)	(0.024)	(0.024)	(0.023)
Neighboring Land Invasions (t-3)			0.031	-0.099***		
			(0.033)	(0.022)		
Neighboring Recognitions out of State	-0.221	-0.260	-0.261	0.887	0.867	0.694
	(0.678)	(0.701)	(0.708)	(0.586)	(0.584)	(0.594)
Relevant Neighboring Reforms	1.108***	1.066***	1.032***	0.380**	0.354**	0.536***
	(0.200)	(0.202)	(0.205)	(0.155)	(0.154)	(0.150)
Land Gini*Neighboring Recognitions out of State	0.085	0.104	0.111	-1.109	-1.124	-0.807
	(0.877)	(0.904)	(0.913)	(0.759)	(0.757)	(0.769)
Land Gini*Relevant Neighboring Reforms	-1.146***	-1.136***	-1.117***	-0.333*	-0.415**	-0.389**
	(0.258)	(0.259)	(0.262)	(0.196)	(0.195)	(0.189)
Land Gini	6.007***	5.988***	5.993***	1.423***	1.502***	1.100***
	(0.367)	(0.367)	(0.374)	(0.299)	(0.293)	(0.289)
Percent Rural	-0.421**	-0.397**	-0.345*	0.051	-0.173	-1.115***
	(0.185)	(0.185)	(0.190)	(0.186)	(0.186)	(0.181)
log(Ag Productivity)	0.046*	0.045*	0.033	0.041*	0.053**	0.107***
	(0.026)	(0.027)	(0.027)	(0.021)	(0.021)	(0.020)
log(Income per capita)	0.659***	0.678***	0.737***	0.547***	0.355***	-0.326***
	(0.143)	(0.144)	(0.150)	(0.081)	(0.083)	(0.093)
Time Trend	TREND	TREND	TREND	TREND	YEAR FE	STATSPEC
Fixed Effects	STATE	STATE	STATE	MUNI	MUNI	MUNI
Observations	137141	135819	130350	40645	42642	42642

* $p<0.10$, ** $p<0.05$, *** $p<0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. "Relevant Neighboring Reforms" are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants in municipalities within a 100km radius. All reform count measures are log-transformed. Model 6 contains state-specific time trends.

Testing Alternative Explanations

Peasant Versus Landowner Organization.

The first alternative explanation would claim that peasant rather than landowner organizational capacity accounts for the observed pattern of land invasions. Perhaps facing a hostile rural environment absent reform spillovers, collective action barriers are high and can only be overcome when the most organized landless social movement, the MST, is willing to aid peasants in order to call attention to landlessness – a tactic that could be especially effective in unequal municipalities that shed a harsh light on rural inequity. Then when there is a permissive environment in the form of neighboring reforms, peasants find organizing invasions easier across the board and thus the most unequal municipalities are no longer specifically targeted.

Table A12 tests this alternative explanation by differentiating highly organized land invasions that involve the MST from those that are not supported by this key social movement. If we find that the same patterns of land invasions obtain for both more and less organized land invasions, then we can infer that it is the response side of landowner organization rather than peasant organization that is driving the results. Models 1-2 of Table A12 are specified the same way as Model 3 of Table 2 and Model 5 of Table 3 but exclude municipality-years in which the MST was involved in land invasions, with data taken from Dataluta as detailed above.[1] Economic crisis in the northeast sugar zone, for instance, enabled the MST to make inroads into the north from its southern origins in an effort to transform itself into a national movement (Wolford, 2010). Similarly, primarily southern cattle ranchers long had difficulty proving productive use of their land, facilitating MST organization and associated land invasions. The findings in Models 1-2 largely mirror those for the full sample presented in the earlier tables. Models 3-4 instead exclude municipality-years in which the MST was *not* involved in land invasions. Again the results mirror the previous results and those in Models 1-2 of Table A12.

In short, whether self-organized or aided by a powerful social movement, land invasions follow similar patterns vis-a-vis landholding inequality and neighboring land reforms. This casts doubt on peasant organization as a mechanism driving the results – perhaps

[1]The Table A12 results also hold when introducing municipal fixed effects to account for unobserved municipal-level factors that may have differentially facilitated MST growth such as a history of social capital or tight-knit communities. Similarly, including controls for sugarcane farming and cattle ranching to account for local agricultural economies that may impact whether the MST is active in some places and not others does not affect the results.

not too surprising given the presumptively much higher barriers to organization for several hundred landless peasant families versus a small number of locally rooted large landowners.

Political Partisanship. The second alternative explanation for where land invasions materialize is the partisan affiliation of political executives, namely governors and the president. State governors are powerful actors in the Brazilian political system. The military police that are typically used to evict squatter settlements are controlled at the state level. Furthermore, governors can influence the agrarian reform process and the pace of land invasions through their influence over the state INCRA office (Meszaros, 2013). The president indirectly appoints the head of INCRA and can use her administrative clout to direct the land reform process. Political partisanship could therefore provide an alternative explanation for the findings if, for instance, one-off land invasions targeting unequal municipalities are hard to rebuff, but when there is an evident threat of invasions due to neighboring reforms, governors on the right either deploy police to protect powerful large landowners in unequal places or credibly signal to land invaders via the state INCRA office that land grants will not be forthcoming in response to invasions. A similar finding could obtain if governors and the president on the right agree on "law and order" policing or an INCRA grant pullback in response to unrest – especially in municipalities where politically powerful landowners have the clout to call a governor's attention.

We test this alternative by examining the patterns of land invasions first directly controlling for governor ideology, then through examining where there is political concordance between governors and the president either on the right or on the left, and finally examining political discordance.[2] If the alternative is correct, we should expect leftwing governors or political concordance on the left to yield either (i) more land invasions regardless of landholding inequality; or (ii) the systematic targeting of more unequal municipalities with land invasions regardless of spillover threats given a broader pool of sympathetic voters. The opposite should hold on the right. Regardless, it is hard to countenance why unequal municipalities would face lower rates of invasions in the face of spillover threats under left rule.

Table A13 reports the results. Models 1-2 indicate

[2]We assign the ideological orientation of presidents and governors on a three point (left-center-right) scale using the ideological coding of Brazil's splintered party system by Carreirão (2006). An examination of the impact of partisan agreement between mayors and governors yielded similar results.

that, consistent with Meszaros (2013), right-wing governors are tied to fewer land invasions relative to the omitted baseline category of centrist governors. Left governors, however, are not tied to more land invasions. Most importantly, the main results with respect to land inequality and spillover threats from neighboring reforms hold even controlling for governor ideology. Models 3-8 examine partisan alignment between governors and the president. The patterns of land invasions documented in previous tables again obtain irrespective of whether governors and the president share political views on the left or the right, or if their partisan affiliations conflict. These results suggest that landowner organization rather than partisanship drives the results.

TABLE A12. Peasant Organization as an Alternative Explanation for Land Invasions, 1988–2013
Dependent Variable: Number of Land Invasions

Peasant Organizational Capacity:	Non-MST Invasions		MST supported Invasions	
	Model 1	Model 2	Model 3	Model 4
All Neighboring Reforms	1.211***		1.993***	
	(0.250)		(0.368)	
Relevant Neighboring Reforms		1.414***		1.914***
		(0.222)		(0.337)
Neighboring Recognitions out of State		-1.541		0.757
		(1.006)		(0.778)
Land Gini*All Neighboring Reforms	-0.807**		-1.959***	
	(0.323)		(0.481)	
Land Gini*Relevant Neighboring Reforms		-1.170***		-1.907***
		(0.281)		(0.432)
Land Gini*Neighboring Recognitions out of State		1.662		-0.743
		(1.261)		(1.040)
Land Gini	4.984***	5.120***	8.112***	7.974***
	(0.477)	(0.460)	(0.593)	(0.555)
Percent Rural	-0.451*	-0.456*	-0.853***	-0.857***
	(0.238)	(0.237)	(0.263)	(0.262)
log(Ag Productivity)	0.095***	0.092***	0.011	0.006
	(0.029)	(0.029)	(0.037)	(0.037)
log(Income per capita)	0.782***	0.788***	0.442*	0.444*
	(0.161)	(0.160)	(0.248)	(0.247)
Time Trend	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES
Observations	134541	134541	134672	134672

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. "Relevant Neighboring Reforms" are a weighted sum of all expropriations (in-state and out-of state) and in-state land grants within a 100km radius. All reform count measures are log-transformed. Models 1-2 include all observations without invasions and invasions not supported by Brazil's landless movement (MST). Models 3-4 include all observations without invasions and invasions supported by the MST.

TABLE A13. Political
Affiliation of Governor and the President as an Alternative Explanation for Land Invasions, 1988–2010

Political Actors:	Governors		Ideological Agreement Between Governor and President					
Political Alignment:	N/A	N/A	Right	Left	None	Right	Left	None
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Land Gini	6.417***	6.420***	6.918***	3.446***	6.896***	6.937***	3.364***	6.859***
	(0.410)	(0.393)	(0.694)	(0.824)	(0.556)	(0.666)	(0.781)	(0.530)
All Neighboring Reforms	1.540***		1.736***	1.172**	1.065***			
	(0.227)		(0.361)	(0.518)	(0.288)			
Relevant Neighboring Reforms		1.584***				1.794***	1.150**	1.010***
		(0.205)				(0.328)	(0.498)	(0.273)
Neighboring Recognitions out of State		0.173				-0.780	-1.278	1.160
		(0.566)				(1.062)	(1.380)	(0.727)
Land Gini*All Neighboring Reforms	-1.315***		-1.500***	-1.319**	-0.774**			
	(0.296)		(0.452)	(0.670)	(0.376)			
Land Gini*Relevant Neighboring Reforms		-1.453***				-1.668***	-1.355**	-0.744**
		(0.262)				(0.401)	(0.636)	(0.350)
Land Gini*Neighboring Recognitions out of State		-0.121				0.934	2.077	-1.639*
		(0.739)				(1.382)	(1.837)	(0.941)
Left Governor	0.016	-0.000			0.227			0.214
	(0.057)	(0.057)			(0.175)			(0.176)
Right Governor	-0.535***	-0.511***			-0.361**			-0.382**
	(0.084)	(0.083)			(0.162)			(0.162)
Percent Rural	-0.661***	-0.663***	-0.623**	-2.101***	-0.211	-0.655**	-2.100***	-0.221
	(0.198)	(0.197)	(0.265)	(0.410)	(0.262)	(0.264)	(0.410)	(0.262)
log(Ag Productivity)	0.055**	0.050**	0.126***	0.143**	-0.026	0.127***	0.137**	-0.032
	(0.025)	(0.025)	(0.029)	(0.065)	(0.035)	(0.029)	(0.065)	(0.035)
log(Income per capita)	0.531***	0.534***	0.567**	0.413	0.497**	0.560**	0.405	0.498**
	(0.152)	(0.152)	(0.228)	(0.333)	(0.198)	(0.228)	(0.334)	(0.198)
Time Trend	YES	YES	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	131307	131307	57883	18703	54721	57883	18703	54721

* $p<0.10$, ** $p<0.05$, *** $p<0.01$ (two-tailed). Standard errors in parentheses (clustered by municipality). Constants estimated but not reported. All independent variables are lagged by one period. "All Neighboring Reforms" are a weighted sum of all land grants within a 100km radius. "Neighboring Relevant Reforms" include all expropriations (in-state and out-of state) and in-state land grants within a 100km radius. All reform count measures are log-transformed. Political alignment indicates whether the political actors are ideologically both on the "Left", the "Right" or not ideologically aligned ("None").