Portuguese Colonial Land Grants in Brazil: Long-term Effects on Inequality and Economic Development

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Background and Motivation

- Inequality in access to land is a key issue in Brazil.
  - "**Brazil has one of the highest levels of inequality of land distribution in the world** [...] **An estimated 1% of the population owns 45% of all land in Brazil**." (USAID, 2016)

Background and Motivation

- Inequality in access to land is a key issue in Brazil.
  - "**Brazil has one of the highest levels of inequality of land distribution in the world** [...] **An estimated 1% of the population owns 45% of all land in Brazil**." (USAID, 2016)
- "The agrarian problem is one of the most serious problems [Brazil] has, because of the great concentration of land ownership and the low level of utilization by the large and medium property owners" (Oliveira Andrade, 1980, p. 1)

Research Question

- How much of economic development and inequality can be traced to historical land grants in Brazil?

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- How much of economic development and inequality can be traced to historical land grants in Brazil?
- Identification:
  - Exploit a 1701 Royal Decree that banned livestock grazing within 80km of the coast of Brazil.
  - Created a separation between where the land grants for livestock could be assigned.

Contribution

- Understanding the historical effects of land distribution and usage in Brazil.
  - Americas: Wigton-Jones, 2020 (JEG), Sellars et al., 2018 (JDE), C. Smith, 2023 (WP)
  - India and Africa: Banerjee et al., 2005 (AER)
- Understand the persistent effects of colonial Brazil's economic structure on the present.
  - Institutional and Natural Endowments: Acemoglu et al., 2001 (AER), Sokoloff et al., 2000 (JEP).
  - Naritomi et al., 2012 (JEH), Musacchio et al., 2014 (JEH), Laudares et al., 2022 (WP).

Background

- Goal was to encourage Portuguese settlement of Brazil.
- One of the few ways to have access to land in colonial Brazil and given to people who could afford to develop the land (T. L. Smith, 1944; Dean, 1971).
- People without direct access to it were often marginalized (Simonsen, 2005).
- Lasted until 1822.
- Historical and anecdotal evidence of the land grants having permanent effects in Brazilian economic structure:
  - Early studies argued it led to the development of the "**economic aristocracy of the colonial society**" and the "**principal cause of the [large estates]**" in Brazil (Lima, 1954, p. 36; Costa Porto, 1979, p. 48).

Data

- Land Grant Locations:
  - Information on the land grants from the Sesmarias of the Luso-Brazilian Empire Database [**Novel Data**]
- Check whether they had an effect in the past:
  - 1872 Brazilian Census [**Novel Data at a Finer Geographical Level**] Parishes
- Present-Day Effects on Land Tenure (1995 Municipalities)
  - 1995 Brazilian Agricultural Census

Identification Strategy I

Matching

$$LandGrant_m = X_m + \mu_s + \epsilon_{m,s} \tag{1}$$

$$Y_{m,s} = LandGrant1600_m + LandGrant1700_m + X_m + \mu_s + \epsilon_{m,s} \tag{2}$$

- Variables used to match: latitude, longitude, mean elevation, mean slope, soil quality for food crops (Galor and Özak, 2016), potential sugarcane output from the FAO, the distance to the coast, distance to the nearest river, and the presence of four types of soil.
  - All important geographical measures of settler presence.

Matching Results

Land Size

Table: Effects of Land Grants in Land Inequality - (%) of Farms over 2,000 ha 1995

	OLS	OLS	Matching
Grants Pre-1700	3.193*	4.210**	4.128**
	(1.669)	(1.674)	(1.753)
Grants Post-1700	2.823***	2.101**	2.367***
	(0.868)	(0.825)	(0.862)
N	2372	2372	1472
Geographical Controls		✓	✓
Control Mean	9.2	9.2	8.2

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Matching Results

Land Size - Different Cutoffs

Table: OLS and Matching Estimates on 1995 Agricultural Census - Varying Land Sizes

	Over 2,000ha (%)		Over 5,000ha (%)		Over 10,000ha (%)	
	OLS	Matching	OLS	Matching	OLS	Matching
Grants Pre-1700	4.210**	4.128**	1.961	2.156	1.415	1.394
	(1.674)	(1.753)	(1.288)	(1.362)	(1.024)	(1.100)
Grants Post-1700	2.101**	2.367***	1.984***	2.151***	1.304**	1.130**
	(0.825)	(0.862)	(0.656)	(0.668)	(0.515)	(0.527)
N	2372	1472	2372	1472	2372	1472
Geographical Controls	✓	✓	✓	✓	✓	✓
Control Mean	9.2	8.2	3.7	3.1	1.7	1.6

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls, which are also used fot the matching, include latitude, longitude, average slope, average elevation, distance to the nearest navigable river, distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different types of soils.

Matching Results

Land Size - Northeast

Table: Effects of Land Grants in Land Inequality - (%) of Farms over 2,000 ha 1995

	OLS	OLS	Matching
Grants Pre-1700	4.180**	5.015***	5.332***
	(1.735)	(1.773)	(1.833)
Grants Post-1700	5.133***	3.153***	3.269***
	(1.291)	(1.101)	(1.110)
N	1007	1007	842
Geographical Controls		✓	✓
Control Mean	7	7	7.4

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Matching Results

Land Size - Southeast

Table: Effects of Land Grants in Land Inequality - (%) of Farms over 2,000 ha 1995

	OLS	OLS	Matching
Grants Pre-1700	−0.055	4.178	2.811
	(4.151)	(4.540)	(4.691)
Grants Post-1700	0.815	2.378**	3.306***
	(1.162)	(1.153)	(1.247)
N	1365	1365	630
Geographical Controls		✓	✓
Control Mean	10.5	10.5	7.5

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

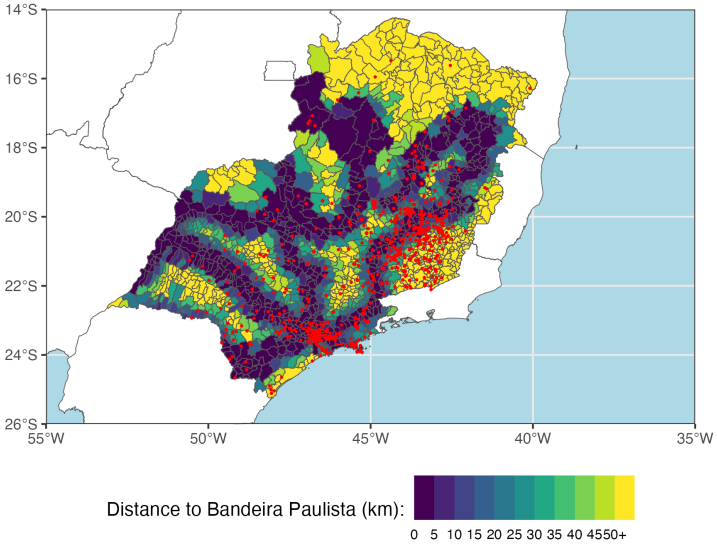
Instrumental Variable

Distance to Explorer Routes

- "Owing in large measure to the intrepid Paulistas of the seventeenth century, the menace of Indian attacks from the interior was largely eliminated, and the lands themselves were appropriated in extremely large tracts for the purposes of cattle raising" (T. L. Smith, 1972, p. 320).
- Focused only on the Southeastern states of Sao Paulo and Minas Gerais.

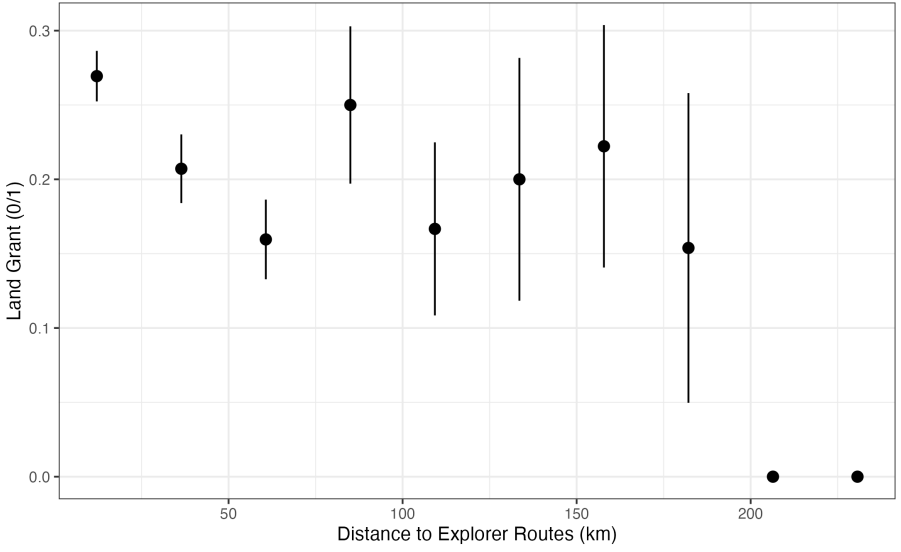
Visualization

First Stage Map



Visualization

First Stage Graph



Identification Strategy II

Instrumental Variable

$$LandGrant_{m,s} = \delta \cdot BandeiraDist_{m,s} + X_{m,s} + \mu_s + \epsilon_{m,s} \tag{3}$$

$$Y_{m,s} = \beta \cdot \widehat{LandGrant}_{m,s} + X_{m,s} + \mu_s + \epsilon_{m,s} \tag{4}$$

- **Exclusion Restriction:** Conditional on the set of controls, the proximity to the Bandeirantes routes only affects the outcomes through the increased presence of land grants.

Matching and IV Results

Land Distribution - 1995

Table: IV and Matching Estimates on Agricultural Land Size - 1995 Agricultural Census

	Over 2,000ha (%)		Over 5,000ha (%)		Over 10,000ha (%)	
	Matching	2SLS	Matching	2SLS	Matching	2SLS
Any Land Grants	3.089**	22.454*	1.969**	12.774	1.186*	13.512*
	(1.266)	(12.246)	(1.002)	(9.354)	(0.703)	(7.796)
N	630	1365	630	1365	630	1365
Geographical Controls	✓	✓	✓	✓	✓	✓
Control Mean	10.5	10.5	4.3	4.3	1.9	1.9

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls include latitude, longitude, average slope, average elevation, distance to the nearest navigable river, distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different types of soils. States considered are Sao Paulo and Minas Gerais.

Heterogeneity I

Coastal Ban on Livestock

Table: Effects of Land Grants in Livestock and Pastures - 1995

	Area used for Livestock (%)	Area used as Natural Pasture (%)	Area used as Planted Past
Panel A - Grants Pre- 1700			
More than 80 km from the Coast	-5.459***	4.027***	-1.567
	(1.994)	(1.443)	(2.770)
Grants Pre-1700 x More than 80 km from the Coast	6.631**	1.216	-2.396
	(3.025)	(1.771)	(2.265)
Grants Pre-1700 x Less than 80 km from the Coast	-4.176	3.429	-1.685
	(3.618)	(7.311)	(2.482)
N	2372	2372	2372
Panel B - Grants Post- 1700			
More than 80 km from the Coast	-3.929*	5.156***	-1.877
	(2.349)	(1.767)	(2.914)
Grants Post-1700 x More than 80 km from the Coast	4.363***	1.464**	1.693
	(1.235)	(0.705)	(2.860)
Grants Post-1700 x Less than 80 km from the Coast	7.121	6.789	0.835
	(5.646)	(5.033)	(4.751)
N	2372	2372	2372

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls include latitude, longitude, average slope, average elevation, distance to the nearest navig distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different type

Heterogeneity I

Coastal Ban on Livestock

Table: Effects of Land Grants in Land Inequality - (%) of Farms over Size Cutoff 1995

	Over 2,000 ha (%)	Over 5,000 ha (%)	Over 10,000 ha (%)
Panel A - Grants Pre- 1700			
More than 80 km from the Coast	-6.100***	-3.563***	-2.407***
	(1.261)	(0.926)	(0.621)
Grants Pre-1700 x More than 80 km from the Coast	7.894***	3.671**	2.027
	(2.104)	(1.612)	(1.299)
Grants Pre-1700 x Less than 80 km from the Coast	1.568	0.859	1.007
	(2.377)	(1.802)	(1.422)
N	2372	2372	2372
Panel B - Grants Post- 1700			
More than 80 km from the Coast	-7.005***	-4.433***	-3.185***
	(1.403)	(1.040)	(0.740)
Grants Post-1700 x More than 80 km from the Coast	3.310***	2.865***	1.992***
	(0.881)	(0.721)	(0.563)
Grants Post-1700 x Less than 80 km from the Coast	-0.138	0.098	-0.217
	(1.716)	(1.285)	(0.922)
N	2372	2372	2372

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls include latitude, longitude, average slope, average elevation, distance to the nearest navigable river, distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different types of soils.

Mechanisms I

Human Capital

- Effects of land concentration on human capital accumulation - (Galor, Moav, et al., 2009)

Mechanisms

Literacy - 1872

Table: IV and OLS Estimates - Literacy Rate in 1872

	Literacy Rate (%)		Men Literacy Rate (%)		Women Literacy Rate (%)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Any Land Grants	1.170	−5.623**	1.408	−5.966*	1.076	−4.950**
	(0.929)	(2.704)	(1.136)	(3.368)	(0.821)	(2.466)
N	483	483	483	483	483	483
Geographical Controls	✓	✓	✓	✓	✓	✓
Mean	18.4	18.4	23.6	23.6	13	13

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls include latitude, longitude, average slope, average elevation, distance to the nearest navigable river, distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different types of soils. States considered are Sao Paulo and Minas Gerais.

Mechanisms

School Attendance - 1872

Table: IV and OLS Estimates - School Enrollment in 1872

	6-15 Attending School (%)		Boys 6-15 Attending School (%)		Girls 6-15 Attending School (%)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Any Land Grants	−0.532	−9.078**	−0.176	−9.293**	−1.349	−9.390**
	(1.227)	(3.984)	(1.457)	(4.383)	(1.204)	(4.142)
N	483	483	483	483	483	483
Geographical Controls	✓	✓	✓	✓	✓	✓
Mean	16.8	16.8	20.5	20.5	13.5	13.5

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls include latitude, longitude, average slope, average elevation, distance to the nearest navigable river, distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different types of soils. States considered are Sao Paulo and Minas Gerais.

Mechanisms

Literacy - 1872

Table: IV Estimates - Literacy Rate and School Attendance in 1872

	Literacy Rate (%)			School Attendance (%)		
	All	Men	Women	All	Boys	Girls
Any Land Grants	−5.623**	−5.966*	−4.950**	−9.078**	−9.293**	−9.390**
	(2.704)	(3.368)	(2.466)	(3.984)	(4.383)	(4.142)
N	483	483	483	483	483	483
Geographical Controls	✓	✓	✓	✓	✓	✓
Mean	18.4	23.6	13	16.8	20.5	13.5

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls include latitude, longitude, average slope, average elevation, distance to the nearest navigable river, distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different types of soils. States considered are Sao Paulo and Minas Gerais.

Mechanisms

Literacy - 1970

[Will probably combine all the censuses into one table]

Table: OLS, Matching, and IV Estimates - Literacy in 1970

	OLS	Matching	2SLS
Any Land Grants	0.135	0.764	−8.317*
	(0.520)	(0.567)	(4.751)
N	1293	648	1293
R^2	0.63	0.52	0.54
Geographical Controls	✓	✓	✓
Mean	53.6	54.9	53.6

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls include latitude, longitude, average slope, average elevation, distance to the nearest navigable river, distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different types of soils. States considered are Sao Paulo and Minas Gerais.

Mechanisms

Literacy - Other Censuses

[Add table for 1980, 1991, ...]
[Results fade at 1980]

Mechanism II

Slavery

Table: IV and OLS Estimates - Slavery in 1872

	Proportion of Slaves (%)		Slaves working on Agriculture (%)		Slaves working on Daily Jobs (%)	
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Any Land Grants	−0.618	−8.456**	0.379	−6.885*	0.534	−4.070**
	(0.838)	(3.292)	(1.328)	(3.808)	(0.717)	(2.041)
N	483	483	483	483	483	483
Geographical Controls	✓	✓	✓	✓	✓	✓
Mean	17.6	17.6	36.4	36.4	5.9	5.9

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

[a] All regressions include state fixed effects. Geographical controls include latitude, longitude, average slope, average elevation, distance to the nearest navigable river, distance to the coast, maximum caloric output from pre-Columbian and post-Columbian crops, and whether or not the municipality contains four different types of soils. States considered are Sao Paulo and Minas Gerais.

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History/Background

Request Process

- Petitioner submits a letter for an unoccupied land detailing their qualifications (captain, governor, etc.)
- Governor reads it, and if accepted returns back a letter with the requirements for the petitioner to satisfy.
- Five years to develop the land
- If successful, upon an inspection, land was transferred to the *sesmeiro*.
- Able to sell, pass down as inheritance, etc.

1872 Parish Level Information

[New Data] Back