Who gains from individual property rights? Evidence from the allotment of Mapuche reservations

Felipe Jordán
PUC-Chile

Robert Heilmayr
UC Santa Barbara

World Bank Land Conference

May 15th, 2024

Indigenous people in Brazil shed tears of joy as the Supreme Court enshrines their land rights

AP

Individual property rights

How should land rights be structured to benefit indigenous communities?

Communal title to reservation

Individual rights & development in indigenous lands

- Individual land rights are often considered a foundation for economic development (Besley, 1995; De Soto, 2003)
- Limitations to the exercise of individual rights might have hampered economic development in indigenous territories:
  - Akee (2009) finds restrictions to collateralization have limited land development in Aguas Caliente reservation in the USA
  - Dippel et al. (2020) find that fractionation of interest has reduced land development in not-allotted reservations in the USA
- Why were individual rights restricted in the first place? Why are they maintained?

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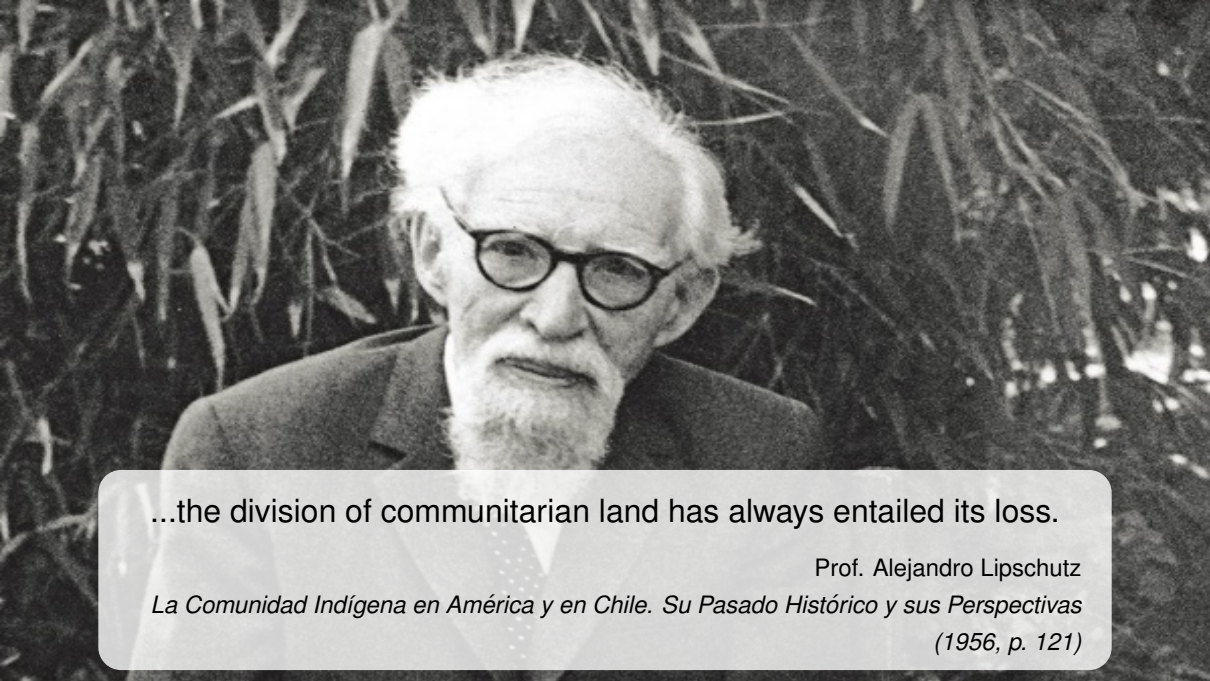

...the division of communitarian land has always entailed its loss.

Prof. Alejandro Lipschutz

La Comunidad Indígena en América y en Chile. Su Pasado Histórico y sus Perspectivas (1956, p. 121)

Dispossession in indigenous lands

- Allotment may expose indigenous communities to disposession:
  - Households in an alloted reservation were “much less likely to own a home after allotment occurred” (Akee, 2020)
  - Increase in incomes from land allotment was due to immigration, “not by improvements in indigenous households’ income or on-reserve employment” (Aragón and Kessler, 2020)
  - Indigenous families were defrauded of their lands, representing an “obvious injury to justice” (Informe Comisión Verdad Histórica y Nuevo Trato, 2003)
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What long-term impacts did the transition from collective to individual land rights have on Mapuche reservations' economic development and the socioeconomic status of their descendants?

1. Did individual rights reduce Mapuche ownership?
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Natural Experiment:

A Century of Change in Mapuche Property Rights

Natural experiment

A century of change in Mapuche reservations' property rights

1884-1929: Forced settlement

June 1930: *Courts of Indians* opened

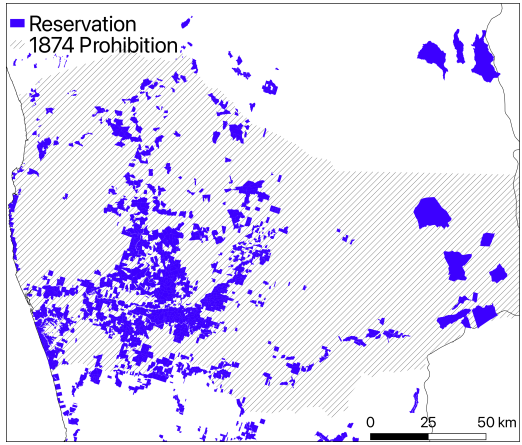
July 1931: Nueva Imperial court closed

1943-1946: Restrictions on sales lifted

1952-1979: Allotments frozen

1979-1989: Massive allotment

Result: Spatial discontinuity



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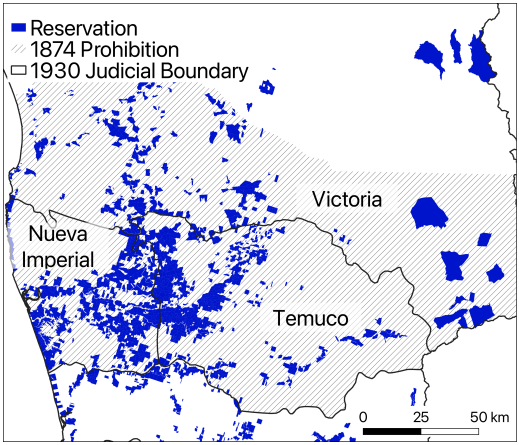

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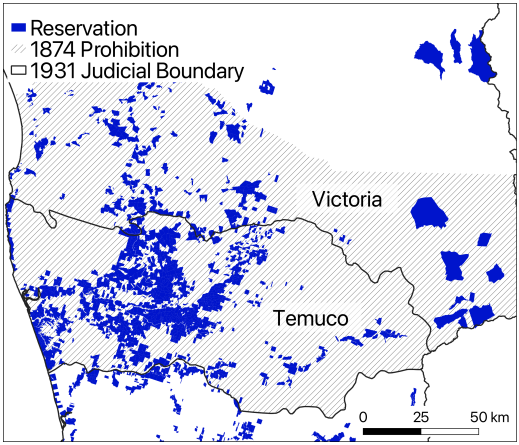

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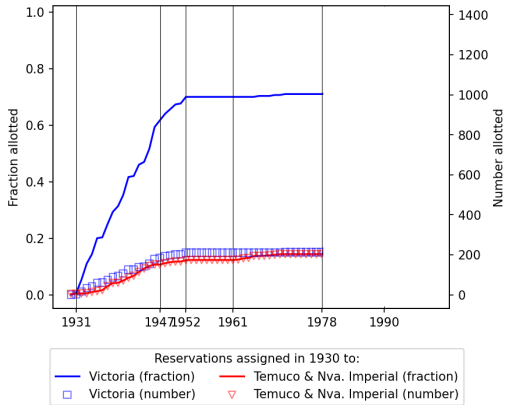

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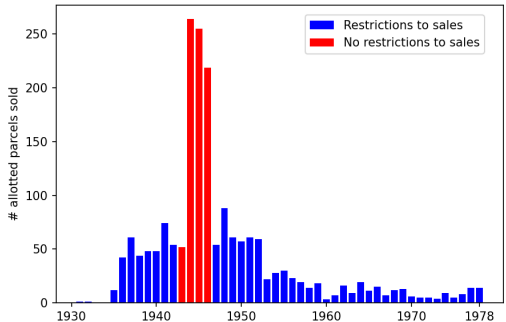

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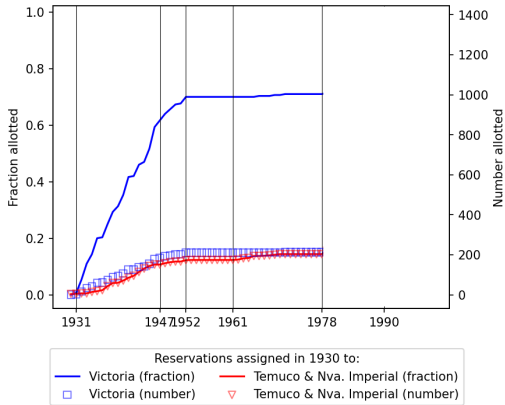

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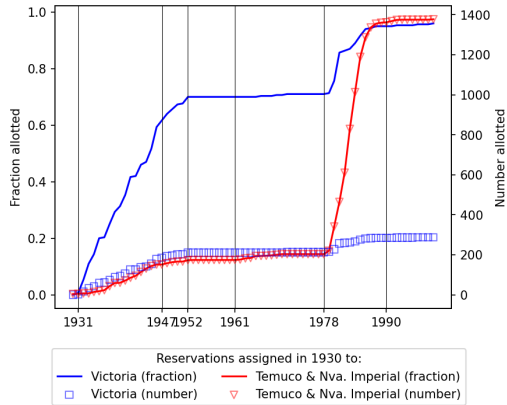

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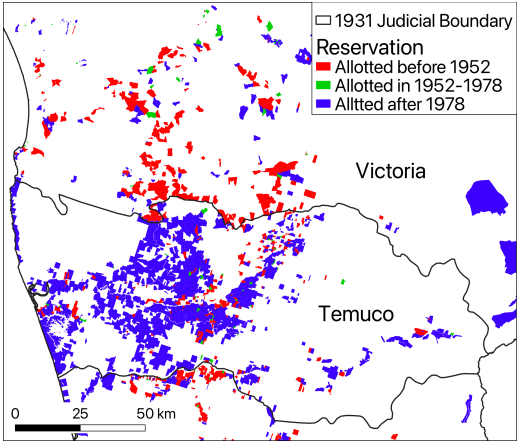
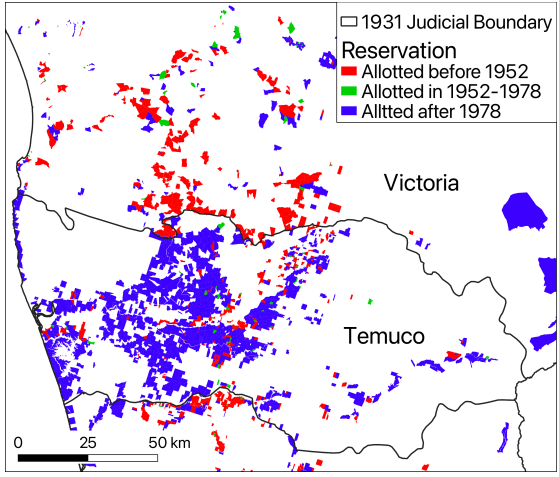



IDENTIFICATION STRATEGY

Identification strategy

Allotment



Allotment

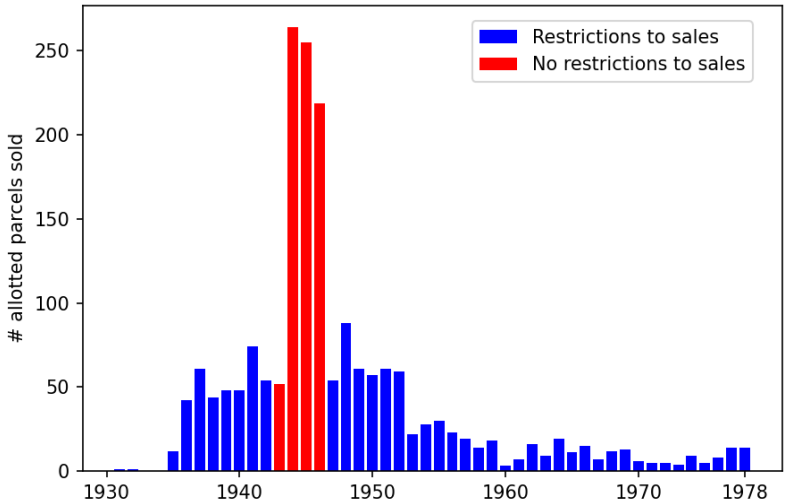
$$Private_r = \alpha_0 + \alpha_1 Victoria_r + f(lon_r, lat_r) + \mathbf{X_r}\mathbf{\Theta} + \eta_r, \quad (1)$$

$$y_{ir} = \beta_0 + \beta_1 \hat{Private}_r + g(lon_r, lat_r) + \mathbf{X_r}\mathbf{\Lambda} + \varepsilon_{ir}, \quad (2)$$

where:

- y_i: dependent variable observation i of reservation r,
- $Victoria_r$: 1 if reservation r assigned to Victoria in 1930, 0 otherwise,
- $Private_r$: 1 if reservation r allotted before 1979, 0 otherwise,
- $f(lon_r, lat_r), g(lon_r, lat_r)$: flexible functions of location of reservation r,
- $\mathbf{X_r}$: additional controls for reservation r,
- η_r, ε_{ir},: zero-mean disturbances (potentially correlated)

Exposure to dispossession



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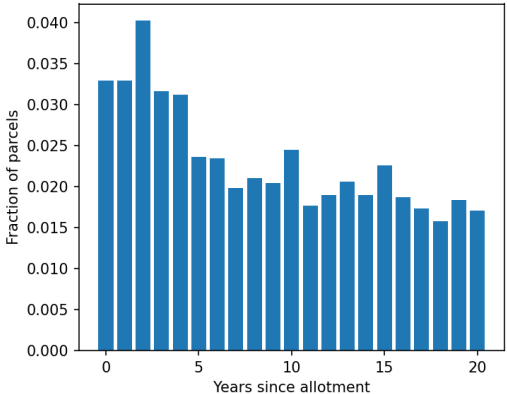

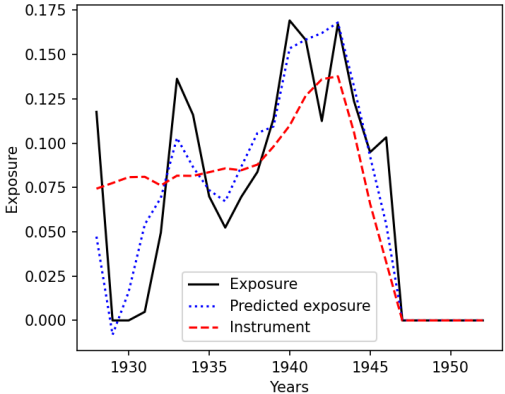

▸ Formal definition


DATA

Assembling data on Mapuche since forced settlement

Reservations:

Reservation titles (AGAI)

Historical judicial boundaries (INE)

Timing of division (AGAI)

1992 Census (INE)

1999 property registry (CIREN)

Sales of allotted parcels (AGAI)

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2021 voting registry (SERVEL)

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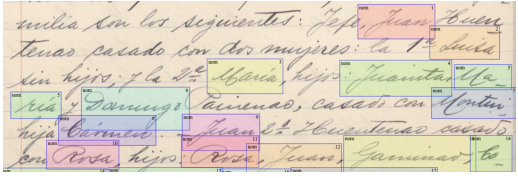

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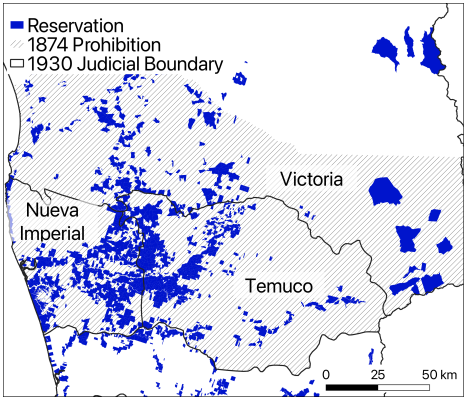

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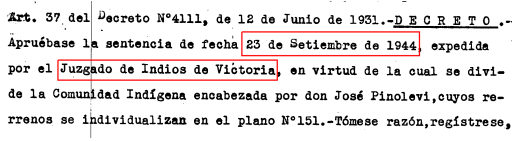

Art. 37 del Decreto N°4111, de 12 de Junio de 1931.-D E C R E T O .-
Apruébase la sentencia de fecha 23 de Setiembre de 1944, expedida
por el Juzgado de Indios de Victoria, en virtud de la cual se divi-
de la Comunidad Indígena encabezada por don José Pinolevi,cuyos re-
rrenos se individualizan en el plano N°151.-Tómese razón,regístrese,

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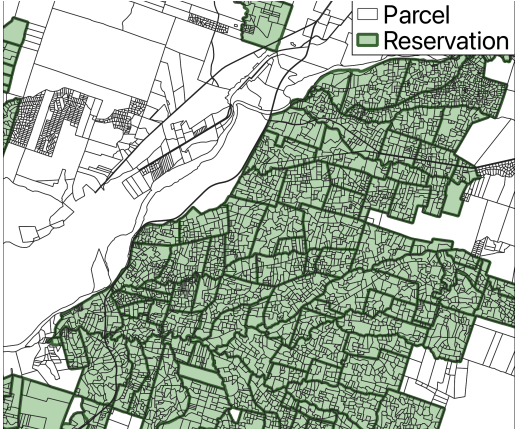

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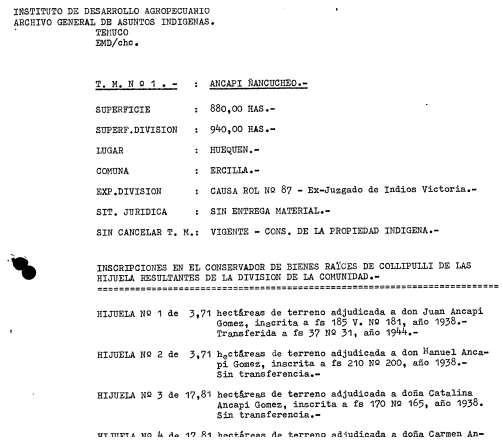

INSTITUTO DE DESARROLLO AGROPECUARIO
ARCHIVO GENERAL DE ASUNTOS INDIGENAS.
TEMUCO
EMD/chc.

T. M. N º 1 .- : ANCAPI RANCUCHEO.-

SUPERFICIE : 880,00 HAS.-

SUPERF.DIVISION : 940,00 HAS.-

LUGAR : HUEQUEN.-

COMUNA : ERCILLA.-

EXP.DIVISION : CAUSA ROL Nº 87 - Ex-Juzgado de Indios Victoria.-

SIT. JURIDICA : SIN ENTREGA MATERIAL.-

SIN CANCELAR T. M.: VIGENTE - CONS. DE LA PROPIEDAD INDIGENA.-

INSCRIPCIONES EN EL CONSERVADOR DE BIENES RAÍCES DE COLLIPULLI DE LAS HIJUELA RESULTANTES DE LA DIVISION DE LA COMUNIDAD.-

HIJUELA Nº 1 de 3,71 hectáreas de terreno adjudicada a don Juan Ancapi Gomez, inscrita a fs 185 V. Nº 181, año 1938.- Transferida a fs 37 Nº 31, año 1944.-

HIJUELA Nº 2 de 3,71 hectáreas de terreno adjudicada a don Manuel Ancapi Gomez, inscrita a fs 210 Nº 200, año 1938.- Sin transferencia.-

HIJUELA Nº 3 de 17,81 hectáreas de terreno adjudicada a doña Catalina Ancapi Gomez, inscrita a fs 170 Nº 165, año 1938. Sin transferencia.-

HIJUELA Nº 4 de 17,81 hectáreas de terreno adjudicada a doña Carmen An-

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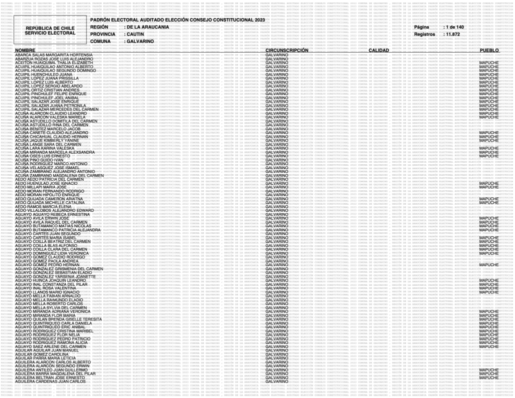

REPÚBLICA DE CHILE
SERVICIO ELECTORAL

PADRÓN ELECTORAL AUDITADO ELECCIÓN CONSEJO CONSTITUCIONAL 2023
REGIÓN : DE LA ARAUCANIA
PROVINCIA : CAUTIN
COMUNA : GALVARINO

Página : 1 de 140
Registros : 11.872

NOMBRE	CIRCUNSCRIPCIÓN	CALIDAD	PUEBLO
ABARCA SALAS MARGARITA HORTENSIA	GALVARINO		
ABARZUA ROZAS JOSE LUIS ALEJANDRO	GALVARINO		
ACEITON HUAIQUIMIL THALIA ELIZABETH	GALVARINO		MAPUCHE
ACUIPIL HUAIQUILAO ANTONIO ALBERTO	GALVARINO		MAPUCHE
ACUIPIL HUAIQUILAO SEGUNDO DOMINGO	GALVARINO		MAPUCHE
ACUIPIL HUENCHULEO JUANA	GALVARINO		MAPUCHE
ACUIPIL LOPEZ JUANA PRISSILLA	GALVARINO		MAPUCHE
ACUIPIL LOPEZ LUIS ALBERTO	GALVARINO		MAPUCHE
ACUIPIL LOPEZ SERGIO ABELARDO	GALVARINO		MAPUCHE
ACUIPIL ORTIZ CRISTIAN ANDRES	GALVARINO		MAPUCHE
ACUIPIL PINCHULEF FELIPE ENRIQUE	GALVARINO		MAPUCHE
ACUIPIL PINCHULEF JOEL ANIBAL	GALVARINO		MAPUCHE
ACUIPIL SALAZAR JOSE ENRIQUE	GALVARINO		MAPUCHE
ACUIPIL SALAZAR JUANA PETRONILA	GALVARINO		MAPUCHE
ACUIPIL SALAZAR MERCEDES DEL CARMEN	GALVARINO		MAPUCHE
ACUÑA ALARCON CLAUDIO LEANDRO	GALVARINO		MAPUCHE
ACUÑA ALARCON VALESKA MARIELA	GALVARINO		MAPUCHE
ACUÑA ASTUDILLO DOMITILA DEL CARMEN	GALVARINO		
ACUÑA ASTUDILLO RINA DEL CARMEN	GALVARINO		
ACUÑA BENITEZ MARCELO JACOB	GALVARINO		
ACUÑA CAÑETE CLAUDIO ALEJANDRO	GALVARINO		MAPUCHE
ACUÑA CHICAHUAL CLAUDIO HERNAN	GALVARINO		MAPUCHE
ACUÑA JAQUE KIMBERLY YANINE	GALVARINO		MAPUCHE
ACUÑA LANGE SARA DEL CARMEN	GALVARINO		
ACUÑA LARA KARINA VALESKA	GALVARINO		MAPUCHE
ACUÑA MIRANDA MARCELA ALEXSANDRA	GALVARINO		MAPUCHE
ACUÑA OSES LUIS ERNESTO	GALVARINO		MAPUCHE
ACUÑA PINO GUIDO IVAN	GALVARINO		
ACUÑA RODRIGUEZ MARCO ANTONIO	GALVARINO		
ACUÑA VELASQUEZ JOSE ISMAEL	GALVARINO		
ACUÑA ZAMBRANO ALEJANDRO ANTONIO	GALVARINO		
ACUÑA ZAMBRANO MAGDALENA DEL CARMEN	GALVARINO		
AEDO AEDO PATRICIA DEL CARMEN	GALVARINO		
AEDO HUENULAO JOSE IGNACIO	GALVARINO		MAPUCHE
AEDO MILLAPI MARIA JOSE	GALVARINO		MAPUCHE
AEDO MORAN FERNANDO RODRIGO	GALVARINO		
AEDO MORAN HIPOLITO ENRIQUE	GALVARINO		
AEDO QUIJADA CAMERON ARIATNA	GALVARINO		MAPUCHE
AEDO QUIJADA MICHELLE CATALINA	GALVARINO		MAPUCHE
AEDO RAMOS MARCIA ELENA	GALVARINO		
AEDO VILLALOBOS ALEJANDRO EDWARD	GALVARINO		
AGUAYO AGUAYO REBECA ERNESTINA	GALVARINO		
AGUAYO AVILA ERWIN JOSE	GALVARINO		MAPUCHE
AGUAYO AVILA RAQUEL DEL CARMEN	GALVARINO		MAPUCHE
AGUAYO BUTAMANCO MATIAS NICOLAS	GALVARINO		MAPUCHE
AGUAYO BUTAMANCO PATRICIA ALEJANDRA	GALVARINO		MAPUCHE
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AGUAYO GOMEZ CLAUDIO RODRIGO	GALVARINO		
AGUAYO GOMEZ PAOLA ANDREA	GALVARINO		
AGUAYO GOMEZ PEDRO HERNAN	GALVARINO		MAPUCHE
AGUAYO GONZALEZ GRISMENIA DEL CARMEN	GALVARINO		
AGUAYO GONZALEZ SEBASTIAN ELADIO	GALVARINO		
AGUAYO GONZALEZ YARSENIA JOANETTE	GALVARINO		
AGUAYO HUINCA JOAQUIN LEANDRO	GALVARINO		MAPUCHE
AGUAYO INAL CONSTANZA DEL PILAR	GALVARINO		MAPUCHE
AGUAYO INAL ROSA VALENTINA	GALVARINO		MAPUCHE
AGUAYO LLANOS MARIO IGNACIO	GALVARINO		MAPUCHE
AGUAYO MELLA FABIAN ARNALDO	GALVARINO		
AGUAYO MELLA RAIMUNDO ELADIO	GALVARINO		
AGUAYO MELLA ROBERTO CARLOS	GALVARINO		
AGUAYO MELLA SYLVIA DEL CARMEN	GALVARINO		
AGUAYO MIRANDA ADRIANA VERONICA	GALVARINO		MAPUCHE
AGUAYO MIRANDA FLOR MARIA	GALVARINO		MAPUCHE
AGUAYO QUILAN BRENDA GISELLE TERESITA	GALVARINO		MAPUCHE
AGUAYO QUINTRIQUEO CARLA DANIELA	GALVARINO		MAPUCHE
AGUAYO QUINTRIQUEO ERIC ANIBAL	GALVARINO		MAPUCHE
AGUAYO RODRIGUEZ CRISTINA MARIBEL	GALVARINO		MAPUCHE
AGUAYO RODRIGUEZ FLOR NELIA	GALVARINO		MAPUCHE
AGUAYO RODRIGUEZ PEDRO PATRICIO	GALVARINO		MAPUCHE
AGUAYO RODRIGUEZ RAMONA ALICIA	GALVARINO		MAPUCHE
AGUAYO SAEZ ARLENE DEL CARMEN	GALVARINO		MAPUCHE
AGUILAR AGUILAR JUAN MANUEL	GALVARINO		
AGUILAR GOMEZ CAROLINA	GALVARINO		
AGUILAR PARRA MARIA LETICIA	GALVARINO		
AGUILERA ALARCON CARLOS ALBERTO	GALVARINO		
AGUILERA ALARCON SEGUNDO ERWIN	GALVARINO		
AGUILERA ANTILEO JUAN GUILLERMO	GALVARINO		MAPUCHE
AGUILERA BARRA MAGDALENA DEL PILAR	GALVARINO		MAPUCHE
AGUILERA BELTRAN JOSE ERNESTO	GALVARINO		MAPUCHE
AGUILERA CARDENAS JUAN CARLOS	GALVARINO		

Additional environmental and ag data

Assembling data on Mapuche since forced settlement

Reservations:

Reservation titles (AGAI)

Historical judicial boundaries (INE)

Timing of division (AGAI)

1992 Census (INE)

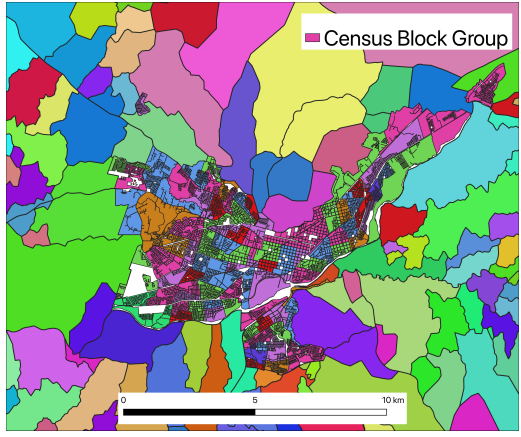
1999 property registry (CIREN)

Sales of allotted parcels (AGAI)

Descendants:

2021 voting registry (SERVEL)

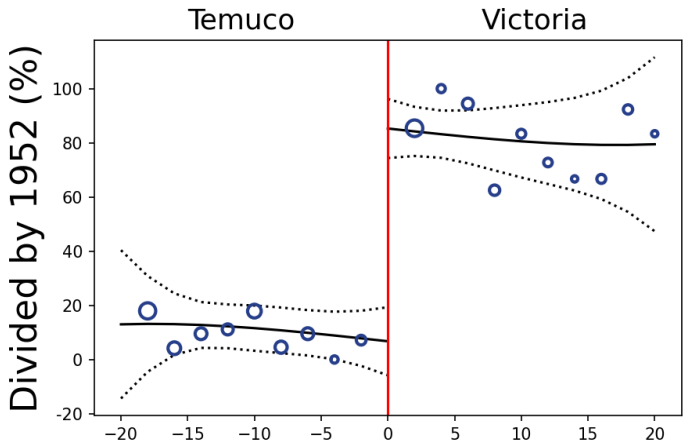
2017 Census (INE)



▸ Additional environmental and ag data

Results

First stage



▸ Tabular results

Validation of assumptions

Dep. var.	Elevation	Slope (std)	% Erodible	Tempera-ture	Precipita-tion	Year settled	Hectares
Victoria (low congestion)	15.29	0.39	-0.06	0.29	3.22	0.64	63.26
	(12.89)	(0.51)	(0.07)	(0.45)	(4.30)	(2.64)	(34.05)*
Mean high congestion	125.07	3.40	0.35	11.87	103.20	1903.06	150.42
Reserva-tions	1,567	1,567	1,567	1,567	1,567	1,567	1,567

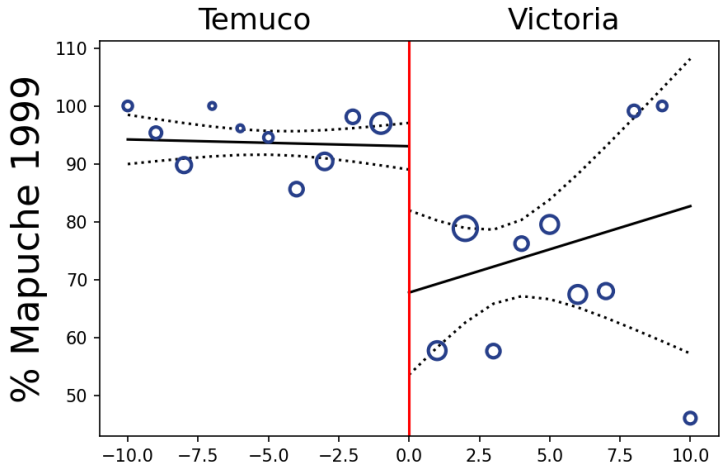
Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

Validation of assumptions (continued)

Dep. var.	Persons settled	Pop. Density	>1 Lineage	Frac. Index	Partition	Amended	Max Wives
Victoria (low congestion)	6.87	-1.80	-0.05	-0.02	0.10	0.01	0.01
	(5.66)	(1.15)	(0.04)	(0.03)	(0.08)	(0.05)	(0.04)
Mean high congestion	33.70	24.81	0.66	0.37	0.14	0.15	0.16
Reserva-tions	1,567	1,567	1,558	1,558	1,558	1,558	1,558

Statistical significance reported next to standard errors: *p$<$0.1, **p$<$0.05, ***p$<$0.01.

1. Did individual rights reduce Mapuche ownership?



▸ Land control ▸ Robustness

1. Did individual rights reduce Mapuche ownership?

Dep. var. % land	Individual			Collective			
	Mapuche	Not-Mapuche	Unknown	Mapuche	Not-Mapuche	No Info	Predicted Mapuche
Private	-26.75	13.79	1.51	-2.28	0.93	12.79	-17.98
	(4.50)***	(2.94)***	(1.70)	(1.59)	(2.36)	(7.35)*	(3.72)***
$\overline{Y}$ collective	81.28	5.82	2.42	0.85	0.98	8.66	90.26
Reservations	1543	1543	1543	1543	1543	1543	1543

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

▸ Land control ▸ Robustness

Labor market 1992

Dep. Var.	Wage worker		
Sample	All	Mapuche	Not-Mapuche
Allotted $\leq$ 1952	15.13	8.86	9.85
	(4.05)***	(3.00)***	(9.93)
Mean allotted $>$ 1952	11.29	9.57	21.64
Reservations	1,414	1,371	1,168

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

▸ Land consolidation ▸ Livestock & overgrazing

2. Did they improve socioeconomic conditions in reservations?

Dep. var.	Wealth Score (1992)		
	All	Mapuche	Not-Mapuche
Private	44.76	23.77	44.97
	(11.88)***	(15.17)	(26.37)*
$\overline{Y}$ collective	-15.29	-27.68	49.92
Reservations	1,414	1,371	1,168

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

▸ Land consolidation ▸ Livestock & overgrazing

3. Did they improve the socioeconomic status of descendants?

Dep. var.	Avg. Schooling Head of Households (2021)
Private	-0.48
	(0.80)
$\overline{Y}$ collective	10.25
Observations	8,763
Reservations	273

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

3. Did they improve the socioeconomic status of descendants?

Dep. var.	Avg. Schooling Head of Households in Census Block Group					
Estimator	OLS			2SLS		
Exposure	-1.45	-1.48	-0.94	-6.18	-3.63	-1.57
	(0.95)	(0.65)**	(1.02)	(1.81)***	(1.90)*	(4.94)
Allotment Year		0.08			0.08	
		(0.04)**			(0.05)	
Private			2.66			-0.26
			(1.90)			(2.11)
$\overline{Y}$ not exposed	9.77	9.77	10.22	9.77	9.77	10.22
Reservations	48	48	273	48	48	273
Observations	1,596	1,596	8,763	1,596	1,596	8,763
F-stat				14.5	13.4	20.1/193.8

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

The allotment of collective reservations into individual properties:

- Reduced Mapuche ownership
- Improved average socioeconomic conditions in reservations
- Had lasting, negative impacts on descendants from reservations with weaker protections against disposession

Further research needed to assess:

- Impacts of individual rights on traditional cultural practices and political power
- Impacts of individual property rights with restrictions on their transfer outside of indigenous communities

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Thank you!
felipe.jordan@uc.cl
rheilmayr@ucsb.edu

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Appendix

Additional data

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Reservations:

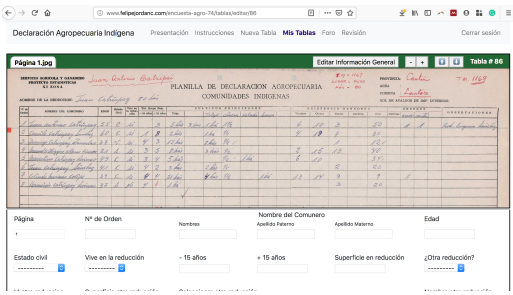
1974 Indigenous Ag. Declaration (AGAI)

Erosion (CIREN)

1999 Land Cover (Graesser et al., 2022)

DEM & Climate (Farr et al., 2007; Fick and Hijmans, 2017)

Allotments maps



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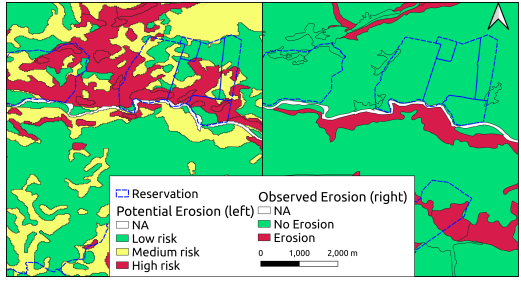

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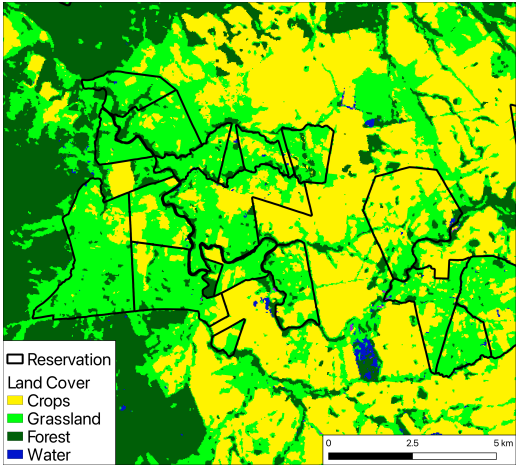

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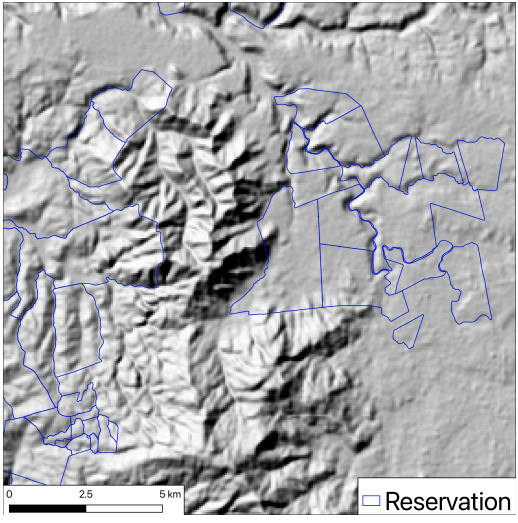

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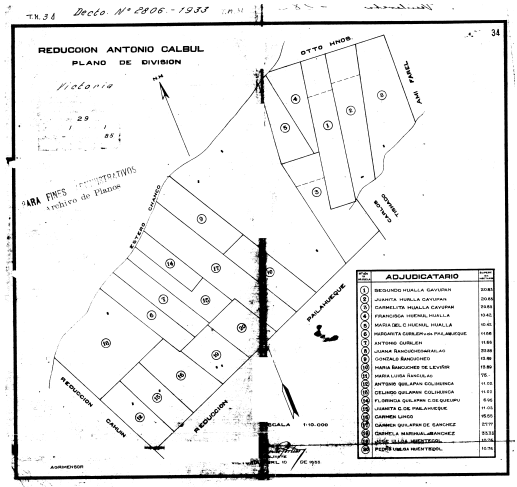

Exposure to dispossession

Back

$$
\begin{aligned}
S_{rt} &= \lambda_j + \textstyle\sum_{k=0}^{T} \delta_k \mathbf{1}(t - Allott_r = k) + \rho No\ Res_t + \psi No\ Res_t * Allott_r + \epsilon_{rt}, \\
I_r &= \textstyle\sum_{k=0}^{T} \mathbf{1}\left(Allott_r + k \in [1943, 1946]\right) \hat{\delta}_k, \\
Exp_r &= \alpha_0 + \alpha_1 I_r + \alpha_2 Allot_r + \mathbf{X_r}\boldsymbol{\Theta} + \eta_{ir}, \\
y_{ir} &= \beta_0 + \beta_1 \hat{Exp}_r + \beta_2 Allot_r + \mathbf{X_r}\boldsymbol{\Lambda} + \varepsilon_{ir},
\end{aligned}
$$

where:

- S_{rt}: % of r's alloted parcels sold for the first time in year t,
- $Allott_r$: Year reservation r was allotted,
- Exp_r: Fraction of r's alloted parcels sold between 1943 and 1946,
- $\mathbf{X_r}$: additional controls for reservation r,
- $\eta_r, \varepsilon_{ir},$: zero-mean disturbances (potentially correlated)

First stage

Back

Dep. Var.	Allotted by:			Year allotted
	1952	1978	1993	
	(1)	(2)	(3)	(4)
Victoria (low congestion)	62.56	61.77	-0.09	-27.16
	(8.56)***	(8.22)***	(0.24)	(3.70)***
Mean high congestion	14.43	16.60	99.53	1977
Reservations	1,550	1,550	1,550	1,546

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

Validation Geographic RD

Land control, 1999-2018

Back

Sample	All		Mapuche		Not-Mapuche	
Dep. var.	# owners	Avg. land	# owners	Avg. land	# owners	Avg. land
Private	-12.87	1.70	-15.58	0.48	3.12	5.67
	(2.64)***	(0.86)**	(2.50)***	(0.93)	(0.83)***	(2.23)**
$\overline{Y}$ collective	27.16	5.25	26.04	5.27	2.75	4.58
Reservations	1337	1337	1304	1304	684	684

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

Appendix

Mapuche ownership: Robustness tests

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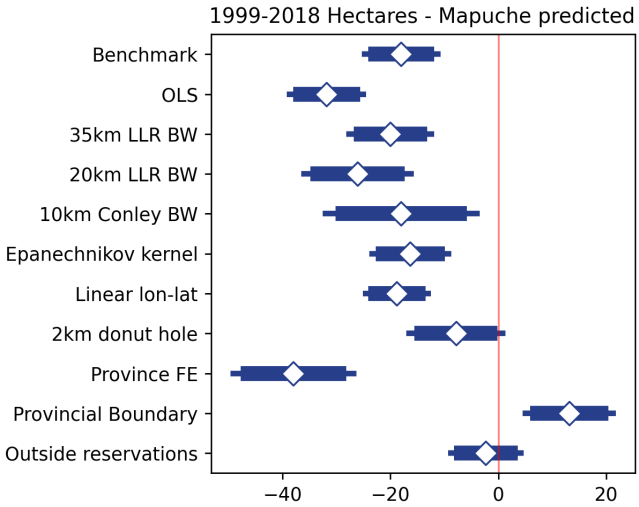

Livestock density in 1974 and land cover in erodible lands in 1999

Back

Dep.var	1974 Livestock Density	1999 Land Cover in Erodible Land (%)			
		Grassland	Cropland	Forest	Shrubland
Private	-0.34	-21.00	2.01	20.45	-1.24
	(0.08)***	(5.02)***	(1.39)	(4.43)***	(0.90)
$\overline{Y}$ collective	0.74	60.39	0.94	36.42	1.62
Reservations	558	1,345	1,345	1,345	1,345

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.

Appendix

Land consolidation, 1974 and ∼1999

Back

Dep. var.	1974 Land Users			1999-2013 Land Owners		
	Log house-holds	Log avg. land used	Avg. % use land out	Log Owners	Log avg. land owned	Avg. % land <0.5 ha
Panel a: All households/Owners						
Private	-0.21	0.14	-4.38	-0.26	0.04	-2.17
	(0.26)	(0.20)	(6.64)	(0.21)	(0.12)	(0.70)***
$\overline{Y}$ collective	2.29	1.95	29.05	3.10	1.62	2.17
Reservations	553	553	553	1,425	1,425	1,425
Panel b: Mapuche households/Owners						
Private	-0.30	0.06	-3.97	-0.50	0.01	-1.86
	(0.24)	(0.18)	(7.08)	(0.18)***	(0.09)	(0.66)***
$\overline{Y}$ collective	2.21	1.94	30.78	3.05	1.61	2.09
Reservations	535	535	535	1,379	1,379	1,379
Panel c: Not-Mapuche households/Owners						
Private	0.65	0.74	12.83	0.73	0.68	-4.25
	(0.27)**	(0.36)**	(9.35)	(0.20)***	(0.26)***	(1.96)**
$\overline{Y}$ collective	0.60	1.73	18.43	0.71	1.21	4.77
Reservations	272	272	272	874	874	874

Statistical significance reported next to standard errors: *p<0.1, **p<0.05, ***p<0.01.