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Who Benefits from Individual Property Rights:
Evidence from the Allotment of Indigenous Reservations

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By FELIPE JORDÁN AND ROBERT HEILMAYR

The structure of property rights institutions is an important determinant of economic development, influencing the efficiency of production, the distribution of resources, and the mobility of individuals. How these processes interact determines who ultimately benefits from changes in property rights. Here we document the impacts of early allotment (1930s–40s vs. 1980s) of Chilean Mapuche reservations, relying upon a sharp discontinuity in allotment capacity across historical courts for identification. Early allotment led to more efficient use of land. However, allotment also reduced Mapuche control over land, consistent with historically documented dispossession. Following over half a million descendants of reservation shareholders, we find that allotment kept descendants closer to their ancestral reservations and in rural areas. Because those areas are among Chile’s poorest, descendants of early-allotted reservations are more likely to be poor.

JEL: J15, K11, N46, N56, O13, O43, Q15, Q24

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Whether land is best held individually or collectively is a classic question in economics with particular relevance for Indigenous lands. Individual property rights can incentivize investment (Besley, 1995; Goldstein and Udry, 2008), improve access to credit (De Soto, 2003), encourage the internalization of externalities (Demsetz, 1967), enable more efficient allocation of labor (De Janvry et al., 2015), and facilitate the reallocation of land toward more productive users (Chen et al., 2022). Yet collective property rights can provide insurance (Baland and Francois, 2005; McCloskey, 1976), protect marginalized communities from dispossession (Akee, 2020), and sustain the territorial governance that underpins cultural practices and Indigenous self-determination (Carpenter and Riley, 2019). How these mechanisms interact to shape the aggregate and distributional consequences of privatization remains an empirical question with substantial policy relevance, as the broad shift toward protecting collective tenure over recent decades (Sieder, 2002; Van Cott, 2000) is met with recurring proposals to reopen Indigenous land markets (Anderson, 2016; Ferrante et al., 2025; Flanagan et al., 2010).

Quantifying the distributional consequences of a transition from collective to individual property rights in Indigenous territories faces a fundamental empirical challenge because individual rights facilitate land transfers that could represent either dispossession or voluntary sales (Akee, 2020). Existing studies largely follow territories rather than people, comparing outcomes across treated and untreated lands. When reforms induce migration, however, such territorial comparisons capture the evolution of places whose populations are themselves reshaped by the reform. In contrast, the fundamental welfare question, *who benefits*, requires knowledge about the original recipients wherever they end up. Property rights recipients who leave may have experienced the largest gains or the largest harms, but are overlooked in studies focused upon territories. To our knowledge, no prior study follows property rights recipients and their descendants wherever they reside under quasi-random variation in the assignment of individual rights.

Here we measure the long-term economic impacts of a transition from collective to individual property rights within Mapuche reservations in Southern Chile. The Mapuche people are Chile’s largest Indigenous group, encompassing 1.6 million people or 8.8% of Chile’s pop-

ulation in 2024 (INE, 2024). In 1930, Courts of Indians were created to allot collectively held reservations, granting parcels with full property rights to each reservation’s shareholders. However, courts’ capacities to allot reservations differed across jurisdictions, creating jurisdiction-specific differences in the share of reservations that were allotted before 1952. Further allotments were limited through 1979, when nearly all the remaining reservations were allotted within a span of 15 years. Thus, by the early 1970s, adjacent reservations separated by a historical judicial boundary were likely to have faced dramatically different property rights regimes over the previous three decades.

We focus on this historical judicial boundary using a fuzzy regression discontinuity design to identify the impact that individual property rights had on economic conditions in reservation territories and among the descendants of property rights recipients. The identification assumption is that only the historical congestion of Courts of Indians, and the ensuing divergence in the share of allotted reservations, varies discontinuously at this boundary. This is likely to hold along our selected boundary, since a segment of it has not overlapped with any other provincial or judicial boundary since 1938. We cannot detect discontinuities for a rich set of predetermined variables, nor, where data are available, for most outcome variables outside reservations, providing strong empirical support for our identifying assumption.

One important advantage of our empirical setting is that we are able to track the economic conditions of the reservations’ descendants, wherever they may have migrated in Chile. Specifically, by matching surnames recorded in the original communal titles to those in Chile’s 2021 Electoral Register and Social Household Registry (RSH), we locate over half a million descendants of the reservations’ original shareholders across present-day Chile, observe their current economic conditions, and link them, probabilistically, to their reservation of origin. To complement these data, we assemble a novel database detailing the evolution of socioeconomic conditions within Mapuche reservations, including measures of local economic activities (e.g., grazing practices), investments (e.g., irrigation), labor markets (e.g., wage employment), and the distribution of resources (e.g., control over land).

On the reservation, early allotment shifted land out of Mapuche hands, underscoring the concern that allotment can erode Indigenous peoples’ control over their territories. Reserva-

tions allotted earlier hold 11.9 to 24.7 percentage points (pp) less Mapuche-owned land by 2024, with corresponding gains for non-Mapuche owners and forestry firms.

Yet alongside this loss of control, early allotment set in motion efficiency gains in how reservation land was used. Land use shifted toward more productive configurations, with less livestock pressure on erodible land, less erosion, and more cropland on land at low risk of erosion. Schooling, off-farm wage labor, and non-agricultural work rose among Mapuche men. Although changes in the population composition increased average household wealth in early-allotted reservations, we find no improvement in wealth among Mapuche households.

The improvement of the reservations' local economies alongside stagnant material conditions for Mapuche residents suggests that the Mapuche who remained did not reap the benefits of allotment. Those who did benefit may instead have left to pursue opportunities elsewhere. Following descendants shows that this was not the case. Early allotment kept descendants closer to their ancestral reservations, in rural areas and outside of Santiago, Chile's largest and wealthiest labor market. Because these areas are among Chile's poorest, descendants of early-allotted reservations are 7.4 pp more likely to be poor, an increase of 11% relative to the descendants of late-allotted reservations. Most of the gap reflects where descendants live. Within a region, descendants of early-allotted reservations are not poorer than their neighbors. These patterns are consistent with historical accounts of dispossession after allotment, which may have left allottees' families with less land with which to finance a move.

Our findings relate to a large body of research on the impacts of property rights on economic development. In agricultural landscapes, several empirical studies have used quasi-experimental methods to document the relationship between individual property rights and investment (Ali et al., 2014; Christensen et al., 2021; Goldstein et al., 2018; Goldstein and Udry, 2008; Jacoby and Minten, 2007), agricultural productivity (Bühler, 2023; Hornbeck, 2010; Newman et al., 2015), labor mobility and its allocation between agricultural and non-agricultural activities (Beg, 2022; Chernina et al., 2014; De Janvry et al., 2015), the allocation of land among producers (Castro-Zarzur et al., 2020; Chen et al., 2022; Libecap and Lueck, 2011), political beliefs (De Janvry et al., 2014), and deforestation (Liscow, 2013).

The results also relate to a growing body of research in economics that studies the historical

determinants of development in Indigenous territories (Akee, 2009, 2020; Akee and Jorgensen, 2014; Akee et al., 2015; Aragón, 2015; Baragwanath and Bayi, 2020; De Janvry et al., 2015; Dippel, 2014; Feir, 2016; Feir et al., 2024; Leonard et al., 2020). While property rights institutions have been widely recognized as a key determinant of economic outcomes in Indigenous territories, only a few studies offer quantitative estimates of the causal, long-term impacts of these institutions. Our paper adds estimates from a novel reform to a literature that has so far drawn most of its evidence from the United States’ 1887 General Allotment Act (Akee, 2009; Akee and Jorgensen, 2014; Dippel et al., 2020), Mexico’s 1992 PROCEDE program (De Janvry et al., 2015), Canada’s First Nations’ modern treaties and allotments (Aragón, 2015; Aragón and Kessler, 2020), and Brazil’s formal recognition of Indigenous territories (Baragwanath and Bayi, 2020; Baragwanath et al., 2023). Within this group, only Aragón and Kessler (2020) and Akee (2020) have explicitly assessed how individual property rights shifted reservation land ownership out of Indigenous hands.

Our contributions to both literatures stem from our ability to follow the recipients of property rights, along with their territories, over nearly a century. This provides, to the best of our knowledge, the first evidence of the long-term impact of converting collective land into individual property on the descendants of its beneficiaries.¹ The loss of land we document, which Aragón and Kessler (2020) and Akee (2020) also find in North America, does not on its own reveal whether those who received the rights were harmed: they may have sold voluntarily and invested the proceeds, or left for better opportunities elsewhere. Following both their territories and their descendants, as we do, lets us see whether the gains in the territories reached the people who received the rights. Our results show that, in a context of historical dispossession, they did not.

Our results also speak to how individual property rights affect mobility. In principle, the effect is ambiguous. By decoupling land rights from land use and making land a liquid asset, individual property rights can free labor to migrate, but by raising the returns to working one’s own land they can also encourage staying (Kennan and Walker, 2011). The available

¹Galán (2024) exploits quasi-random variation in the allocation of parcels to rural families in the context of Colombia’s land reform to study the causal impact of access to land on intergenerational mobility. In contrast to this study, the counterfactual in Galán (2024) is having no land, rather than owning land collectively.

evidence points to the first effect, as formalizing land rights increased migration in Mexico and Russia (Chernina et al., 2014; De Janvry et al., 2015; Valsecchi, 2014). Our finding that early allotment kept descendants close to home, and away from Chile’s main labor market, runs against this evidence and points to an additional reason for staying. When land markets open between Indigenous owners and better-resourced outsiders, recipients may lose their land without sharing in the local gains, leaving them without the means to move to better labor opportunities elsewhere.

Returning to the tradeoff between collective and individual landholdings with which we began, our results inform the recurring debate over whether to open Indigenous lands to the market (Anderson, 2016; Ferrante et al., 2025; Flanagan et al., 2010). Individual property rights can make Indigenous territories more productive, yet when Indigenous people are exposed to dispossession, the gains may accrue to outside buyers while the original rights holders and their descendants remain nearby and are more likely to be poor. For Indigenous people to gain from tenure reforms in their territories, such reforms should establish and maintain safeguards that protect them from being dispossessed of their land.

I. PROPERTY RIGHTS AND DISPOSSESSION IN MAPUCHE RESERVATIONS

A. *Forced settlement and collective titles (1866–1929)*

Prior to their conquest by Chilean armies in 1883, Mapuche were organized in independent lineages whose chiefs controlled who settled in their territories and where land could be cleared for crops (Bengoa, 2000, pp. 60–63). In preparation for the conquest, the Chilean government passed a law in 1866 to establish property rights in Mapuche territory (Law of 4 December 1866).² The law promised collective titles to Mapuche over the lands they had used continuously for over a year, and declared untitled land fiscal property to be auctioned. Settlers rushed to the frontier to secure titles, prompting Congress in 1874 to establish a prohibition zone in which no settler could acquire land directly from Mapuche by any means (Law of 4 August 1874). Restrictions on such acquisitions have remained in place, to varying degrees, to the present day, except between February 1943 and February 1947.

²The laws and decrees cited in this section are listed, with their official titles, in Online Appendix OA5.

Between 1884 and 1929, Mapuche were forcibly settled into reservations. Titles were granted to close to 3,000 local chiefs on behalf of their communities, over a small fraction of their ancestral territories. Every settled individual held a transferable, inheritable share that entitled its owner to usufructuary rights over reservation land, while local chiefs and family heads allocated specific parcels informally (Faron, 1961, pp. 110–116). However, resettlement and the imposition of Chilean institutions undermined traditional authority (Stuchlik, 1976, pp. 203–204). With limited access to Chilean courts, Mapuche had little recourse to settle land disputes. By the early twentieth century, government officials and some Mapuche organizations had started advocating for the allotment of reservations.

B. Allotment and diverging property rights regimes (1930–1942)

A first allotment law, sponsored by the Mapuche congressman Manuel Manquilef and passed in 1927, created a single court that allotted only a handful of reservations (Almonacid, 2008). A second law in 1930, modified by a 1931 decree, created five Courts of Indians that would allot a reservation when at least a third of its shareholders requested it (Law 4802 of 1930 and Decree 4111 of 1931).³ Allotment required listing the reservation’s shareholders, adjudicating conflicting claims with non-Indigenous neighbors, drawing parcels for resident shareholders in proportion to their shares, and creating credits in favor of absent shareholders, payable by allottees and secured by mortgages on their parcels. This process overwhelmed the courts’ limited resources, and allotment proceedings could take decades. Courts were also responsible for authorizing every sale of allotted parcels and of shares in reservations not yet allotted.

The 1930 law established three Courts of Indians within the 1874 prohibition zone, where this paper focuses: Victoria in the north, Temuco in the southeast, and Nueva Imperial in the southwest (Figure 1a). A year later, budgetary constraints closed the Nueva Imperial court and appended its jurisdiction to Temuco’s. Temuco’s court thus covered more than twice as many reservations as Victoria’s with similar staff (Decree 4499 of 1931), and over the following two decades a large gap opened in the share of reservations each court had allotted (Figure 1b).⁴

³Courts of Indians were run by non-Indigenous bureaucrats. They were named Courts of Indians because they heard civil cases related to reservations.

⁴Temuco’s court was staffed with a judge, a secretary, two land surveyors, two officers, and one assistant

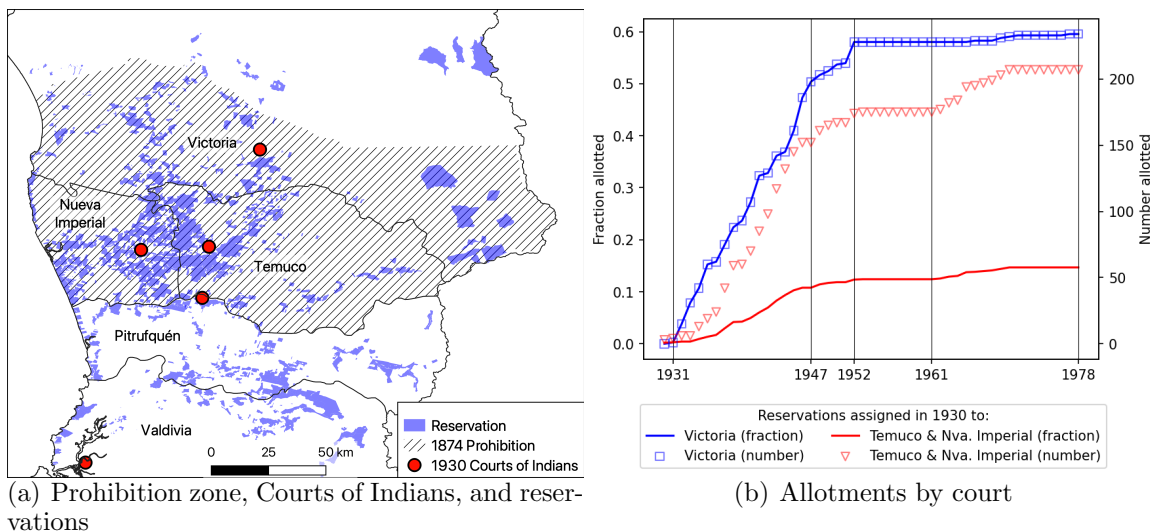


Figure 1. : Mapuche reservations, Courts of Indians, and the timing of allotments, 1874–1989

Notes: Panel (a): reservation polygons from the Chilean National Indigenous Development Corporation (CONADI); Courts of Indians’ locations georeferenced by the authors; historical administrative boundaries from INE, from which the authors construct the displayed judicial boundaries following the jurisdictions defined in the courts’ founding decrees; the 1874 prohibition zone constructed by the authors from its enabling law together with INE’s historical administrative limits. Panel (b): authors’ construction from CONADI’s primary documentation.

C. Unprotected sales and dispossession (1943–1946)

Allotment was meant to integrate Mapuche land and people into the market economy (Almonacid, 2009). To avoid “the serious social problem that would arise if a large part of the indigenous population were to lose ownership or possession of their lands” (Regulation of Law 4802, p. 1), the 1930 law required court authorization for every sale of reservation land. This protection was conceived as temporary. Set to expire in 1940, it was extended for two years and lapsed in February 1943, when a further extension failed in Congress. The expiration of these protections meant that both allotted parcels and shares in unallotted reservations could be freely sold without any government review. Sales of allotted parcels surged in the following years (Figure 2), until Congress restored the authorization requirement in February 1947. As part of the 1947 law, Congress also sought to retroactively invalidate the sales made without court authorization during the unprotected window, but the Supreme Court struck down this provision.

attorney. Victoria’s court was similarly staffed, only missing the assistant attorney.

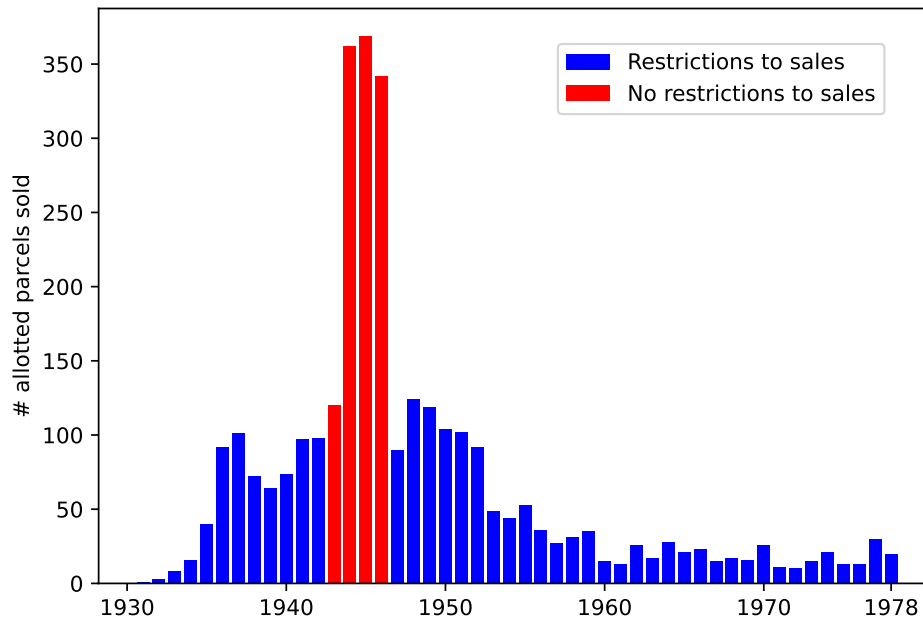


Figure 2. : Sales of allotted parcels by year of first sale, 1930–1978

Notes: Authors’ construction from CONADI’s primary documentation. First-sale dates come from the registry reports listing each reservation’s allotted parcels, which we locate with the image classifier used to find the allotment records (Section II); for each reservation allotted before 1979 we digitize by hand the date of each parcel’s first sale. The 1930 law required courts to authorize all sales of reservation land; this requirement lapsed in February 1943 and was restored in February 1947.

The attempt to retroactively invalidate sales reflected a broad belief that many of them were fraudulent. Ormeño and Osses (1972) estimate that about a fifth of reservation land changed hands during the unprotected window. Contemporary observers documented buyers using deception to obtain land below market prices (Muñoz, 1948), including leases recorded as sales without the owner’s informed consent (CVHNT, 2008, p. 407). The Commission for Historical Truth and New Deal with Indigenous Peoples later concluded that many of these transfers occurred “illegitimately, through fraud against the legal system, and with obvious harm to justice” (CVHNT, 2008, p. 576). Reservations allotted before 1947 thus became transferable property in time for the unprotected market, leaving allottees open to dispossession. These reservations account for 77% of all reservations allotted between 1930 and 1978.

D. Pause and mass allotment (1947–1989)

The 1947 law restoring sale authorization was sponsored by Venancio Coñuepan, a Mapuche congressman who opposed allotment. As Minister of Land and Colonization from 1952 and head of the Bureau of Indigenous Affairs from 1953, he froze further allotments. With fewer cases, Victoria’s court was closed in 1952 and its jurisdiction appended to Temuco’s (Decree 1961 of 1952). This locked in the difference in allotment between the two jurisdictions for three decades (Figure 1b), while reservations on both sides of the boundary were now served by the same court. A 1961 law reopened the courts that had been closed in 1931 and 1952, restoring the jurisdictions of the original 1930 design (Law 14511 of 1961). Few reservations were allotted under this law. In 1972, regular civil courts took over the role of the Courts of Indians (Law 17729 of 1972). Allotments resumed in 1979, when a decree of Pinochet’s dictatorship made allotment much faster and easier, as the request of a single person sufficed to initiate it (Decree Law 2568 of 1979), and by 1989 almost all reservations in our study area had been allotted (Jaimovich and Jordán, 2025).

Late (post-1979) allotments differed from early ones in two important ways. First, they titled current land users rather than shareholders. Second, the sale of late-allotted parcels was restricted, first by a twenty-year moratorium on transfers (Decree Law 2568 of 1979) and then by the 1993 Indigenous Law (Law 19253), which limited sales of reservation land across both early- and late-allotted reservations. Because these restrictions limited land transactions in both groups, ownership differences between early- and late-allotted reservations have been slow to converge. Modern ownership data therefore largely reflect differences in transfers that took place before 1979.

II. DATA

Our primary unit of treatment is a reservation: a tract of land granted as communal property to a group of Mapuche families at forced settlement. The Chilean General Archive of Indigenous Affairs (AGAI) has digitized the original geospatial boundaries of 2,900 of 3,011 reservations, together with over 250,000 pages of primary documentation.⁵ We apply

⁵Most of the reservations that were not digitized only existed legally, that is, they were never officially granted to Mapuche families.

a trained image classifier to these documents to locate the records from which we digitize the data by hand. The year in which each reservation was formally allotted comes from the allotment decree, the court’s allotment ruling, or other documents that record the allotment. For most reservations allotted before 1979, the classifier locates the registry reports listing their allotted parcels and their inscriptions in the Real Estate Registry (*Conservador de Bienes Raíces*), from which we record by hand the year of each parcel’s first sale (Figure 2). The number of parcels allotted in each reservation comes from the lists of first-division allottees provided by the National Indigenous Development Corporation (CONADI). Courts of Indians’ jurisdictions are georeferenced from the administrative units listed in the Regulation of Law 4802, combined with Chile’s 1928–1975 internal administrative boundaries (Decree with Force of Law 8582 of 1928) and the 1874 prohibition zone (Laws of 15 July 1869 and 4 August 1874).

From each reservation’s original title, we also extract pre-allotment variables to verify their continuity across the judicial boundary. These include the number of original settlers, the date of settlement, and a list of founding-men surnames and the number of wives. We also create variables indicating whether each reservation’s original title file included an amendment to increase the size of the reservation, or a petition for an informal partition between reservations’ families before formal allotments were available. We combine these settlement-era characteristics with topographic and climatic variables: elevation and slope at 30 m resolution from the Copernicus GLO-30 digital elevation model ([European Space Agency, 2024](#)), and 1970–2000 average monthly temperature and precipitation at ~ 1 km resolution ([Fick and Hijmans, 2017](#)).

Our descendant outcomes come from merging the 2021 Electoral Register, which lists all adults in Chile with their surnames, gender, address and comuna of registration, and national ID, with confidential data from the Social Household Registry (RSH), an administrative database used to determine eligibility for means-tested social programs. This merge was carried out on our behalf under a confidential data-use agreement. It covers the 1,030,824 registered voters whose paternal or maternal surname appears in the Mapuche Data Project (MDP) list of 8,624 Mapuche surnames ([Mapuche Data Project, n.d.](#)). For each of these

individuals, we observe whether their bracket in the RSH’s socioeconomic score falls within the bottom four deciles. We classify descendants in this bottom-40% group as poor. The data are then aggregated at the surname level, overall and for men and women separately, calculating the fraction of poor individuals. The surnames included within one or more reservations’ list of founding-men surnames account for 64.1% of the 1,030,824 adults in the electoral register who carry at least one MDP surname, a share comparable to the proportion of the Mapuche population settled in reservations, about 70% according to [CVHNT \(2008\)](#). The data are then expanded to the surname-reservation level by defining weights that sum up to one for each surname and represent the probability that a descendant bearing the surname descends from a given reservation, using the frequency of reservation settlers bearing each surname across reservations. We provide further details on this probabilistic link in [Section III](#) and [Appendix A](#). The Electoral Register also records where descendants live, allowing us to create three binary variables for whether they live (a) outside the comuna of their ancestors’ reservation, (b) in Santiago, or (c) at a rural address.

To measure who controls the use of reservation land we use two distinct datasets from different points in time. For 2024 we use confidential parcel-level ownership records produced by the Chilean Internal Revenue Service (SII) and the Center for Natural Resource Information (CIREN), which we access under a confidential data-use agreement. For each parcel, these records provide the owner’s full name and national ID together with the parcel’s vector boundaries. These records provide rich information for most reservations in our sample: across the 1,530 reservations in our RD sample, 1,502 have some coverage, averaging 81% of reservation area with a 10th–90th percentile range of 56–97%. The 2024 land-control analysis keeps the 1,487 reservations in which the cadaster covers at least 10% of reservation area. To describe control over land in 1974, we use the 1974 Indigenous Agricultural Declaration collected by the Instituto de Desarrollo Agropecuario (INDAP), which records the name of every household head using land within each reservation. We recovered these data from AGAI’s storage rooms and digitized them for this study, covering 559 reservations. Importantly, the Indigenous Agricultural Declaration describes land control after early allotment but prior to late allotment.

We aggregate these two data sources at the reservation level to study allotment’s impact on who controls land in the average reservation. Because the two sources cover different reservations, we estimate each on its own maximal sample rather than on their intersection. Each parcel of land is classified as owned by a Mapuche individual, a non-Mapuche individual, a Mapuche collective entity (Indigenous community), or a non-Mapuche collective entity (firms, public bodies, or churches), using regular expressions on owner names and surname matching against both the reservation’s original-title surnames and the MDP surname list. Mapuche communities hold only a tiny fraction of reservation area, so we report them together with Mapuche individuals. For Mapuche individual owners we further distinguish descendents—whose paternal or maternal surname appears in the reservation’s list of original settlers—from outsiders, and men from women.

To capture land use, land value, and economic conditions within reservations we draw on four additional sources. The 1974 Indigenous Agricultural Declaration reports family-level livestock holdings, from which we construct a standardized stocking rate using Livestock Unit equivalents.⁶ Remotely sensed 1999 land cover derived from merging [Graesser et al. \(2022\)](#) with [Proyecto MapBiomass Chile \(2024\)](#) as detailed in [Jaimovich et al. \(2026\)](#) lets us measure the share of reservation land under grassland, cropland, native forest, and plantation. We combine these data with vector data on actual and potential erosion ([Centro de Información de Recursos Naturales de Chile, 2010](#)) to differentiate land use on high- and low-erodibility land, and the extent to which potential erosion materializes into actual erosion. Land transaction data from 2000–2022, combined with the 2024 land cadaster, both obtained from SII, allow us to calculate reservation-specific measures of both appraised and transacted land values, and the fraction of arable and irrigated land. Microdata from the 1992 General Population Census yield labor-market outcomes and schooling, together with an asset-based household wealth index that the Census Bureau computes and distributes with the microdata ([Ramos et al., 2004](#)). We georeference and digitize these census microdata at the rural *sector* level using the Census Bureau’s 1992 field maps, and aggregate up

⁶We compute the stocking rate as a reservation’s total Livestock Units (LSU) divided by the land its households report using. The LSU aggregates species by their grazing requirements relative to an adult dairy cow, following the Eurostat livestock-unit equivalents: 0.78 for cows and oxen, 0.8 for horses, 0.1 for sheep and goats, 0.26 for pigs, and 0.02 for poultry.

to the reservation level by area-weighted overlap.⁷

Three further sources complete the data. A civil registry of given names assigns the gender of parcel owners whose gender is not recorded. CONADI’s index of the Temuco court’s case files, which records the filing date, parties, subject, and community of each case, describes the work of the Courts of Indians; we classify the cases by subject and link them to reservations by community name (Online Appendix OA1.5). The 2024 Population and Housing Census (INE, 2024) validates our classification of descendants’ electoral addresses as rural. Appendix A details the surname-matching algorithm. Online Appendix OA1 describes the *sector*-to-reservation imputation, the construction of reservation-level land holdings from the parcel records, and the rural classification of electoral addresses.

III. EMPIRICAL STRATEGY

The sharp divergence in allotment outcomes across the Victoria–Temuco judicial boundary motivates a fuzzy geographic regression discontinuity (FGRD) design. For an outcome y_{ij} observed on unit i linked to reservation j , we estimate

$$\begin{aligned} (1) \quad \text{EarlyAllotted}_j &= \alpha_0 + \alpha_1 \text{Victoria}_j + g(\text{lon}_j, \text{lat}_j) + \mathbf{X}_j \Lambda + \eta_j, \\ (2) \quad y_{ij} &= \beta_0 + \beta_1 \widehat{\text{EarlyAllotted}}_j + f(\text{lon}_j, \text{lat}_j) + \mathbf{X}_j \Theta + \varepsilon_{ij}, \end{aligned}$$

where Victoria_j is a dummy equal to one if reservation j lies within Victoria’s jurisdiction; EarlyAllotted_j is a dummy equal to one if reservation j was allotted before 1979; $g(\cdot)$ and $f(\cdot)$ are smooth functions of the longitude and latitude of reservation j ’s centroid; and $\mathbf{X}_j$ is the vector of reservation-level predetermined controls described in Section II (topography, climate, and conditions of forced settlement). The coefficient β_1 is the average causal effect of early allotment at the judicial boundary under the standard identification assumptions of the FGRD estimator.

Our baseline specification estimates equations (1)–(2) by local linear regression, with distance to the judicial boundary as the running variable, a triangular kernel, and a 50 km

⁷Each *sector* is significantly smaller than the typical reservation, spanning a 10th–90th percentile range of 2–16 households within our study area.

bandwidth. All specifications include region-along-the-boundary fixed effects and the vector $\mathbf{X}_j$ (see Online Appendix OA2 for details on the regions along the judicial boundary and the associated sample selection). The baseline sample comprises 1,530 reservations within 50 km of the historical Victoria–Temuco boundary (out of 1,574 within that distance), for which the allotment status and the full set of predetermined controls are observed. For inference, we use Conley spatial HAC standard errors with a 50-km cutoff (Conley, 1999). Robustness to alternative bandwidths, kernels, and a linear specification with first-order polynomials in longitude and latitude is reported in Online Appendix OA3.

Table 1 reports the first stage. Reservations on the Victoria side of the boundary were 60 pp more likely to have been allotted by 1952 and 59 pp more likely by 1978 than reservations on the Temuco side (columns 1–2). The gap is essentially closed by 1993, after Pinochet’s 1979 decree made allotment much faster and easier and nearly all remaining reservations were allotted (column 3). On average, reservations in Victoria were formally allotted 26 years earlier than those in Temuco (column 4). The Victoria indicator thus provides a strong instrument for early allotment. The F statistic for column 2, the first stage of the reservation-level analyses, is 45.

Table 1—First stage: Victoria Court and allotment

Dep. Var.	Allotted by:			Year
	1952	1978	1993	allotted
	(1)	(2)	(3)	(4)
Victoria (low congestion)	59.65 (9.63)*** [14.50]	59.24 (8.82)*** [16.91]	-0.20 (0.11)* [99.69]	-25.95 (4.22)*** [1976.81]
Reservations	1,530	1,530	1,530	1,528

Unit of analysis is a reservation. Victoria row presents treatment effects estimates of Victoria’s jurisdiction dummy on the dependent variable in the column’s header, using a Geographic Discontinuity Design with local linear regression on distance to the judicial boundary as running variable, regions-along-the-boundary fixed effects, and a 50-km triangular kernel. Standard errors in parentheses (Conley, 50-km bandwidth); Temuco jurisdiction means in brackets. *p<0.1, **p<0.05, ***p<0.01.

Table 2 reports the reduced-form effect of the Victoria indicator on fourteen predetermined reservation characteristics. These cover: topography—mean elevation, ruggedness (slope’s standard deviation), share of land in gentle (0–15%) and mid (15–45%) slope, share of erodible land; climate—temperature and precipitation; and conditions of forced settlement—

year settled, area, number of persons settled, population density at settlement, whether the reservation petitioned for an informal partition or an amendment of its collective title before 1927, and the maximum number of wives among original settlers as a proxy for pre-settlement wealth. None of the fourteen estimates is significantly different from zero at the 5% level, supporting the identifying assumption that the judicial boundary does not coincide with confounding discontinuities in predetermined conditions.

The specific boundary we analyze is particularly well-suited to FGRD identification. Although the judicial boundary followed provincial boundaries when it was defined in 1930, a section of the provincial boundary was modified in 1938, so that over most of the study period, along that section, the judicial boundary diverges from the provincial boundary. The boundary also cuts perpendicularly through the territory of the two main Mapuche confederations at the time of forced settlement—the *Abajinos* on the west and the *Arribanos* on the east—leaving reservations from both groups on either side. The Indigenous Settlement Commission (*Comisión Radicadora de Indígenas*), which administered forced settlement, organized its work independently of provincial boundaries. Online Appendix [OA3](#) reports two checks that use the section of the boundary where the judicial and provincial lines diverge, a demanding test since only 24 reservations in our sample lie on different sides of the two boundaries. Our results are mostly robust to restricting the identifying variation to that section. Along the provincial boundary there, once the judicial side is held fixed, most estimates are indistinguishable from zero. Where outcomes are also observed outside reservations, a better-powered placebo estimates the same discontinuity on 879 census localities along the entire judicial boundary, yielding mostly null results.

The exclusion restriction requires that the Victoria indicator affect outcomes only through the timing of allotment. The threat is that congestion also slowed the courts' other tasks (authorizing sales of reservation land, hearing suits against non-Indigenous occupants, and settling debts), and that those delays left their own lasting mark. Three features of the setting make this unlikely. First, congestion likely fell mainly on allotment. The law let judges expedite the other tasks but set no deadline for any step of allotment. Second, the one task that could have left a lasting mark on land control, authorizing sales, was rare and

shows no discontinuity. Among reservations allotted before 1942, the share of parcels sold by 1942, when every sale required the court's authorization, does not differ across the boundary, so there is no sign that congestion limited the courts' capacity to authorize sales.⁸ Third, the difference in court capacity was temporary, whereas the difference in allotment was not. Court capacity diverged across the boundary only from 1931, when Nueva Imperial's court closed, to 1952, when Victoria's court closed; in 1961 the courts reopened under their original 1930 jurisdictions. The freeze on allotments, by contrast, locked in the difference in allotment for three decades.

Table 2—Continuity of predetermined variables across judicial boundary

Dep. var.	Elevation	Slope (std)	Slope 0–15%	Slope 15–45%	% Erodible	Tempera- ture	Precipita- tion
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Victoria (low congestion)	28.35	0.56	-0.03	0.02	-0.06	-0.15	1.82
	(14.85)* [120.31]	(0.55) [3.67]	(0.08) [0.76]	(0.07) [0.23]	(0.09) [0.34]	(0.08)* [11.99]	(2.78) [103.61]
Reserva- tions	1,530	1,530	1,530	1,530	1,530	1,530	1,530
Dep. var.	Year settled	Hectares	Persons settled	Pop. Density	Partition	Amend- ment	Max Wives
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Victoria (low congestion)	2.42	65.88	5.99	-1.93	0.04	0.00	-0.17
	(3.33) [1903.02]	(39.21)* [151.72]	(6.39) [33.63]	(1.30) [24.40]	(0.10) [0.14]	(0.04) [0.15]	(0.17) [1.54]
Reserva- tions	1,530	1,530	1,530	1,530	1,530	1,530	1,530

Unit of analysis is a reservation. Same specification as Table 1: the Victoria row reports the estimated effect of Victoria's jurisdiction dummy on the dependent variable in the column's header. Slope 0–15%, 15–45% are the shares of reservation land in those percent-slope brackets (Copernicus GLO-30), matching the SII land-capability slope thresholds. Standard errors in parentheses (Conley, 50-km bandwidth); Temuco jurisdiction means in brackets. *p<0.1, **p<0.05, ***p<0.01.

For descendant-level outcomes we observe the average outcome of each surname's present-day bearers, but not the reservation each bearer descends from. Each of the 579,706 descendants

⁸CONADI's index of the Temuco court's case files records 246 authorizations to sell in the 1930s, about 5% of the court's caseload, and only 6% of the reservations on the Temuco side still undivided in 1940 record one (Online Appendix [OA1.5](#)). Debt rulings could not reach reservation land, which was unseizable while unallotted. The estimated discontinuity in the share of allotted parcels sold up to 1942 is -0.5 pp (standard error 4.2, Temuco mean 19.5%).

in the RD sample, those whose surnames link to a reservation within the bandwidth, enters through every Mapuche surname of theirs that is matched to a reservation, once when only one surname is matched (440,981 descendants) and twice when both are (138,725 descendants). Let p_{sr} be the probability that surname s originated in reservation r , which sums to one across reservations for each surname (Appendix A.A2). In a discontinuity design a surname spread across reservations has no meaningful average location, so we expand each surname into one observation per reservation of origin. Every observation then sits at an actual reservation, with its own location, court, and covariates. The surname’s outcome, however, reflects the allotment history of all of its reservations of origin. We therefore replace EarlyAllotted_j in equations (1)–(2) with the surname’s exposure to early allotment, $\bar{D}_s = \sum_r p_{sr} \text{EarlyAllotted}_r$, and instrument it with the Victoria indicator of the observation’s reservation. Appendix A.A3 shows by simulation that this specification recovers the effect of early allotment on descendants.

Each observation is weighted by $W_K \times p_{sr} \times n_s$. The term n_s is the number of descendants used to calculate the surname’s outcome. It makes the estimates effects on descendants rather than on the average surname, and, because each outcome is an average over n_s descendants, weights observations by the inverse of their sampling variance. The informativeness weight $W_K = \max\{0, 1 - H_s / \log K\}$, where $H_s = -\sum_r p_{sr} \log p_{sr}$ is the entropy of the surname’s distribution across reservations, equals one for a surname found in a single reservation’s title, falls as the surname spreads across reservations, and is zero for surnames whose entropy is at least that of an even spread over K reservations. It guards against the errors that remain in the link, which are larger for widespread surnames. The probabilities p_{sr} are estimated from the founders’ surnames rather than from today’s descendants, and some present-day bearers of a widespread surname do not descend from any reservation. This approach builds on work that exploits surname-level variation to study intergenerational mobility, where rarer or more concentrated surnames carry more information about their bearers’ origins (Barone and Mocetti, 2021; Clark and Cummins, 2015; Güell et al., 2015), and that sharpens surname-based estimates by up-weighting the more informative surnames (Barone and Mocetti, 2021; Clark and Cummins, 2015; Rivadeneira, 2024). Our preferred specification sets $K = 30$, which retains 1,202 of the 1,254 surnames, carried by 490,790 of the 579,706 descendants, while

giving zero weight to the most widespread lineages. Appendix A.A3 reports the estimates over a grid of caps, spaced on a log scale, from $K = 3$ to $K \rightarrow \infty$, the limit at which $W_K = 1$ and the informativeness weight drops out.

IV. THE TRANSFORMATION OF RESERVATION LAND USHERED IN BY ALLOTMENT

In this section we leverage a rich dataset built from land cadasters, household surveys, satellite imagery, land transactions, and census data to estimate how allotment transformed reservations. We study how allotment redistributed reservation land across groups defined by ethnicity and ancestry; how it affected the efficiency of land use, focusing on livestock production and erosion; how it impacted land investments; and how it affected local human capital, labor-market conditions, and household wealth. We find that early allotment set reservations on a path of substantial economic development amidst large compositional changes within ethnic and ancestry groups.

A. *Early allotment and the distribution of land*

A common concern raised about the allotment of Indigenous territories is that transferable property rights will lead to the loss of Indigenous control over land. No quantitative evidence has been offered for this claim in the Mapuche case, and only a handful of studies, all from the Global North, establish a link between allotment and Indigenous communities' loss of control over reservation resources (Akee, 2020; Aragón and Kessler, 2020). We document how allotment reshaped the distribution of land between Mapuche and non-Mapuche, and among Mapuche, at two points in time. In the first row of Table 3 (1974) we use the 1974 Indigenous Agricultural Declaration to document changes in landholdings as of 1974, a point in time when late-allotted reservations were still held collectively. In the second row (2024), we explore changes in titled ownership as recorded in SII's land cadaster around the year 2024.

Columns 1–4 of Table 3 report the share of reservation area held by each type of landholder: Mapuche in column 1, and three non-Mapuche groups in columns 2–4 (individuals, forestry companies, and other institutions). Column 5 gives the share of the reservation unaccounted for—either not surveyed in 1974, or of unknown ownership in 2024. Because these five shares

partition reservation area, the estimated effects in columns 1–5 sum to zero. The first row shows that by 1974 early allotment had already reduced the share of land held by Mapuche by 23.3 pp ($p < 0.01$), mirrored by increases of 10.5 pp in land held by non-Mapuche individuals (n.s.) and 12.8 pp in unaccounted land (n.s.). This bounds the loss of Mapuche control between 23.3 pp, attributing all the additional unaccounted land to non-Mapuche, and 10.5 pp (n.s.; column 1 plus column 5), attributing all of it to Mapuche. We suspect the truth lies nearer the upper bound: the Indigenous Agricultural Declaration recorded land held by reservation smallholders, so much of the extra unaccounted land plausibly sits with non-Mapuche large landholders.

In 2024 (second row), this loss of Mapuche control was still 24.7 pp ($p < 0.01$), largely unchanged from 1974. As explained in Section I, this stability over half a century is expected: the transfer restrictions imposed on late-allotted parcels, later locked in place by the 1993 Indigenous Law, barred the sale of Mapuche-owned reservation land to non-Mapuche. That the loss persists indicates these *de jure* prohibitions did restrict transfers in practice on both early- and late-allotted reservations, as documented by Jordán et al. (2025). The 2024 cadaster also has better coverage—the late-allotted mean unaccounted share (in brackets, column 5) is 13.7% against 33.6% in 1974—and its owner-type detail lets us identify institutional owners, notably the forestry companies at the center of the Mapuche–state conflict (Klubock, 2014). The Mapuche loss of ownership is contrasted against gains of 7.9 pp for non-Mapuche individuals ($p < 0.1$), 3.0 pp for forestry companies ($p < 0.05$), and 12.8 pp in unaccounted land ($p < 0.01$). This increase in unaccounted land plausibly reflects the relative difficulty SII faces in digitizing the older registry records emerging from early allotment. Bounding the loss of Mapuche control over land to take into account uncertainty from unaccounted land as before yields a comparable range, 11.9 to 24.7 pp ($p < 0.01$ at the lower bound).

Columns 6–7 turn to the distribution of land *among* Mapuche individuals, separating descendents, whose paternal or maternal surname appears among the reservation’s original settlers, from outsiders. Both groups lost land relative to late-allotted reservations. In 1974, the share of reservation land held by descendents was 12.4 pp lower in early-allotted reservations

Table 3—Control of land

		Holder type (% reservation area)				Within-Mapuche (%)	
		Non-Mapuche					
	Mapuche	Ind.	Inst.- Forestry	Other Inst.	Not covered	Descen- ders	Out- siders
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1974	−23.28 (6.26)*** [57.86]	10.49 (6.97) [8.54]	—	—	12.79 (10.69) [33.59]	−12.40 (6.64)* [23.54]	−10.03 (5.37)* [33.92]
2024	−24.73 (3.16)*** [75.70]	7.85 (4.01)* [10.18]	2.96 (1.19)** [0.04]	1.11 (2.13) [0.42]	12.81 (2.74)*** [13.66]	−8.81 (2.21)*** [29.12]	−16.82 (3.34)*** [46.63]

Unit of analysis is a reservation. *1974* uses the INDAP Indigenous Agricultural Declaration, which records the land each household declared holding; *2024* the SII parcel registry, which records titled ownership. Each cell is a 2SLS estimate of Early Allotment (instrumented by Victoria’s jurisdiction) from local linear regression with region fixed effects, predetermined controls, and a 50-km triangular kernel; Conley standard errors (50-km) in parentheses and the late-allotted-side mean in brackets. The 1974 row covers 546 surveyed reservations and the 2024 row 1,487 reservations whose cadaster covers at least 10% of reservation area ($N = 523$ – $1,487$ across cells). Columns 1–5 give shares of reservation area by holder type. *Mapuche* (col 1) combines Mapuche individuals and Mapuche organizations (Indigenous communities); the next three columns are non-Mapuche—individuals, forestry firms, and other institutions; and *Not covered* (col 5) is the residual with no holder on record (the no-parcel share in 2024, the not-surveyed share in 1974). Columns 6–7 decompose the Ind.-Mapuche share of reservation area by ancestry: *Descenders* carry a paternal or maternal surname among the reservation’s original settlers, *Outsiders* carry neither. Online Appendix Table OA4.1 splits both groups by gender. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

($p < 0.1$), and that held by outsiders 10.0 pp lower ($p < 0.1$). By 2024, the descenders’ share was 8.8 pp lower ($p < 0.01$), falling from 29.1% of reservation area in late-allotted reservations to about 20.3%, and the outsiders’ share was 16.8 pp lower ($p < 0.01$). Allotment thus reduced the land held both by the founding lineages and by families who settled in the reservation after its establishment.

Online Appendix Table OA4.1 splits both groups by gender. In 1974 the losses fall on men, while outsider women gained 5.4 pp ($p < 0.01$). By 2024, descender and outsider men and women all hold less land in early-allotted reservations. Online Appendix Table OA4.2 shows that by 2024 the distribution of land *among* Mapuche is balanced across the judicial boundary, suggesting that the closed market among Mapuche let holdings converge within Mapuche groups even as it stayed divergent between Mapuche and non-Mapuche.

The results are robust to the standard battery of tests we run for the FGRD—alternative kernels and bandwidths, a narrower Conley bandwidth, a linear polynomial in longitude

and latitude in place of distance to the boundary, a 2-km donut hole around the boundary, and province fixed effects that draw inference only from the segment of the boundary that does not overlay the provincial boundary—displayed in Online Appendix Figure OA3.1. The results are mostly null in the placebo test that estimates a discontinuity along the provincial boundary while controlling for the judicial boundary; where it is significant, the point estimates carry the opposite sign to our main results. Online Appendix Table OA4.3 shows that similar results are obtained when calculating the share of appraised value instead of hectares. The Mapuche loss of land value (16.4 to 28.2 pp) is somewhat larger than their loss of land area, suggesting that non-Mapuche may have gained control of above-average-quality reservation land.

Overall, the land-control results show that allotment meaningfully reduced Mapuche control of land, though Mapuche still hold the majority of reservation land on average. These territorial losses were borne by both men and women, and extended to the descendants of the reservations' founding settlers, whose share of reservation land fell from 29.1% to about 20.3% by 2024.

B. Land use and value

The transformation of ownership was accompanied by a change in how reservation land was used. Under collective tenure, use rights were not tied to specific plots, giving families little reason to internalize the cost of grazing livestock on common land—a classic open-access problem.⁹ If individual property rights closed this commons, grazing pressure on reservation land should fall as households internalize the externalities of livestock production. Column 1 of Table 4 shows this is the case: early allotment lowered 1974 livestock density by 0.28 units ($p < 0.01$), a large decline compared to the late-allotted average of 0.75.

Columns 2–5 trace the consequences for land cover in 1999. Across all reservation land, early allotment moves land out of grassland by 24.1 pp ($p < 0.01$), and into both cropland (+13.1 pp, $p < 0.05$) and forest. The rise in cropland is itself an expected consequence of

⁹ Titiev (1951, p. 20) describes the resulting overgrazing and severe erosion in Mapuche reservations by the 1940s: "...the increase of livestock since pacification [forced settlement] has led to serious overgrazing, with the result that the heavy rains of winter wash valuable chemicals out of the denuded earth and erode great tracts of precious soil as the waters cut deeply into the bare ground."

Table 4—Livestock density (1974), land cover (1999), and actual erosion

Dep.var	1974 Livestock	1999 Land Cover (%)				Actual erosion
	Density	Grassland	Cropland	Native forest	Plantation	On erodible land (%)
	(1)	(2)	(3)	(4)	(5)	(6)
Early Allotment	-0.28 (0.06)*** [0.75]	-24.13 (4.61)*** [77.28]	13.09 (5.89)** [1.49]	5.63 (1.94)*** [8.50]	6.43 (4.83) [6.77]	-16.00 (8.48)* [27.00]
Reservations	546	1,530	1,530	1,530	1,530	1,357

Unit of analysis is a reservation, on all reservation land. Same specification as Table 3. Column 1 reports livestock density (livestock units per hectare) from the 1974 Indigenous Agricultural Declaration. Columns 2–5 report 1999 land cover shares. Column 6 reports the share of the reservation’s erosion-prone land that is actually eroded. Table OA4.4 reports the land-cover columns separately for erodible and non-erodible land. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

closing the commons: by enclosing individual plots to exclude other households’ animals, farmers can protect crops from being trampled or grazed, increasing the viability of crop production (Hornbeck, 2010). The forest gain, however, is only statistically significant for *native* forest (+5.6 pp, $p < 0.01$). This distinction matters for interpretation, as it shows that the recovery of forest is not simply forestry firms planting on land they acquired. The firms’ share of reservation land rose only modestly (Table 3), and the increase in plantation cover presented in Table 4 is statistically indistinguishable from zero. The reallocation of land use instead points to a process in which clearer and more enforceable property rights reduced incentives to overgraze marginal lands while enabling the expansion of cultivated crops and native forests.

Splitting reservation land by erosion potential sharpens the picture (Online Appendix Table OA4.4). On erodible land, where grazing is most damaging, the reduction of grassland (−21.0 pp, $p < 0.01$) is countered mainly by native forest expansion (+10.8 pp, $p < 0.01$). This shift is consistent with land owners allowing permanent vegetation to reestablish on erodible land. On non-erodible land, the decline in grassland (−21.8 pp, $p < 0.01$) gives way to cropland (+13.8 pp, $p < 0.05$) and, again, native forest (+3.9 pp, $p < 0.01$). Marginal land returning to forest while better land moves into crops is the reallocation one would expect if allotment let households put each parcel to its most suitable use. In both subsamples

plantation cover rises but never significantly.

This more careful use of marginal land translated, as expected, to less erosion in the long term. Column 6 of Table 4 shows that early allotment lowered the share of erosion-prone land that is actually eroded by 16.0 pp ($p < 0.1$), against a late-allotted mean of 27.0%.

Table 5—Land quality and land value

Dep.var	Land quality (% land)		Land value (log CLP/ha)	
	Arable (I–IV)	Irrigated	Appraisal	Transaction price
	(1)	(2)	(3)	(4)
Early Allotment	24.43	2.37	0.09	0.20
	(5.97)***	(0.92)**	(0.10)	(0.13)
	[67.07]	[1.80]	[15.02]	[14.51]
Reservations	1,499	1,499	1,499	1,020

Unit of analysis is a reservation. Same specification as Table 3. Columns 1–3 are built from the SII serie-A agricultural parcels whose centroid falls inside the reservation: *arable* (SII land-capability classes I–IV) and *irrigated* are the declared hectares in those classes over total declared hectares (columns 1–2), and the *appraisal* (column 3) is the log of total appraised value over total declared hectares. Column 4 is the log median transaction price per hectare over 2000–2022 from SII Form 2890, restricted to reservations with at least five transactions; the price is converted from UF/m² to CLP/ha using the 31-Dec-2024 UF (38,416.69 CLP), so columns 3 and 4 are both in log CLP per hectare and directly comparable. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Controlling erosion through a reduction of grazing pressure and an expansion of permanent vegetation on erodible lands constitutes a significant improvement to reservation land. In the first column of Table 5 we use parcels whose reference point in the SII’s cadaster falls within reservations to study whether these improvements are also reflected in SII’s 2024 classification of arable land, which responds to topographic and soil characteristics as well as to actual erosion. One of the main topographic characteristics of arable land is a gentle slope of up to 15%, a characteristic that is balanced across the boundary (Table 2). We therefore interpret the large increase in arable land (24.4 pp, $p < 0.01$) as evidence that erosion control spurred by early allotment has led to meaningful improvements in land. The fact that this result is detectable even though late-allotted reservations have been allotted for at least three decades by 2024 suggests that, once erosion reaches a critical point, it is very hard to revert. That is, early allotment probably caused long-term improvements in arability by preventing initial erosion rather than accelerating the recovery of heavily eroded

lands.

The same data reveal, in column 2, that early-allotted reservations also invested in improving land quality by increasing irrigation by 2.4 pp ($p < 0.05$), more than doubling the late-allotted mean of 1.8%. Thus, the improvements due to avoided erosion and the subsequent increase of arable land were accompanied by a complementary investment in irrigation. In columns 3 and 4 we study whether these improvements translate into land valuations, both in fiscal appraisal in column 3 and observed transaction prices in column 4. Fiscal appraisal assigns a price to each land type, distinguishing irrigated arable from non-irrigated arable and non-arable land, based on observed transactions in the parcel's municipality. Since reservation parcels are a small share of their municipalities' land market, changes in appraisal value should only reflect changes in the share of land falling in each of these broad land types. The point estimate is positive but not statistically significant, consistent with appraisal capturing only the shift across broad land types. Observed transaction prices could provide a more complete description of how early allotment influenced the long-term value of affected properties. Using observed prices across 1,020 reservations for which we observe five or more transactions between 2000 and 2022, the point estimate is also positive, 0.20 log points, but not statistically significant. We therefore cannot detect, at conventional significance levels, that these improvements were capitalized into land values, although both point estimates are positive and the price estimate is large enough to be consistent with the market valuing the gains in land quality.¹⁰

These results are robust to the same battery of specification and placebo tests (Online Appendix Figure OA3.2 for Table 4, Online Appendix Figure OA3.3 for Table 5). Where the outcome is also observed off the reservations—land cover, actual erosion, land quality, and land value—we add a second placebo that estimates the same boundary discontinuity on census entities outside reservations, which were never allotted (Online Appendix OA1.2). The decline in livestock density, the retreat from grassland, the recovery of native forest, the lower realized erosion, the higher share of arable land, and the positive value estimates keep their sign across all tests but one (the erosion estimate changes sign at the 20-km

¹⁰A one-sided test rejects the null that early allotment did not raise transaction prices at the 10% level ($p = 0.06$).

bandwidth, where it is imprecise), and the placebo on census entities outside reservations shows no comparable discontinuity for any outcome. Along the provincial boundary, the placebo estimates for grassland and cropland area are statistically significant but carry the opposite sign to our estimates. Reassuringly, no discontinuities are detected in the better-powered test based on placebo units outside reservations. We also note that our irrigation estimates should be read with caution, since they do not survive the robustness test with province-level fixed effects.

C. Labor markets and household wealth in reservations

By changing how land is used and who controls and is able to work it, early allotment is likely to reshape local labor markets and the characteristics of workers. A move from farming into wage labor may reflect new opportunities, or the loss of land that households could farm. Traditional gender roles that assign Mapuche men a greater role in the market economy may, in turn, shape how men and women respond to these changes.

We explore these mechanisms using the 1992 General Population Census, the earliest census with sufficient spatial resolution to measure reservation-specific effects. Table 6 reports outcomes for working-age individuals (15–64) in Panel A and a household wealth index in Panel B, for all residents (column 1), non-Mapuche individuals (column 2), and Mapuche individuals split by gender (columns 3–5).

All working-age individuals had been born on or before 1977. Thus, most of the late-allotted individuals had lived most of their lives in unallotted reservations, while early-allotted individuals had lived most of their lives in allotted reservations. The first row shows that the fraction of individuals who self-declare as Mapuche falls by 20.3 pp, mirroring the reduction in land ownership found in Table 3. The second row also shows that labor became considerably more mobile within Mapuche, where we define a migrant laborer as a person whose mother was born in another municipality. Thus, early allotment encouraged immigration into reservations, consistent with the opening of the land market to outsiders documented in Table 3, and increased ethnic diversity.

The third and fourth rows report changes in human capital. The point estimates for literacy

Table 6—Labor markets and human capital (1992 Census)

	Non-		Mapuche		
	All (1)	Mapuche (2)	All (3)	Men (4)	Women (5)
<i>Panel A: Working-age individuals (15–64)</i>					
% Mapuche	–20.26 (4.95)*** [79.37]				
% Migrant	18.61 (9.17)** [28.50]	6.85 (7.48) [41.91]	17.98 (9.03)** [25.65]	16.96 (9.14)* [24.21]	19.88 (9.31)** [27.70]
% Reads	5.66 (3.74) [82.23]	7.42 (4.04)* [85.72]	3.34 (3.89) [81.51]	2.82 (2.49) [86.46]	7.02 (6.23) [75.68]
Avg. schooling	0.39 (0.23)* [5.24]	0.16 (0.28) [5.96]	0.28 (0.26) [5.11]	0.48 (0.24)** [5.50]	0.23 (0.32) [4.65]
% Wage workers	11.98 (2.81)*** [10.86]	5.20 (5.99) [16.91]	8.24 (1.34)*** [9.68]	13.17 (2.45)*** [15.03]	0.51 (1.00) [3.69]
% Agriculture	–17.82 (7.61)** [71.66]	–15.16 (9.37) [58.75]	–18.87 (7.26)*** [73.82]	–15.45 (6.13)** [78.53]	–8.21 (6.26) [19.41]
% Non-ag. wage	4.72 (1.39)*** [6.67]	0.64 (2.55) [11.99]	3.61 (1.78)** [5.76]	4.64 (2.74)* [7.75]	0.56 (0.80) [3.50]
Reservations	1,480	1,440	1,462	1,452	1,453
Individuals	58,841	11,494	47,347	25,105	22,242
<i>Panel B: Households</i>					
Wealth score	15.36 (6.33)** [–14.28]	12.65 (8.89) [10.18]	6.31 (7.50) [–19.25]		
Reservations	1,479	1,366	1,448		
Households	22,597	4,141	18,456		

Unit of analysis is a reservation. Same specification as Table 3. Panel A reports outcomes for working-age individuals (15–64). % Reads is the literacy rate. % Agriculture is computed among employed workers. % Non-ag. wage is the share of working-age individuals who are wage workers employed outside agriculture. % Migrant is the fraction whose mother was born in a different municipality. Panel B reports the household-level wealth index by head's ethnicity; gender columns are omitted. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

and schooling are positive for every group, but most are imprecise. Literacy rises by 7.4 pp among non-Mapuche living in reservations ($p < 0.1$); among Mapuche the estimate is

positive but not statistically significant (3.3 pp). Schooling rises significantly only among Mapuche men, by 0.48 years ($p < 0.05$); the estimate for Mapuche women is smaller and imprecise (0.23 years).¹¹

The final three rows of Table 6, Panel A dig deeper into labor-market participation by gender by looking at the percentage of wage and agricultural workers. The only group that experiences a significant change in these variables is Mapuche men, who increase their participation in wage work by 13.2 pp, effectively doubling the benchmark level of late-allotted reservations ($p < 0.01$), and reduce their participation in agricultural work by a similar amount (15.4 pp, $p < 0.05$). For Mapuche women, point estimates are considerably closer to zero and not significant. These results are robust, and even stronger, when considering non-migrant Mapuche (Online Appendix Table OA4.6), suggesting a change in how Mapuche men engaged with the labor market rather than a compositional change. The last row of panel A isolates non-agricultural wage labor, which combines both margins: early allotment raised the share of working-age Mapuche men employed as wage workers outside agriculture by 4.6 pp ($p < 0.1$), well above the late-allotted baseline of 7.7%, while the effect for Mapuche women is small and not statistically significant (0.56 pp). This confirms that a substantial share of the rise in male wage work reflects a move into the non-agricultural labor market.

Panel B of Table 6 reports the Census Bureau’s household wealth index (Section II), normalized to mean zero and standard deviation 100 across households in the study area. We find no improvement among Mapuche households. The point estimate for Mapuche households

¹¹Several factors could explain these gains in human capital. The non-Mapuche population is on average 2.4 years younger, which could drive part of the increase in literacy rates as younger generations had better access to school (Online Appendix Table OA4.5). Compositional changes within each group could also play a role, although the results are similar or stronger when focusing on the sub-sample of individuals whose mothers were born in the same municipality in which they were surveyed—which we label non-migrants (Online Appendix Table OA4.6). Thus, the results likely reflect changes in the expected returns and opportunity cost of education on reservations. Opportunity cost might have fallen with allotment given children’s traditional role as herders (Titiev, 1951): the enclosure of families’ parcels reduces the need for herding, plausibly freeing time for children to attend school. At the same time, higher agricultural productivity, the move into wage work (final three rows of Table 6, Panel A), and smaller landholdings for subsistence agriculture are likely to have raised the expected return to the basic skills needed to engage effectively in a market economy, such as literacy and arithmetic. The larger result on schooling for men, especially among non-migrants in Online Appendix Table OA4.6, is consistent with higher returns to education for men, who are the ones moving into wage work. Together, these changes in incentives to invest in human capital could have shifted fertility decisions toward having fewer, better-educated children. Indeed, in Online Appendix Table OA4.5 we find that early allotment reduced children ever born per woman by 0.63 among non-Mapuche ($p < 0.05$); the estimate for Mapuche is smaller and not statistically significant (0.35), but becomes significant when focusing on non-migrant women (Online Appendix Table OA4.6).

is 6.3 points and not statistically significant, half the estimate for non-Mapuche households (12.6 points, also imprecise), and small when considered against the large transformation of land use and the move of Mapuche men into wage work reported above. The overall estimate (column 1) is larger, 15.4 points ($p < 0.05$), and significant. It exceeds either within-group effect because of the change in population composition. Early allotment shifts the population mix from Mapuche toward non-Mapuche households, who are far wealthier at baseline (a late-allotted mean of +10.2 versus the Mapuche's -19.2, a gap of 29 points on this scale).

This compositional reading underscores why following descendants, as we do in the next section, is essential. Restricting attention to who lived in reservations in 1992—as the census forces us to do—would lead one to conclude that allotment left the wealth of Mapuche households unchanged, even as it improved material conditions in reservations. But the census documents conditions for a different population than the people whose property rights were directly transformed through allotment. Descendants of the original shareholders may have left, and those who remain are mixed with newcomers whom the census cannot differentiate.

These census results are robust to the same battery of specification and placebo tests, displayed in Online Appendix Figures OA3.4, OA3.5, and OA3.6 for the working-age outcomes and Online Appendix Figure OA3.7 for the household wealth index. The one exception is the migrant share among Mapuche women, for which the placebo on localities outside reservations is as large as the main estimate. The pooled and men's estimates pass the test.

V. THE IMPACTS OF EARLY ALLOTMENT ON RESERVATIONS' DESCENDANTS

Early allotment kept descendants closer to their ancestral reservations and in rural areas. Because those areas are among Chile's poorest, it also left them more likely to be poor. Table 7 reports the estimates for our preferred specification ($K = 30$), which keeps the 1,202 surnames that are most informative about their reservation of origin, carried by 490,790 descendants. Columns 1–3 describe where descendants live and columns 4–5 whether they are poor. The court instrument is strong, with a first-stage F of at least 33 in every column. Columns 1–3 examine whether early allotment changed where descendants live. Migration could increase if allotment frees labor from the land and provides an asset to finance moves

Table 7—Descendants’ location and poverty

	Where descendants live			Poverty	
	% Left comuna (1)	% In Santiago (2)	% Rural address (3)	% Poor (4)	% Poor region (5)
Early allotment	−10.55 (5.47)* [88.36]	−13.41 (5.50)** [33.71]	9.80 (4.96)** [40.71]	7.36 (2.73)*** [67.15]	0.66 (0.91) [67.15]
First stage	0.40	0.40	0.40	0.39	0.35
First-stage F	35.6	35.6	35.7	34.3	32.9
Surnames	1,202	1,202	1,183	1,173	1,173
People	490,790	490,790	490,773	490,762	490,762
Reservations	1,323	1,323	1,322	1,322	1,322

Unit of analysis is a (surname, reservation) pair from the combined surname sample (paternal and maternal). Local linear regression with 2SLS (50-km triangular kernel) and predetermined reservation controls; the endogenous variable is the surname’s exposure to early allotment, the probability-weighted share of its reservations of origin allotted before 1979, instrumented by the reservation’s court. Observations are weighted by $W_K \times p_{sr} \times n_s$, where $W_K = \max\{0, 1 - H_s / \log K\}$ gives zero weight to surnames whose entropy across reservations is at least that of an even spread over K reservations, p_{sr} is the probability that surname s originated in reservation r , and n_s is the number of descendants behind the surname’s outcome. The cap is $K = 30$. Columns 1–2 locate descendants in the 2021 Electoral Register relative to their reservation’s municipality. Column 3 is the share whose electoral address is rural (Online Appendix OA1.4). Columns 4–5 report the poverty rate among descendants present in the Social Household Registry (RSH); descendants absent from the RSH are excluded. Column 5 adds as controls the shares of the surname’s descendants living in each region (Araucanía omitted). First stage is the effect of the court instrument on exposure in each column’s regression, with its reservation-clustered F statistic. Surnames and People count the surnames with positive weight in each regression and the registered descendants who carry them. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

toward locations with better labor-market conditions (De Janvry et al., 2015). It could also decrease, either because improved local conditions raise the returns to staying (Kennan and Walker, 2011), or because families who lost their land in the sales that followed allotment were left without the asset that would have financed a move. Our estimates indicate that allotment decreased mobility. Descendants of early-allotted reservations are 10.5 pp less likely to live outside the comuna (Chile’s smallest administrative unit) of their ancestors’ reservation ($p < 0.1$), 12% of the late-allotted mean, and 13.4 pp less likely to live in Santiago, Chile’s capital and largest labor market ($p < 0.05$), a decline of 40%. They are also 9.8 pp more likely to have a rural address ($p < 0.05$), 24% above the late-allotted mean.

Column 4 reports the share of descendants living in poor households, defined as the bottom 40% of the RSH socioeconomic distribution. Descendants of early-allotted reservations are 7.4 pp more likely to be poor ($p < 0.01$), 11% of the late-allotted mean. Column 5 adds

as controls the shares of each surname's descendants living in each region. The estimate falls to 0.7 pp (n.s.). Because where descendants live is itself shaped by allotment, this conditional estimate decomposes the poverty gap rather than identifying a separate effect. The decomposition is nonetheless informative. Within a region, descendants of early-allotted reservations are not detectably poorer than those of late-allotted reservations, and most of the gap is accounted for by their living in poorer regions. Had allotment improved descendants' standing within the places they live, the conditional estimate would be negative. Instead, early-allotted descendants remain concentrated in poorer, largely rural regions (columns 2–3). One explanation that is consistent with these patterns of mobility and poverty is that the historical dispossession described in Section I left allottees' families with less land to finance a move.

Online Appendix Table OA4.7 estimates the preferred specification separately by gender and by birth cohort. The poverty estimates are similar for men and women and for descendants born before and from 1979 onward. The estimates for leaving the comuna and for rural addresses are larger for men than for women, and the location estimates are larger for the older cohort, with overlapping confidence intervals. In every group the conditional poverty estimate is small and insignificant.

The results are robust to the standard battery of tests we run for the FGRD (Online Appendix Figure OA3.8). Every location and poverty estimate keeps its sign across specifications; the conditional poverty estimate stays close to zero, and the placebo along the provincial boundary yields estimates within a few percentage points of zero for every outcome. The figure further shows that the OLS estimates of the location and poverty effects are much closer to zero than the FGRD estimates, suggesting that reservations allotted earlier were selected on characteristics associated with more out-migration and less poverty among their descendants, biasing OLS toward zero. The gap between the OLS and FGRD estimates underscores the importance of addressing endogeneity when studying high-stakes reforms to property rights.

The estimates also hold under alternative specifications (Online Appendix Table OA4.8). The estimates keep their sign and size when we restrict to surnames matched to fewer than

five reservations (Panel A) or assign each surname to its single most likely reservation of origin (Panel B). Counting descendants absent from the RSH as non-poor lowers the poverty estimate modestly (Panel C); this is a reasonable bound, since RSH enrollment is a prerequisite for most means-tested benefits, which poor households have strong incentives to obtain. The results are also robust to the selection of the entropy cap K (Appendix Figure A1). The point estimates are stable across caps, and every estimate remains significant at the 10% level for caps up to $K = 100$, except for rural addresses at $K = 3$ and $K = 100$. A cap of 100 sits well above the largest entropy observed in the sample, which corresponds to a surname spread evenly across 85 reservations.

In sum, early allotment kept descendants close to the local economies it transformed, in places that remain relatively poor, without making them better off than the descendants of late-allotted reservations who live in the same places.

VI. Limitations

Although our study provides a rich characterization of the long-term impacts of land allotment on the Mapuche people and their ancestral territories, several important limitations deserve explicit recognition. First, although we are able to explore a rich set of outcomes describing material conditions (e.g., poverty, control over land and wealth), we emphasize that this overlooks many important concerns that motivate Indigenous opposition to allotment. Specifically, we do not assess the impacts of allotment on traditional language use, cultural practices, sense of belonging, and subjective well-being. Documenting how allotment has transformed Indigenous peoples' capacity for self-determination and ability to sustain their culture constitutes a fundamental avenue for future research.

Second, we acknowledge that our study is a rich description of a highly specific context and, as a result, extrapolation of our results to other settings should be done with caution. For example, shortly before allotment, Mapuche had been forcibly relocated to reservations in ways that are likely to have disrupted the traditional institutions responsible for managing collectively held lands. This colonial disruption of collective property rights institutions is unfortunately common in the history of many Indigenous peoples. Communities who have been able to sustain effective institutions for the management of common pool resources

may experience fewer efficiency gains from privatization. Similarly, Chilean allotment was implemented within a legal setting that, with the exception of a few years in the 1940s, sought to restrict the transfer of lands to non-Mapuche. In contexts without these protections, it is possible that Indigenous communities would experience even greater dispossession and associated territorial losses.

VII. Conclusion

In this paper we address a classic question in development economics: how do individual property rights transform local economies, and who benefits from these transformations? The allotment of Mapuche reservations in Chile provides a credible, decades-long source of exogenous variation in the timing of allotment, allowing us to measure its long-term consequences. We track these consequences both within allotted territories and among the descendants of property rights recipients. These two perspectives provide a comprehensive assessment of both the efficiency gains unlocked by private property and the distributional costs that privatization can have for marginalized communities.

The reservation-level database we assembled for this study allows us to document in detail how allotment transformed local economies. Individual property rights closed the commons, reducing livestock density and shifting land use from grasslands toward cropland on good soils and native forest on erodible ones. Erosion fell, leaving a lasting improvement in the share of arable land. Allotment also transformed labor markets as Mapuche men moved out of agriculture and into wage and non-agricultural work. Finally, allotment shifted the population composition toward non-Mapuche households, increasing the average household's wealth score.

These transformations, however, did not improve socioeconomic conditions for the descendants of early-allotted reservations. Consistent with prior studies from North America, we uncover a causal link between allotment and the loss of Indigenous control over reservation land (Akee, 2020; Aragón and Kessler, 2020). Early-allotted reservations hold 11.9 to 24.7 pp less Mapuche-owned land, a loss already visible by 1974 and unchanged through 2024. Following descendants shows that these land transfers did not unlock migration to locations with more economic opportunities. Present-day descendants of early-allotted reservations

are more likely to reside in the comuna of their ancestors' reservation, at a rural address, and outside of Santiago. As a result, they are also 7.4 pp more likely to be poor.

Our findings offer a cautionary lesson for the recurring debate over whether to open Indigenous lands to the market: without strong and consistent protections against dispossession, the development of Indigenous lands need not improve the lives of the people to whom those lands were granted. The allotment of Mapuche reservations did yield efficiency improvements, yet these gains did not benefit the reservations' descendants. In our context, this divergence in economic conditions between territories and people is plausibly due to a lapse in protections against dispossession. Given that many Indigenous communities are exposed to dispossession, judging the effects of allotment will require following not only changes in Indigenous lands but also the people who received them.

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Conflict of interest

The authors declare no conflict of interest.

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DATA APPENDIX

This appendix details the surname-based linkage of present-day descendants to the reservations where their ancestors were settled (Sections A.A1–A.A2). The construction of reservation-level land holdings from the 2024 parcel cadaster and the 1974 declaration, the aggregation of the 1992 census to reservation boundaries, and the construction of placebo reservations outside titled land are described in Online Appendix OA1.

A1. *Founding-lineage surnames from the settlement records*

The starting point is the *Título de Merced* (TDM) issued to each reservation at settlement, which lists the families settled together with each registrant’s name and relationship to other registrants; gender is not recorded in the title and is inferred from the given name. We recover these records from the digitized AGAI archive and process them in three steps.

Separating given names from surnames. Each registrant’s full name is tokenized, and tokens that appear in a civil-registry list of given names are discarded; the remaining tokens are taken as surnames, with Spanish particles (*de, la, los, ...*) attached to the surname they precede. Children were often recorded without a surname, so we impute the paternal surname along the kinship chain: a missing surname is filled with that of the nearest male ancestor reachable by following the recorded parent links.

Identifying founding settlers. From each title we collect the surnames of the reservation’s original settlers. These founding surnames are the basis for the *descender* classification used in the within-Mapuche ownership decomposition (Section IV.A): a descender is a present-day person whose paternal or maternal surname is a founding surname of the reservation, and an *outsider* is one who carries none.

Founding-surname counts. For each reservation we tally the surnames carried by its male founders, after dropping single-character and non-alphabetic tokens. The result is a count $f_{s,r}$: the number of founding male settlers of reservation r carrying surname s . These reservation-level counts are the bridge between a modern surname and the reservations in which it may have originated.

A2. *Linking descendants to reservations*

The Electoral Register. We consolidate the sixteen regional files of Chile’s 2021 Electoral Register, which records every adult in the country with their full name, municipality of registration, and national tax identifier (*RUT*). The register lists each person’s paternal surname (sn_1), maternal surname (sn_2), and given names, in that order. Particles such as *de la* are grouped with the surname that follows, so that compound surnames are kept whole.

Screening founding surnames. We keep the founding surnames whose spelling in the titles appears in the Mapuche Data Project (MDP) list of 8,624 Mapuche surnames ([Mapuche Data Project, n.d.](#)), which discards the few Spanish surnames in the titles. The surname–reservation probabilities and the link to the Electoral Register use the surnames as spelled in the titles. Titles sometimes render a surname in an older orthography than the one its bearers use today. To gauge how many descendants the exact link forgoes for this reason, we harmonize each title spelling to the register of allottees, the individuals who later received parcels (CONADI’s confidential *adjudicatarios* register, shared under our cooperation agreement and typed up decades after the titles in more standardized spellings). A title spelling that appears in that register is kept as is. For the remainder we search the allottees of the same reservation for a phonetic match, reducing each surname to a code that collapses the common Spanish/Mapudungun spelling variants (vowels; $c/qu/k$; hu/gu ; $ll/\tilde{n}/ng$; n/m ; v/b ; z/s) and accepting a match when the codes lie within a Levenshtein distance of one and the raw spellings within three. Register adults carrying a title spelling are 99.3% of those carrying either a title or a harmonized spelling, so the exact link forgoes 4,838 adults. We do not link on harmonized spellings because some phonetic matches are likely distinct lineages with similar names, and because the allottee register records who remained in each reservation at allotment, a date that differs by treatment. The reservation-linked surnames

capture 64.1% of the 1,030,824 adults in the Electoral Register who hold at least one MDP surname. The MDP-surname adults we do not link carry surnames that appear in no title.

Surname-reservation probabilities. For each founding surname s , as spelled in the titles, we turn the founding counts into a distribution over reservations,

$$p_{s,r} = \frac{f_{s,r}}{\sum_{r'} f_{s,r'}}, \quad \sum_r p_{s,r} = 1,$$

the share of surname s 's historical founders settled in reservation r . A surname found in a single title has $p_{s,r} = 1$ there, and a surname common to many titles spreads its mass across them. These probabilities describe the founders. Today's descendants may be distributed differently across reservations because of later differences in fertility and survival, and some present-day bearers of a surname do not descend from any reservation. Both discrepancies matter more for widespread surnames, which the informativeness weight below down-weights.

Informativeness weight. How much a surname reveals about its bearer's origin depends on how concentrated $p_{s,\cdot}$ is. We summarize it with the entropy-capped weight of Section III,

$$W_K = \max \left\{ 0, 1 - \frac{H_s}{\ln K} \right\}, \quad H_s = - \sum_r p_{s,r} \ln p_{s,r}.$$

Since $\ln K$ is the entropy of a surname spread evenly over K reservations, $W_K = 1$ for a surname unique to one reservation and $W_K = 0$ for one at least as dispersed as an even spread over K reservations. Every surname receives positive weight once K exceeds $e^{H_{\max}} \approx 85$, the cap at which the most widespread surname of the sample reaches zero weight, and $W_K \rightarrow 1$ for every surname as $K \rightarrow \infty$.

Exposure to early allotment. For each surname we compute its exposure $\bar{D}_s = \sum_r p_{s,r} D_r$, where D_r indicates that reservation r was allotted before 1979. The sum runs over all of the surname's reservations of origin with a known allotment year, including those beyond the 50-km bandwidth, because descendants from every reservation of origin contribute to the surname's outcome. The probabilities are rescaled to sum to one over these reservations.

Outcomes and the unit of observation. Because we do not have access to the full RSH,

the linkage was performed on our behalf under a confidential data-use agreement, linking each adult who carries a surname in the MDP list to the RSH by RUT. Poverty is an indicator for placing in the bottom 40% of the RSH socioeconomic score. Descendants absent from the RSH are treated as missing in the main specification and counted as non-poor in a robustness check (Online Appendix Table OA4.8). Place of residence comes from the comuna of registration in the Electoral Register. *Left comuna* is the share of a surname's registered descendants who live outside the comuna where reservation r lies, so it varies across the surname's reservations of origin. *In Santiago* is the share who live in the Santiago Metropolitan Region. *Rural address* is the share whose address of registration is rural, classified from the address text as described in Online Appendix OA1.4. For each surname we also compute the shares of its bearers living in each region. A descendant enters the sample once for each Mapuche surname matched to a reservation (through sn_1 , through sn_2 , or both), so the unit of observation is a (surname, reservation) pair, weighted by $W_K \times p_{s,r} \times n_s$, where n_s is the number of descendants behind the surname's outcome. For poverty, n_s counts the surname's descendants present in the RSH; for the location outcomes, it counts all of its registered descendants.

A3. Estimating effects on descendants

This section sets out the model behind the descendant specification, shows by simulation that it recovers the effect of early allotment, and explains how we choose K .

Setup. Let D_r indicate early allotment of reservation r , and let y_s be the average outcome of the descendants who carry surname s . Suppose the outcome of a descendant of reservation r is $\beta_0 + \beta_1 D_r + f(x_r) + u$, where $f(x_r)$ is a smooth function of the reservation's location. If a share $p_{s,r}$ of the surname's descendants originates in reservation r , averaging over them gives

$$y_s = \beta_0 + \beta_1 \bar{D}_s + \sum_r p_{s,r} f(x_r) + u_s, \quad \bar{D}_s = \sum_r p_{s,r} D_r.$$

The surname's outcome responds to its exposure $\bar{D}_s$, the probability-weighted treatment of its reservations of origin.

Why we do not collapse to surnames. A natural alternative would collapse the data to

one observation per surname, averaging the reservation-level variables with the weights $p_{s,r}$. Controls that enter linearly can be averaged in this way, so a specification with a global polynomial in longitude and latitude could be estimated on surname averages. Our design, however, is local. Each observation is weighted by a kernel in its reservation's distance to the boundary, reservations beyond the bandwidth are excluded, and the slope in distance differs on each side of the boundary, with separate intercepts for each region along the boundary. A surname's reservations of origin typically lie at different distances from the boundary, and sometimes on different sides or beyond the bandwidth, so there is no single distance at which to evaluate the kernel, and an average location may fall close to the boundary even when none of the surname's reservations does. We therefore keep each observation at its own reservation.

Estimation. We stack the data into (surname, reservation) pairs weighted by $p_{s,r}$, so that every observation sits at a reservation with its own location, and estimate a fuzzy discontinuity design with $\bar{D}_s$ as the endogenous variable, instrumented by the Victoria indicator of reservation r . The instrument, the running variable, and the controls are those of the paired reservation, so identification comes from the discontinuity at the boundary. Because the outcome depends on allotment only through $\bar{D}_s$, the ratio of the reduced form to the first stage recovers β_1 . In our sample the court raises the exposure of surnames by 0.39 with $K = 30$ (first-stage $F = 34$).

Simulation. We verify that this estimator recovers the effect of allotment in a simulated version of our setting on the real line. Each simulation places 300 reservations at locations x_r drawn uniformly on $[-1, 1]$, with the boundary at zero, and assigns the instrument $Z_r = \mathbf{1}\{x_r < 0\}$. Allotment is fuzzy. With probability 0.7 a reservation's allotment status equals Z_r , and otherwise it is drawn as a fair coin, so the first stage is 0.7. We then draw 3,000 surnames. Each surname originates in a number of reservations drawn uniformly between one and an upper bound of 1, 3, 10, or 30, and the probabilities $p_{s,r}$ across them are drawn from a flat Dirichlet distribution. In the *scattered* design these reservations are drawn at random along the line, so a surname's reservations typically lie on both sides of the boundary. In the *neighboring* design they form a block of adjacent reservations, so they mostly lie on the same

side.¹² The surname’s outcome follows the model above, $y_s = 0.5 + \bar{D}_s + 0.8 \sum_r p_{s,r} x_r + u_s$ with $u_s \sim N(0, 0.2^2)$, so the true effect is one and location affects the outcome through every reservation of origin. We stack the surnames into (surname, reservation) pairs weighted by $p_{s,r}$ and estimate the effect of $\bar{D}_s$, instrumented by Z_r , controlling for distance to the boundary with a separate slope on each side. Table A1 reports the mean and standard deviation of the estimate over 200 simulations. The estimator is centered on one in every design, and its dispersion grows only when surnames spread over many reservations on both sides of the boundary. The simulation abstracts from kernel weighting, controls, and errors in the probabilities $p_{s,r}$, which we address with the weight W_K .

Table A1—Recovering the effect on descendants: simulation

Reservations of origin per surname	Reservations of origin	
	Scattered	Neighboring
1	1.00 (0.02)	1.00 (0.02)
1 to 3	1.00 (0.03)	1.00 (0.02)
1 to 10	0.99 (0.05)	1.00 (0.02)
1 to 30	1.00 (0.07)	0.99 (0.02)

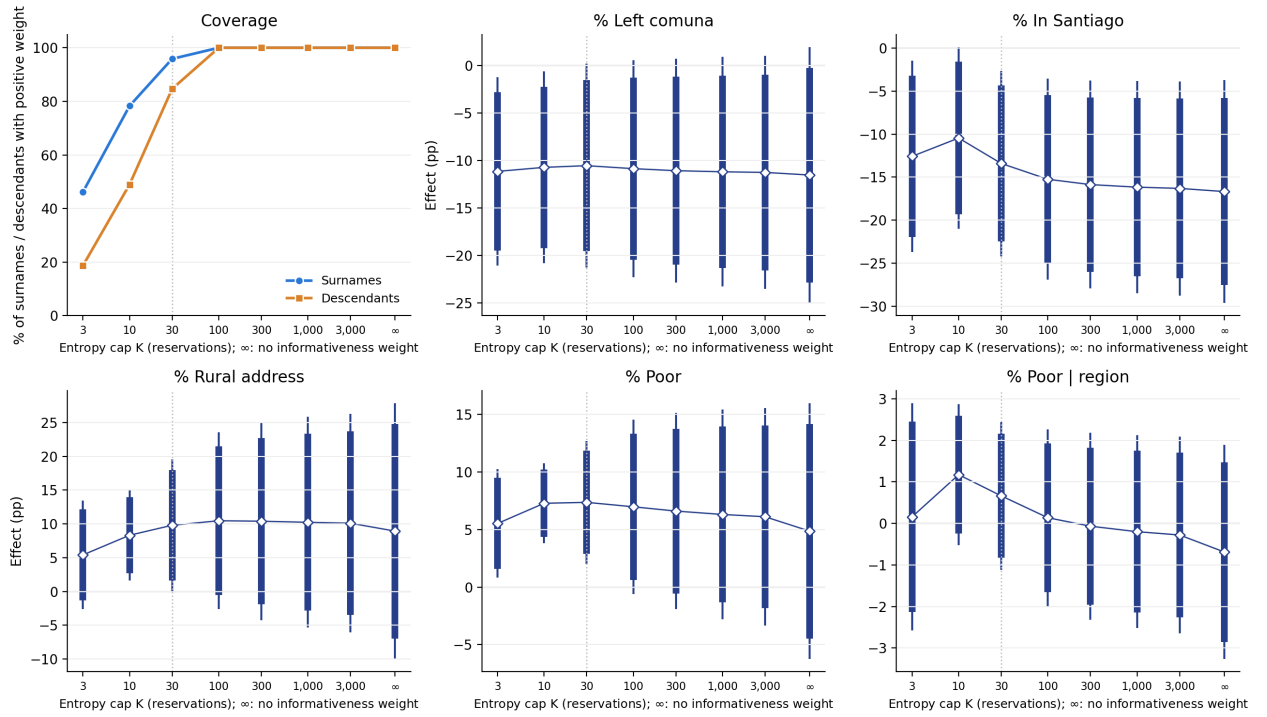
Mean (standard deviation) of the fuzzy-RD estimate over 200 simulations with true effect equal to one, for 3,000 surnames and 300 reservations on a line with the boundary at zero (Appendix A.A3). Rows give the upper bound on the number of reservations of origin per surname. A surname’s reservations of origin are drawn at random (*Scattered*) or as a block of adjacent reservations (*Neighboring*).

Choosing K . The weight W_K down-weights widespread surnames, for which the probabilities $p_{s,r}$ describe today’s descendants least accurately (Appendix A.A2). Figure A1 reports the share of the sample that receives positive weight and the estimates over a log-spaced grid of caps from $K = 3$ to $K = 3,000$, and for $K \rightarrow \infty$, where $W_K = 1$ and observations are weighted by $p_{s,r} \times n_s$ alone. Caps above $e^{H_{\max}} \approx 85$ give positive weight to every surname. The poverty estimate lies between 5.5 and 7.4 pp for every cap from $K = 3$ to $K = 100$, significant at the 5% level up to $K = 30$ and at the 10% level up to $K = 100$. The estimates for leaving the comuna and for poverty conditional on region are stable over the same range. The estimates for rural addresses and for residence in Santiago grow in magnitude as K

¹²We sort reservations by location, draw a starting position at random, and take the block of consecutive reservations centered on it, truncated at the ends of the line. With 300 reservations on $[-1, 1]$, a block of 30 spans about a tenth of the line, so it crosses the boundary only when its center falls close to zero.

risers and more widespread lineages enter the sample. Removing the informativeness weight altogether leaves the point estimates close to those at $K = 30$, at -11.5 pp for leaving the comuna, -16.7 pp for residence in Santiago, 8.9 pp for rural addresses and 4.9 pp for poverty, with wider confidence intervals. With the estimates stable in K , we choose the cap by coverage. $K = 30$ retains 1,202 of the 1,254 surnames and 490,790 of the 579,706 descendants while still giving zero weight to the most widespread lineages; larger caps admit all of them at the cost of precision.

Figure A1. : Descendant estimates by entropy cap K



The first panel shows the share of surnames, and of the descendants behind them, that receive positive weight at each value of K . In the remaining panels, each marker is the fuzzy-RD estimate (percentage points) with its 90% (thick) and 95% (thin) Conley confidence intervals, using weights $W_K \times p_{s,r} \times n_s$ for the value of K on the horizontal axis (log scale). ∞ sets $W_K = 1$ so that observations are weighted by $p_{s,r} \times n_s$ alone. Specification as in Table 7. The dotted line marks the preferred $K = 30$.

Online Appendix

This Online Appendix contains additional data-construction details (Section [OA1](#)), a description of the regions along the judicial boundary (Section [OA2](#)), the robustness figures for every main table (Section [OA3](#)), additional tables (Section [OA4](#)), and the legal sources cited in the text (Section [OA5](#)).

DATA CONSTRUCTION DETAILS

1. *Aggregating the 1992 census to reservations*

The 1992 Population Census is georeferenced at the rural enumeration *sector*, whose boundaries we digitized from the Census Bureau’s 1992 field maps. To carry census outcomes to reservations we overlay reservation polygons on sector polygons and weight each sector by the share of its area lying within a reservation,

$$w_{r,j} = \frac{\text{area}(\text{reservation } r \cap \text{sector } j)}{\text{area}(\text{sector } j)},$$

so that a reservation-level mean is the area-weighted average of sector outcomes,

$$\bar{y}_r = \frac{\sum_j w_{r,j} S_{y,j}}{\sum_j w_{r,j} n_{y,j}},$$

where $S_{y,j}$ and $n_{y,j}$ are the sum of outcome y and the count of valid respondents in sector j . This apportions a sector’s residents to overlapping reservations in proportion to land area, under the assumption of uniform population density within a sector.

Over the working-age population (ages 15–64) we compute the share in wage employment, average years of schooling (mapped from the census education level and grade), the share who can read, and average age, together with the Mapuche population share; each is formed for all residents and separately by self-reported ethnicity (Mapuche if the respondent reports Mapuche culture) and gender. At the household level we use the census socioeconomic score, an asset- and housing-based index that the Census Bureau computes and distributes with the microdata ([Ramos et al., 2004](#)); we assign each household the ethnicity of its head and standardize the score across study-area households to mean zero and standard deviation 100.

2. *Placebo reservations outside titled land*

Several of our outcomes—1999 land cover, realized erosion, observed transaction prices, and the 1992 census variables—are observed throughout the study area, not only within reservations. For these we construct a set of *placebo reservations*: areas outside titled land that were never subject to allotment. Estimating the same boundary discontinuity on these

units probes whether the judicial boundary is associated with outcomes for reasons unrelated to allotment; a discontinuity there would signal that the boundary coincides with some other geographic or administrative break, while its absence supports the identifying assumption that only allotment changes discontinuously across it.

We build the placebo units from the digitized 1992 census geography. Working from the georeferenced household points, we classify a census *sector* as lying outside reservations when every one of its households falls outside all reservation polygons; sectors with any household inside a reservation are discarded, so the placebo areas never overlap titled land. The outside sectors are then dissolved to the census locality (*entidad*)—a grouping of neighboring sectors—so that each placebo unit is of broadly comparable spatial scale to a reservation.

Each placebo locality is then placed in the same geography used for reservations: we assign it to the Victoria or Temuco jurisdiction, measure its centroid’s distance to the historical judicial boundary (the running variable), attach the region-along-the-boundary fixed effect, and apply the prohibition-zone sample screen. Because these localities were never allotted, the placebo test has no allotment first stage: we estimate a reduced-form discontinuity, regressing each off-reservation outcome on the Victoria-side indicator with the same triangular kernel, 50-km bandwidth, and Conley standard errors (50-km cutoff) as the main specification. The resulting estimates appear as the *Placebo reservations* specification in the robustness figures.

3. Constructing land holdings in 1974 and 2024

Both snapshots—the 2024 parcel cadaster and the 1974 Indigenous Agricultural Declaration—are turned into reservation-level area shares by holder type through a common pipeline: place each holding within a reservation, parse its holder’s name, classify the holder, and aggregate. We describe the steps for the 2024 parcels first and then for the 1974 declaration, which reuses the same classifier.

Placing parcels in reservations. We overlay the 2024 SII parcels on the reservation polygons. A parcel is assigned to a reservation when more than 10% of the parcel falls within the boundary, or when it covers more than 5% of the reservation’s area. Within each reservation we then dissolve parcels to one geometry per owner, unioning an owner’s holdings and

absorbing any overlap among them. Where distinct owners’ geometries still overlap—only a few reservations, covering under 0.01% of accounted area—we divide the overlapping area equally among them. Area carrying no parcel is recorded as a residual. A reservation’s *coverage* is the share of its area carrying a parcel, and reservations below the 10% threshold of Section II are dropped.

Parsing owner names. Ownership records list owners as free-text strings (for example “SUR-NAME1 SURNAME2 GIVEN MIDDLE”) that mix surnames and given names in either order and at unknown positions. Records whose RUT is found in the Electoral Register (the 2021 register, complemented by its 2011 wave for owners absent from it) inherit the register’s standardized ordering; for the rest we infer the split. We first score each token’s similarity to a civil-registry list of given names and, separately, to a list of surnames: an exact match scores one, and otherwise the score declines with the Levenshtein distance to the closest entry. We then enumerate the plausible layouts of the string—one or two surnames placed at the front or the back, with the remaining tokens as given names—and choose the layout that maximizes the total similarity across all tokens (equivalently, minimizes the combination’s total normalized edit distance), so that the name and surname lists are fit jointly rather than token by token. The match proceeds in two stages: the surname list is first restricted to the surnames already recorded in the same reservation—which exploits the clustering of related families and guards against spurious matches—and tokens left unresolved are then scored against a global surname list.

Classifying owners. Each owner is assigned to one of the table’s categories by matching surnames, in order, against: (i) the reservation’s own founding surnames (Section A.A1), which marks a Mapuche *descender*; (ii) the founding surnames of reservations within 5 km; and (iii) the MDP Mapuche surname list—a match in (ii) or (iii) but not (i) marks a Mapuche *outsider*. An individual whose surnames match none of these is classified as non-Mapuche. Legal entities are identified from the owner type and name keywords and split into Indigenous communities, forestry firms, and other institutions. Owner gender is taken from the tax record where present and otherwise imputed from the given name by civil-registry majority.

Aggregating to reservations. Each parcel contributes its area to its owner’s category; di-

viding by reservation area gives the shares reported in Table 3—the five holder types and, within Mapuche individuals, the descender and outsider shares, which Online Appendix Table OA4.1 splits by sex.

The 1974 declaration. The declaration is tabular rather than spatial: each row is a household, with its head’s name and the land the household reports using inside the reservation, in hectares. Household heads’ names are already split into surnames and given names, so we skip the parsing step, classify each head’s surname through the same hierarchy, and assign gender from the given name. We then sum hectares by category and divide by reservation area. Because it is a household survey of individuals, the declaration records no institutional land, so the forestry and other-institution categories are absent; the not-surveyed residual—one minus surveyed hectares over reservation area—completes the partition and is left unclipped, turning mildly negative for the few reservations whose declared hectares exceed the digitized polygon.

4. *Classifying electoral addresses as rural*

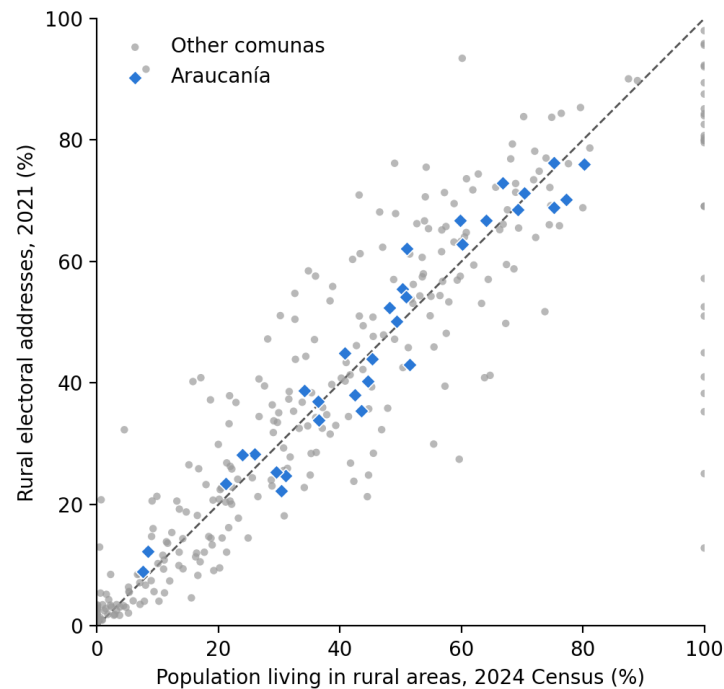
The Electoral Register records each adult's address of registration as free text. We classify each address as rural or urban with a keyword rule applied to the upper-cased address. Addresses with an urban marker, such as *población*, *villa*, *pasaje*, *departamento*, *block*, or *avenida*, are urban. Addresses with a rural marker and no urban marker are rural. Rural markers include *sector*, *lugar*, *comunidad*, *fundo*, *parcela*, *hijuela*, *lote*, *kilómetro*, and *camino*. Addresses with neither marker are classified by whether they carry a house number. A street name followed by a number is urban, while a bare place name, or an address without a number (*sin número*, *S/N*, or a number made only of zeros), is rural. Blank addresses, 2.5% of the register, are treated as missing. For each surname we compute the share of its registered bearers with a rural address, counting each person under both of their surnames as in the other descendant outcomes.

Figure OA1.1 compares, for each of the 344 comunas, the share of registered adults with a rural address to the share of the population living in rural areas in the 2024 Census. The two measures have a correlation of 0.86 and differ by 9 percentage points on average. Most of the discrepancy comes from small comunas, which the Census classifies as entirely rural because it defines as urban only settlements above a population threshold, while many of their addresses carry a street and number. Among the 295 comunas with at least 6,000 inhabitants the correlation is 0.94, and among the comunas of Araucanía, where most descendants live, it is 0.97, with an average difference of 4 percentage points.

5. *Cases of the Courts of Indians*

The Archivo General de Asuntos Indígenas of CONADI holds the case files of the Courts of Indians. CONADI digitized an index of these files from the cover page of each one, which records the filing date, the case number, the plaintiff and defendant, the subject of the case (*materia*), and the community involved, named after the cacique of the reservation's title. The index exists for the files of the Temuco court and of the Nueva Imperial court; while the latter was closed, between 1931 and 1961, its cases were heard by the Temuco court, so we pool both as the Temuco court's caseload. The index contains 7,492 cases, of which 4,514 were filed between 1930 and 1939. Coverage is uneven after 1942, so we use it to describe

Figure OA1.1. : Rural electoral addresses and rural population by comuna



Each marker is a comuna. The vertical axis is the share of adults in the 2021 Electoral Register whose address is classified as rural; the horizontal axis is the share of the population living in rural areas in the 2024 Census. Comunas in Araucanía are shown as blue diamonds. The dashed line is the 45-degree line.

the 1930s only. No index exists for the Victoria court.

The subject of each case is free text with many spellings. We classify a case as an authorization to sell when its subject contains an authorization term (*autorización* or its abbreviation) together with a sale term (*enajenar* in any of its spellings, *vender*, or *venta*), and as a debt case when it contains *liquidación de crédito*, *crédito*, *deuda*, or *cobro*, excluding the liquidation of estates. By these rules, authorizations to sell are 5% and debt cases 39% of the cases filed in the 1930s.

We link each authorization to a reservation by matching its community name to the names of the reservations under the Temuco court's jurisdiction. Both names are stripped of accents and punctuation, and the match uses the token-sort ratio, which compares the two strings after sorting their words, so that a name written surname-first in one source and given-name-first in the other still matches. We accept matches with a ratio of at least 90 out of 100. This links 59% of the authorizations to a reservation; the remainder have no community

recorded (46 cases) or a name that matches no reservation (55 cases). An authorization counts as a sale of shares when it was filed before the reservation's allotment year, which is the case for 90% of the linked authorizations. The share of reservations with at least one such authorization, reported in Section III, is computed among the reservations on the Temuco side within 50 km of the judicial boundary that were still unallotted in 1940, and it is a lower bound, since unlinked authorizations are not attributed to any reservation.

REGIONS ALONG THE BOUNDARY

From west to east, most of Chile has three distinctive landmarks: the coastal mountains (in our study region, the Nahuelbuta mountains), the central valley, and the Andes mountains. Geographically, it is natural to define five regions based on them: the western slope of the coastal mountains, the eastern slope of the coastal mountains, the central valley, the western slope of the Andes, and the high Andes.

The region we study has an atypical central mountain range that divides the central valley in two: the Humpilñielol mountains. This division carries historical importance: the two sides were inhabited by two rival groups that played an important role in Mapuche history before forced settlement—the Abajino Mapuche confederation on the western side and the Arribano Mapuche confederation on the eastern side (Bengoa, 2000). We therefore define six regions: the western slope of the Nahuelbuta mountains, from the Pacific Ocean to the highest peaks of the Nahuelbuta range; the eastern slope of the Nahuelbuta mountains, from there to the line formed, north to south, by the Purén, Lumaco, and Cholchol rivers and a straight line south from its confluence with the Imperial river; the western central valley, from that line to the highest peaks of the central range; the eastern central valley, from that line to the start of the western slope of the Andes; the western slope of the Andes, from there to the high peaks of the Andes; and the high Andes, from there to the border with Argentina.

For the empirical analysis we drop the western slope of the Andes and the high Andes from the sample, as they contain only a few isolated reservations. Figure OA2.1 shows all reservations within fifty kilometers of the judicial boundary, the regions described above, and a hillshade gray background representing elevation.

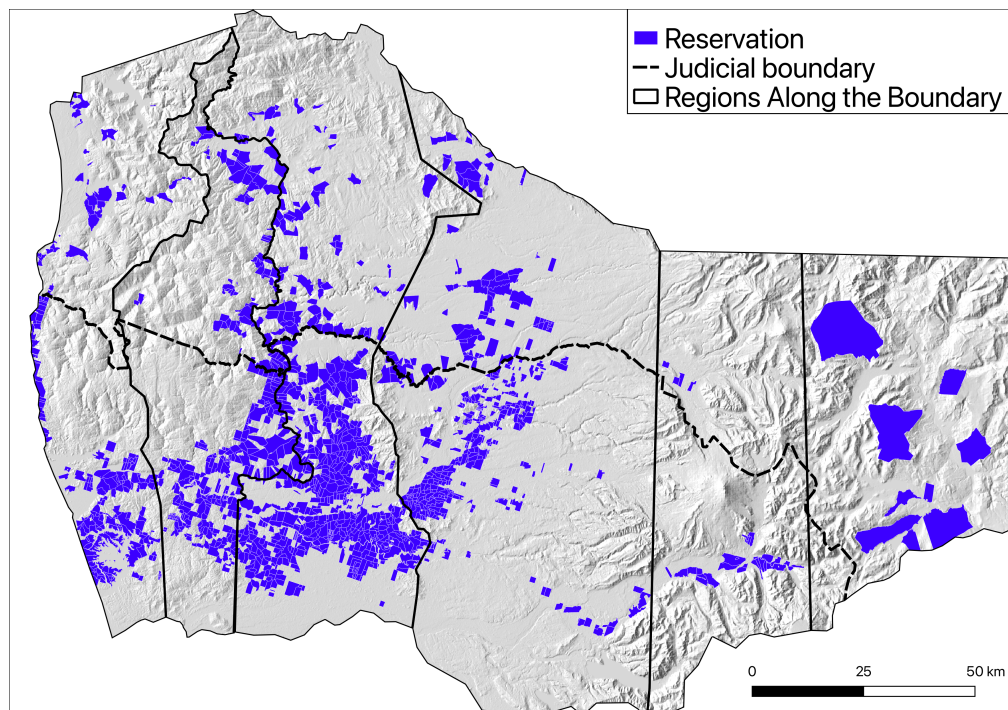
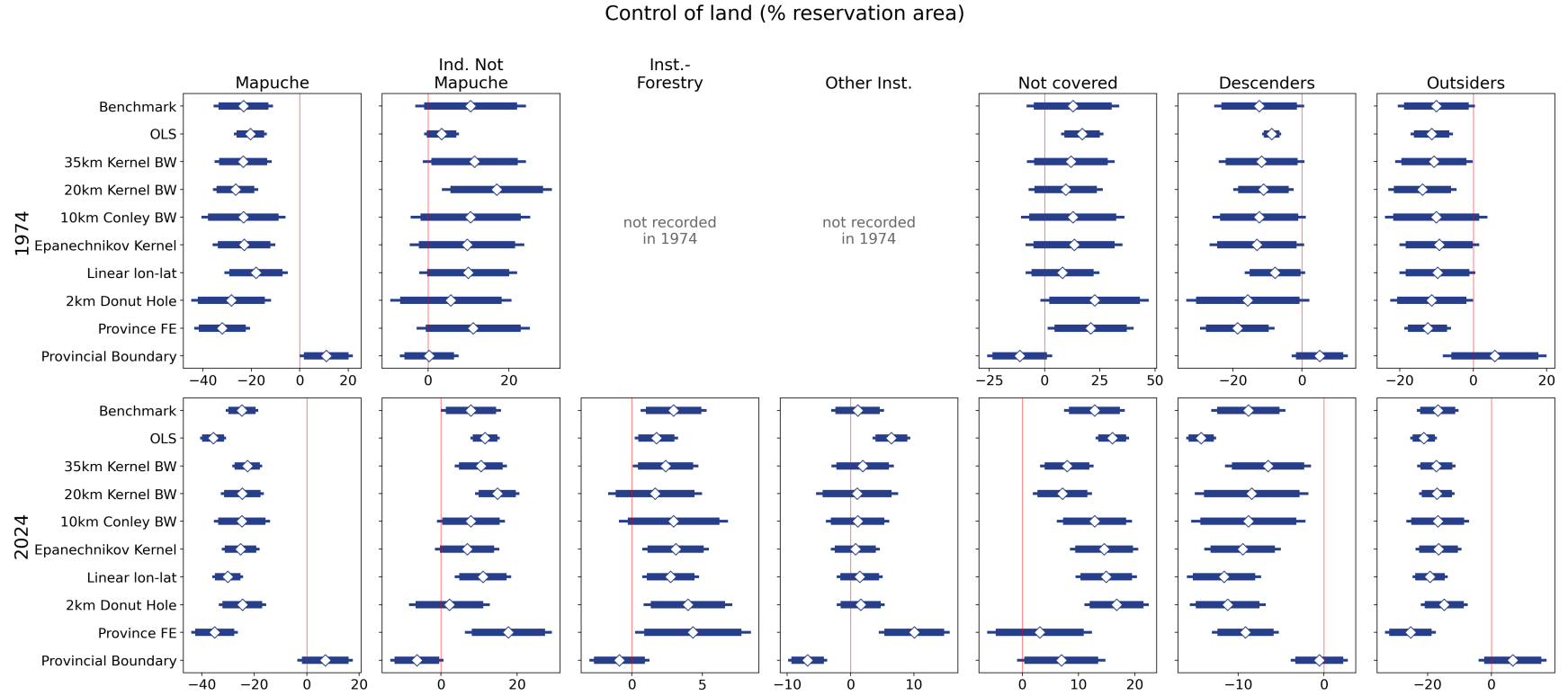


Figure OA2.1. : Regions along the judicial boundary

ROBUSTNESS

This appendix establishes the robustness of the main estimates to alternative specifications and a set of placebo tests. For each main result we re-estimate under alternative bandwidths (35 and 20 km), a 10-km Conley cutoff, an Epanechnikov kernel, a first-order polynomial in longitude and latitude in place of distance to the boundary, a 2-km donut hole around the boundary, the addition of province fixed effects, and OLS in place of 2SLS. We also report two placebo tests—a reduced-form discontinuity along the provincial boundary where it does not coincide with the historical judicial boundary, and the same design estimated for census entities outside reservations when data are available.

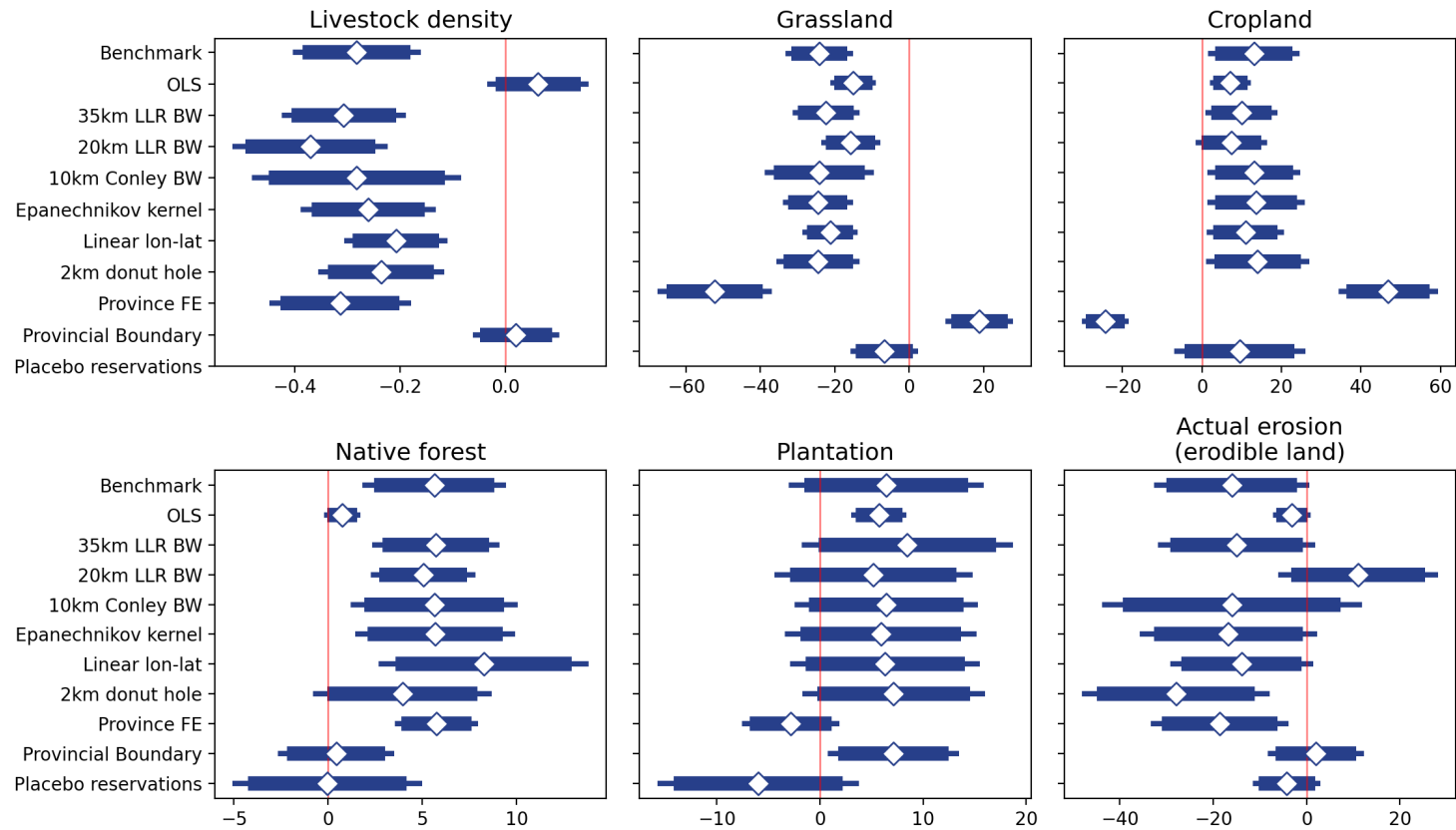
Figure OA3.1. : Robustness of control-of-land estimates (Table 3)



Each diamond is the 2SLS estimate of early allotment on a category's share of reservation area under an alternative specification; thick and thin bars are 90% and 95% Conley intervals (50-km). Columns follow Table 3: the five holder types, then the descender and outsider shares among Mapuche individuals. Top row, 1974 (Indigenous Agricultural Declaration, which records no institutional land); bottom row, 2024 (SII parcels).

Province FE adds the Victoria-province control; *Provincial Boundary* is a placebo along the provincial boundary off the judicial one.

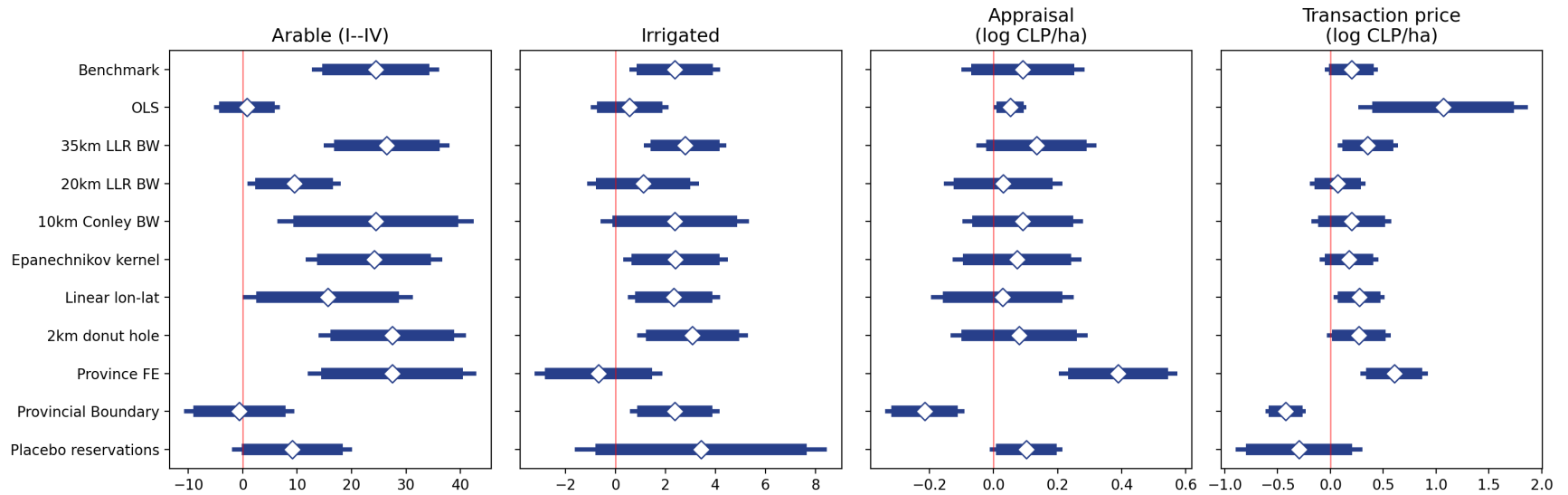
Figure OA3.2. : Robustness of the Table 4 estimates



Each diamond is the discontinuity estimate under an alternative specification; thick and thin bars are 90% and 95% Conley intervals (50-km).

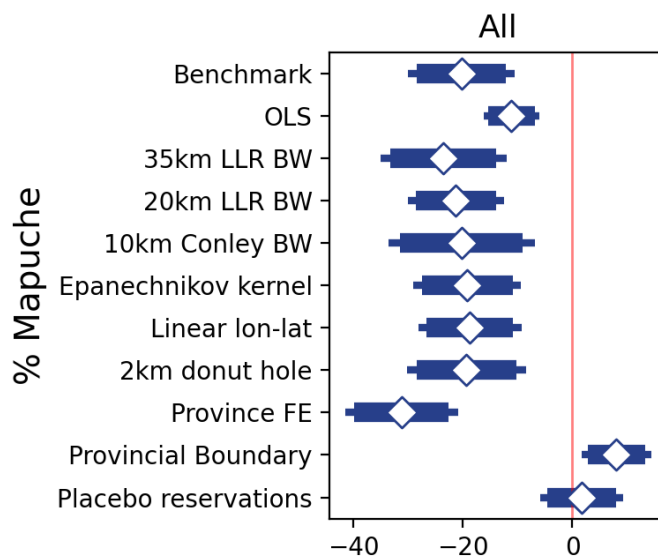
Panels are 1974 livestock density (livestock units per hectare), the four 1999 land-cover shares (percentage points), and the eroded share of erosion-prone land (percentage points). Land cover and actual erosion are also observed off-reservation, so they carry a second placebo on census entities outside reservations (*Placebo reservations*); 1974 livestock density has no off-reservation counterpart, so that row is blank. See Figure OA3.1 for the remaining specifications.

Figure OA3.3. : Robustness of the Table 5 estimates



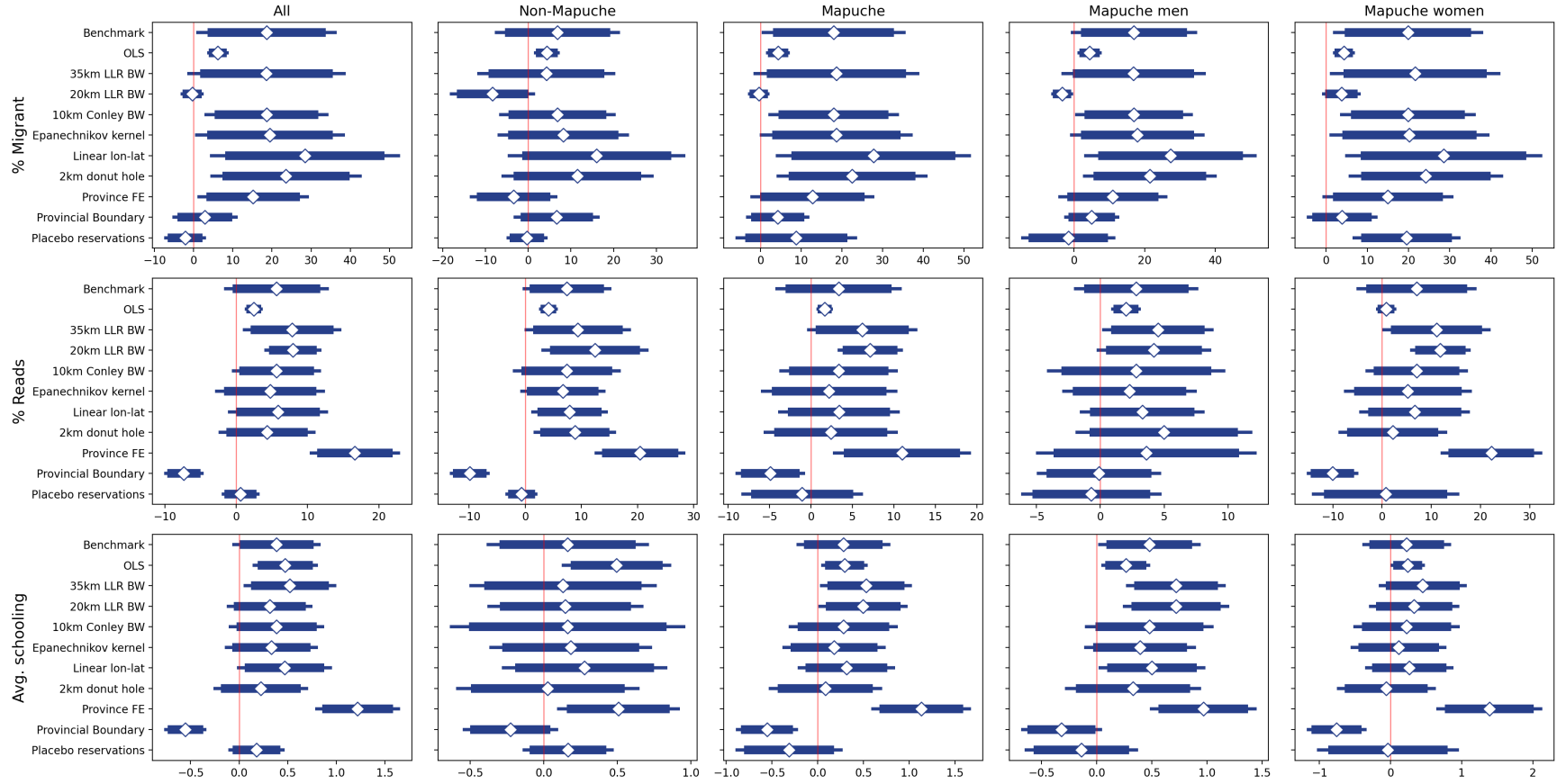
Each diamond is the discontinuity estimate under an alternative specification; thick and thin bars are 90% and 95% Conley intervals (50-km). Panels are the arable (SII classes I–IV) and irrigated land shares (percentage points), the log appraised value per hectare, and the log median transaction price per hectare (CLP/ha, units with at least five sales). All four are also observed off the reservations, so each carries the second placebo on census entities outside reservations (*Placebo reservations*): arable, irrigated, and appraisal from the same points-in-polygon measures applied to the entidad polygons, the price from off-reservation transactions. See Figure OA3.1 for the remaining specifications.

Figure OA3.4. : Robustness of the % Mapuche estimate (Table 6, Panel A)



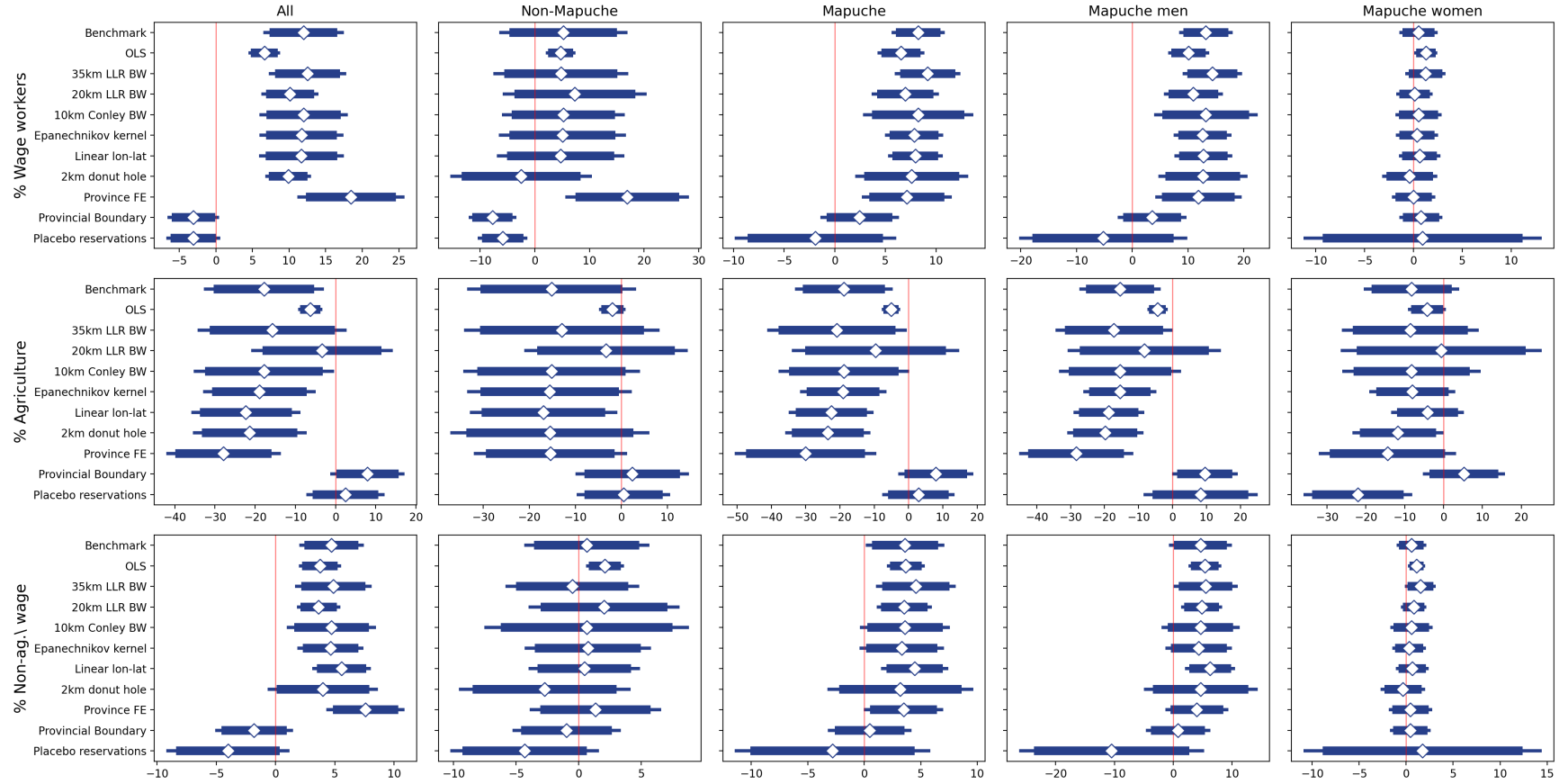
Each diamond is the discontinuity estimate on the share of working-age (15–64) residents who self-identify as Mapuche, under an alternative specification; thick and thin bars are 90% and 95% Conley intervals (50-km). The share is defined for all residents only. A second placebo estimates the same discontinuity on census entities outside reservations (*Placebo reservations*). See Figure OA3.1 for the remaining specifications.

Figure OA3.5. : Robustness of labor-market estimates: migration and human capital (Table 6, Panel A)



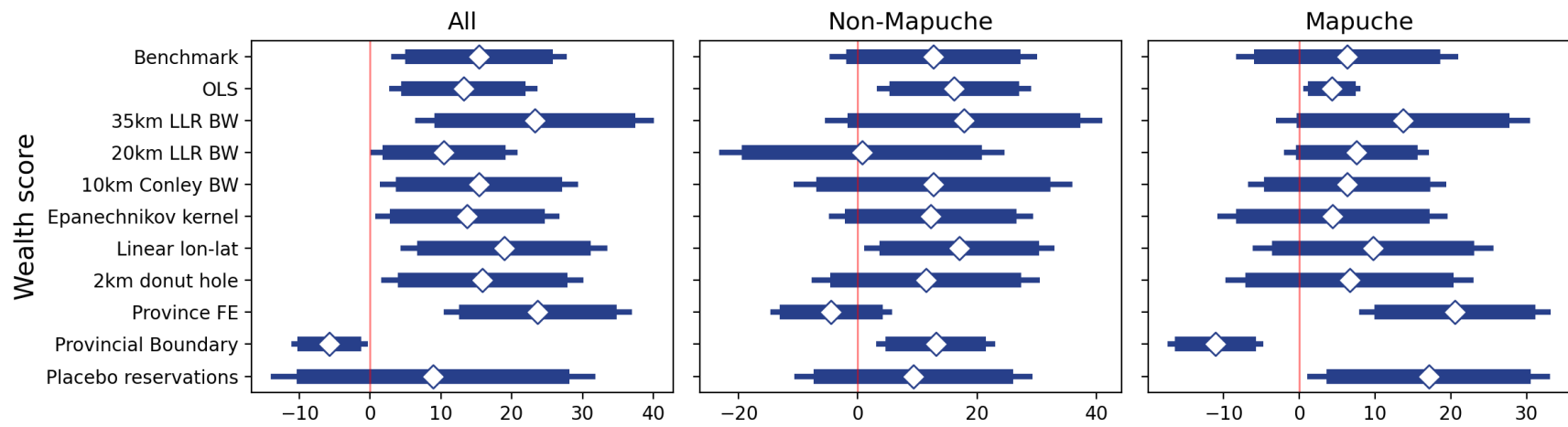
Each diamond is the discontinuity estimate under an alternative specification; thick and thin bars are 90% and 95% Conley intervals (50-km). Rows are the migration and human-capital Panel A outcomes (% with mother born elsewhere, % who read, schooling); columns are all residents, non-Mapuche, and Mapuche (all, men, women). A second placebo (*Placebo reservations*) repeats it off-reservation. See Figure OA3.1 for the remaining specifications.

Figure OA3.6. : Robustness of labor-market estimates: labor market (Table 6, Panel A)



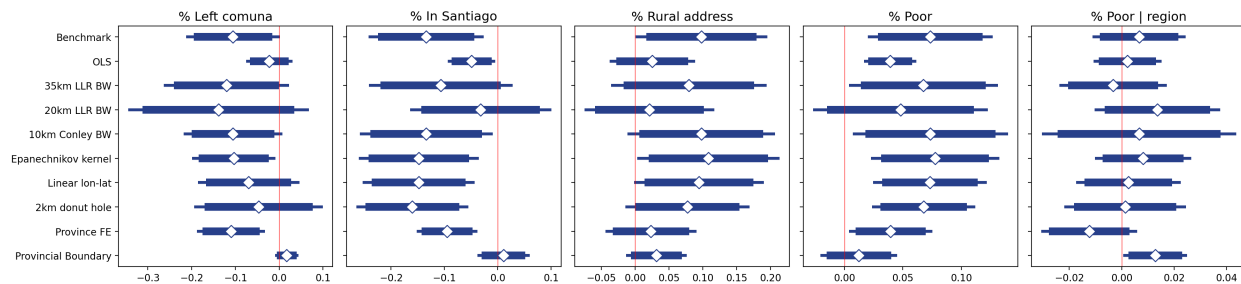
Each diamond is the discontinuity estimate under an alternative specification; thick and thin bars are 90% and 95% Conley intervals (50-km). Rows are the labor-market Panel A outcomes (% wage workers, % in agriculture, % in non-ag. wage work); columns are all residents, non-Mapuche, and Mapuche (all, men, women). A second placebo (*Placebo reservations*) repeats it off-reservation. See Figure OA3.1 for the remaining specifications.

Figure OA3.7. : Robustness of household-wealth estimate (Table 6, Panel B)



The 2SLS estimate of early allotment on the household wealth index, for all households, non-Mapuche households, and Mapuche households. See Figures OA3.1 and OA3.5 for the specifications, placebo conventions, and confidence-interval definitions.

Figure OA3.8. : Robustness of descendant outcomes



Each diamond is the discontinuity estimate under an alternative specification; thick and thin bars are 90% and 95% Conley intervals (50-km). Panels are the five outcomes of Table 7, under its weights ($K = 30$). Estimates are in fractions rather than percentage points. *Benchmark* matches Table 7; *Province FE* adds the Victoria-province control; *Provincial Boundary* is a placebo along the provincial boundary off the judicial one.

ADDITIONAL TABLES

Table OA4.1—Control of land: within-Mapuche decomposition by gender

	Descender		Outsider	
	Men (1)	Women (2)	Men (3)	Women (4)
1974	−12.68 (6.41)** [20.76]	0.28 (1.34) [2.77]	−15.48 (5.18)*** [28.55]	5.45 (1.84)*** [5.38]
2024	−5.40 (1.56)*** [18.54]	−3.42 (1.72)** [10.58]	−10.36 (2.19)*** [26.08]	−6.46 (2.90)** [20.55]

Unit of analysis is a reservation. The within-Mapuche columns of Table 3 split by gender: each cell is the share of reservation area held by individual Mapuche owners of the given ancestry and gender. *Descender* = paternal or maternal surname among the reservation's original settlers; *Outsider* = neither. Sex is taken from the registry (2024) or inferred from the given name. The 1974 declaration records land under the household head, most often a man, so the 1974 split mainly reflects who headed the household. Same sample, waves, and specification as Table 3: 2SLS estimates of Early Allotment, Conley standard errors (50-km) in parentheses, late-allotted-side means in brackets. *p<0.1, **p<0.05, ***p<0.01.

Table OA4.2—Control of land: within-Mapuche decomposition as a share of individual-Mapuche area

	Descender		Outsider	
	Men (1)	Women (2)	Men (3)	Women (4)
1974	−13.87 (7.83)* [35.84]	2.59 (2.51) [5.00]	−4.93 (7.65) [48.76]	17.23 (4.02)*** [9.74]
2024	−1.67 (2.44) [23.73]	−0.44 (2.88) [13.84]	1.39 (3.58) [34.50]	1.23 (4.86) [27.66]

Unit of analysis is a reservation. The within-Mapuche decomposition by ancestry and gender (Table OA4.1), here expressed as a share of the reservation's total individual-Mapuche area rather than of total reservation area. *Desc.* = paternal or maternal surname among the reservation's original settlers; *Out.* = neither; reservations with no individual-Mapuche area are dropped. Same sample, waves, and specification as Table 3: 2SLS estimates of Early Allotment, Conley standard errors (50-km) in parentheses, late-allotted-side means in brackets. *p<0.1, **p<0.05, ***p<0.01.

Table OA4.3—Control of land: shares of appraised value (2024)

	Owner type (% reservation value)					Within-Mapuche (%)	
	Mapuche	Non-Mapuche			Not covered	Descen- ders	Out- siders
		Ind.	Inst.- Forestry	Other Inst.			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
2024	−28.19 (2.99)*** [74.16]	12.09 (4.29)*** [11.19]	2.86 (1.21)** [0.04]	1.43 (1.88) [1.63]	11.81 (2.97)*** [12.98]	−8.09 (3.03)*** [27.55]	−18.83 (3.61)*** [46.12]

Unit of analysis is a reservation. The Table 3 decomposition expressed as a share of the reservation's total fiscal-appraisal *value* rather than its area, for 2024 (SII). Each cell is a 2SLS estimate of Early Allotment on the group's share of total reservation value, with the standard error in parentheses (Conley, 50-km) and the late-allotted-side mean in brackets. Total reservation value is the appraised value of identified parcels plus a coverage-robust residual: the uncovered area valued at the reservation's points-in-polygon appraisal density (the hectare-weighted mean appraisal per hectare of the agricultural parcels whose reference point falls inside the reservation). *Not covered* (col 5) is the uncovered value residual, so columns 1–5 partition total reservation value and sum to 100. There is no 1974 wave because the INDAP Indigenous Agricultural Declaration carries no appraisal. Columns and sample match the 2024 row of Table 3. *p<0.1, **p<0.05, ***p<0.01.

Table OA4.4—Land cover (1999) by soil erodibility

Dep.var	1999 Land Cover (%)			
	Grassland (1)	Cropland (2)	Native forest (3)	Plantation (4)
<i>Panel A: Erodible (high-erodibility) land</i>				
Early Allotment	−21.01 (6.41) ^{***} [63.52]	3.50 (1.32) ^{***} [0.68]	10.77 (3.55) ^{***} [16.00]	5.65 (6.28) [10.61]
Reservations	1,346	1,346	1,346	1,346
<i>Panel B: Non-erodible (low-erodibility) land</i>				
Early Allotment	−21.80 (6.69) ^{***} [82.76]	13.77 (6.77) ^{**} [1.96]	3.86 (1.11) ^{***} [6.04]	4.35 (3.20) [3.30]
Reservations	1,298	1,298	1,298	1,298

Unit of analysis is a reservation. Same specification, controls, and sample as the land-cover columns of Table 4. Columns report 1999 land cover shares from the Graesser classification (forest split into native forest and plantation using MapBiomass data), estimated separately on erodible (high-erodibility, Panel A) and non-erodible (low-erodibility, Panel B) land within reservations. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. *p<0.1, **p<0.05, ***p<0.01.

Table OA4.5—Additional census characteristics (1992 Census)

	Non-		Mapuche		
	All (1)	Mapuche (2)	All (3)	Men (4)	Women (5)
Avg. age	0.31 (0.49) [35.67]	−2.39 (0.95)** [35.33]	1.26 (1.09) [35.69]	0.23 (0.82) [35.38]	1.73 (1.63) [36.29]
Avg. children	−0.38 (0.21)* [3.23]	−0.63 (0.28)** [3.16]	−0.35 (0.22) [3.24]		
Reservations	1,480	1,440	1,462	1,452	1,453
Individuals	58,841	11,494	47,347	25,105	22,242

Unit of analysis is a reservation. Same specification as Table 3. Avg. children is the average number of children ever born among women aged 14 and older. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. *p<0.1, **p<0.05, ***p<0.01.

Table OA4.6—Labor markets and human capital among non-migrants (1992 Census)

	Non-		Mapuche		
	All	Mapuche	All	Men	Women
	(1)	(2)	(3)	(4)	(5)
<i>Panel A: Working-age individuals (15–64), non-migrants</i>					
% Reads	5.39 (3.77) [81.78]	8.81 (3.61)** [84.83]	3.66 (3.74) [81.23]	3.84 (2.35) [85.88]	7.32 (6.32) [75.30]
Avg. schooling	0.41 (0.25)* [5.14]	0.58 (0.26)** [5.54]	0.30 (0.26) [5.07]	0.54 (0.23)** [5.41]	0.18 (0.32) [4.63]
Avg. children	−0.52 (0.20)*** [3.27]	−1.25 (0.25)*** [3.25]	−0.43 (0.19)** [3.29]		
% Wage workers	12.80 (3.28)*** [10.01]	6.57 (6.23) [14.68]	9.78 (1.51)*** [9.44]	15.37 (2.57)*** [14.45]	0.38 (0.99) [3.44]
% Agriculture	−18.10 (6.16)*** [75.64]	−17.49 (8.78)** [67.76]	−19.18 (6.73)*** [76.52]	−16.48 (5.54)*** [80.51]	−6.65 (6.65) [21.06]
Reservations	1,254	1,183	1,238	1,225	1,224
Individuals	40,784	6,781	34,002	18,476	15,526
<i>Panel B: Households (non-migrant head)</i>					
Wealth score	14.44 (6.43)** [−17.66]	13.76 (9.26) [−1.53]	6.54 (7.24) [−21.24]		
Reservations	1,252	1,080	1,221		
Households	15,963	2,409	13,553		

Unit of analysis is a reservation. Same outcomes and specification as Panels A and B of Table 6, but recomputed on individuals who are *not* long-run migrants—those whose mother was born in the same municipality—and, for the household wealth index, on households whose head is not a long-run migrant. Avg. children is the average number of children ever born among non-migrant women aged 14 and older. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. *p<0.1, **p<0.05, ***p<0.01.

Table OA4.7—Descendants' location and poverty by gender and by birth cohort

	By gender		By birth cohort	
	Men	Women	Born < 1979	Born ≥ 1979
	(1)	(2)	(3)	(4)
<i>Panel A. Where descendants live</i>				
% Left comuna	−12.29 (5.21)** [87.72]	−8.52 (5.66) [89.23]	−11.47 (5.07)** [87.78]	−9.01 (5.77) [89.50]
% In Santiago	−13.64 (5.72)** [32.05]	−13.24 (5.45)** [35.95]	−13.81 (4.89)** [34.55]	−10.82 (6.13)* [36.66]
% Rural address	12.69 (5.18)** [43.19]	7.63 (5.14) [37.79]	11.73 (4.46)** [42.97]	7.79 (5.76) [36.33]
<i>Panel B. Poverty</i>				
% Poor	7.26 (3.39)** [62.39]	7.19 (2.39)** [70.97]	6.54 (3.41)* [71.72]	7.97 (1.95)** [60.59]
% Poor region of residence	−0.18 (1.50) [62.39]	1.32 (1.14) [70.97]	−0.38 (1.46) [71.72]	1.38 (1.23) [60.59]

Same specification as Table 7 ($K = 30$), estimated separately for men and women and for descendants born before and from 1979. Gender comes from the Electoral Register. Birth cohort comes from the RSH birth date for % Poor, % Left comuna, and % In Santiago. For % Rural address, which uses all registered descendants, it is predicted from the national ID number (RUT), which is assigned in chronological order (an OLS of birth year on RUT has $R^2 \approx 0.95$). The row % Poor | region of residence controls for the regional shares of all of the surname's descendants. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table OA4.8—Descendants: robustness checks

	Where descendants live			Poverty	
	% Left comuna (1)	% In Santiago (2)	% Rural address (3)	% Poor (4)	% Poor region (5)
<i>Panel A. Surnames in fewer than five reservations</i>					
Early allotment	−10.85 (5.19)** [87.61]	−10.38 (5.25)** [32.40]	8.18 (3.37)** [41.35]	7.62 (1.72)*** [68.57]	1.58 (0.90)* [68.57]
Reservations	773	773	764	762	762
<i>Panel B. Top reservation per surname</i>					
Early allotment	−8.71 (5.15)* [86.62]	−11.69 (4.21)*** [31.62]	10.10 (3.88)*** [41.38]	8.79 (1.61)*** [68.34]	2.03 (0.94)** [68.34]
Reservations	714	714	708	704	704
<i>Panel C. Descendants absent from the RSH counted as non-poor</i>					
Early allotment				5.95 (2.44)** [55.06]	−0.30 (1.05) [55.06]
Reservations				1,323	1,323

Robustness checks for Table 7; same specification, columns and weights ($K = 30$). **Panel A** keeps only surnames matched to fewer than five reservations. **Panel B** keeps each surname's single most likely reservation of origin. **Panel C** counts descendants absent from the Social Household Registry as non-poor. Standard errors in parentheses (Conley, 50-km bandwidth); control-group means in brackets. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

LEGAL SOURCES

The laws and decrees cited in Sections I and II are listed below in chronological order, with their official titles where the instrument carries one. All are acts of the Republic of Chile.

- **Law of 4 December 1866.** *Fundación de poblaciones en el territorio de los indígenas.* Establishes the legal framework for property rights in Mapuche territory and promises collective titles.
- **Law of 15 July 1869.** *Creación de los nuevos departamentos de Angol, Lebu e Imperial.* Used, with the 1874 law, to reconstruct the prohibition zone.
- **Law of 4 August 1874.** *Enajenación de terrenos situados en territorio araucano.* Establishes the prohibition zone in which settlers could not acquire land directly from Mapuche.
- **Decree with Force of Law 8582 (1928).** *Decreto que fija la nueva división territorial de la República.* Source of the 1928–1975 internal administrative boundaries.
- **Law 4802 (1930).** Creates the Courts of Indians and sets the allotment procedure.
- **Regulation of Law 4802 (1930).** *Reglamento de la Ley 4802.* Lists the administrative units under each court’s jurisdiction and the sale-authorization safeguard.
- **Decree 4111 (1931).** *Texto definitivo de la ley sobre división de comunidades, liquidación de créditos y radicación de indígenas.* Consolidated text of the allotment law.
- **Decree 4499 (1931).** Staffing of the Courts of Indians.
- **Decree 1961 (1952).** Closure of the Victoria court and transfer of its jurisdiction to Temuco.
- **Law 14511 (1961).** *Establece los juzgados de letras de indios que señala y fija normas sobre división de comunidades, liquidación de créditos y radicación de indígenas.*
- **Law 17729 (1972).** *Establece normas sobre indígenas y tierras de indígenas; trans-*

forma la Dirección de Asuntos Indígenas en Instituto de Desarrollo Indígena. Dissolves the Courts of Indians.

- **Decree Law 2568 (1979).** *Modifica Ley 17729, sobre protección de indígenas, y radica funciones del Instituto de Desarrollo Indígena en el Instituto de Desarrollo Agropecuario.* Orders the allotment of the remaining reservations and imposes a twenty-year moratorium on transfers of newly allotted parcels.
- **Law 19253 (1993).** *Establece normas sobre protección, fomento y desarrollo de los indígenas, y crea la Corporación Nacional de Desarrollo Indígena.* The Indigenous Law; restricts sales of reservation land to non-Mapuche.