Land Reform and Contemporary Distributional Beliefs: Evidence from Peru*

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Abstract

We examine whether large-scale land redistribution durably alters citizens' perceptions of their position in the national income distribution. Exploiting quasi-random variation in Peru's 1969–1980 agrarian reform, we find that districts experiencing greater redistribution exhibit systematically larger underestimation of their national economic position four decades later. Using household survey data from 2012–2019, we instrument district-level reform intensity with membership in core agrarian-zone departments that hosted reform administrative offices. A one percentage-point increase in redistributed area raises average underestimation by 0.134 deciles. We demonstrate that this effect operates through persistent changes in local economic structures: reformed areas exhibit lower contemporary inequality and reduced perceived income stability, creating compressed local reference groups that anchor distributional judgments. These findings reveal that transformative asset redistribution can durably reshape social cognition about inequality, with important implications for understanding how historical policies influence contemporary political preferences and the demand for redistribution.

Keywords: Land reform, income distribution, biased perceptions
JEL Codes: D13, Q15

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1 Introduction

Across countries, the politics of redistribution increasingly hinges on citizens' beliefs about inequality and their position in the income distribution, not merely on objective measures. Economics and political science research documents systematic misperceptions: people often place themselves toward the distribution's center rather than at their actual position, anchoring judgments in local reference groups rather than national benchmarks (Karadja et al., 2017; Hvidberg et al., 2023*a*; Hauser and Norton, 2017). Cross-national evidence reveals substantial variation in these misperceptions across institutional contexts, with political elites sometimes exploiting perceptual biases to shape redistributive preferences (Mijs, 2021; Bobzien, 2020; Gimpelson and Treisman, 2018; Bublitz, 2022). Information experiments reveal that correcting beliefs about income or wealth distribution produces only partial preference updates, shaped by identity and fairness considerations (Kuziemko et al., 2015; Fehr et al., 2022; Trump, 2018, 2020, 2023). These findings challenge the canonical Meltzer-Richard model, which predicts redistribution based on objective inequality, suggesting instead that perceived rather than observed inequality drives redistributive preferences (Meltzer and Richard, 1981; Choi, 2019; Iacono and Ranaldi, 2021; Windsteiger, 2022). The mapping from inequality to policy thus operates through perceived inequality and perceived rank, not objective measures alone (Gimpelson and Treisman, 2018; Iacono and Ranaldi, 2021).

Redistribution encompasses not only fiscal instruments—taxes and transfers—but also asset redistribution, particularly land reform. Land redistribution targets a foundational asset structuring production, wealth accumulation, and local status hierarchies. Historical evidence spans diverse institutional contexts with heterogeneous consequences: postwar East Asia implemented sweeping redistributions; India experimented with land ceilings and tenancy reforms; Latin American countries pursued extensive twentieth-century programs. Cross-national evidence documents hundreds of reforms, linking their enactment to regime transitions and conflict dynamics, underscoring land's centrality to redistribution and political development (Bhattacharya et al., 2019). Contemporary relevance persists as governments continue revisiting rural development and land markets, signaling that asset-side redistribution remains politically salient alongside debates about income inequality and growth.

Latin America provides an ideal laboratory for examining how citizens form redistributive preferences. The region exhibits persistent high inequality alongside volatile macroeconomic cycles, while political actors routinely deploy highly visible distributional policies. This environment exposes citizens to salient economic signals—neighbors losing employment, shifts in local consumption patterns, uneven public goods provision—that can influence inequality beliefs more rapidly than economic fundamentals alone. Micro-level evidence supports this mechanism: Cruces et al. (2013) demonstrate that Buenos Aires residents systematically underestimate their income rank, with corrective information producing only partial preference updates, highlighting how reference groups generate middle-class bias in redistributive attitudes. These perceptual dynamics gain contemporary relevance as governments across the region revive "second-wave" agrarian reform initiatives and expand rural development programs, reflecting land ownership's persistent role in shaping economic opportunity, social identity, and political mobilization. Similar debates over land redistribution currently unfold in Brazil, South Africa, and other developing countries, underscoring the global policy relevance of understanding how asset redistribution affects political beliefs.

Peru provides a particularly informative case to study the belief channel of redistribution. Between 1969 and 1980, the country implemented one of Latin America's most extensive agrarian reforms, expropriating and redistributing roughly half of all agricultural land while reorganizing production through cooperatives, creating sharp spatial variation in exposure (Albertus, 2020; Albertus and Popescu, 2020). The reform produced mixed long-term effects: while reducing land concentration, it also worsened human capital accumulation as increased land availability induced children to work rather than attend school, creating complex legacies across affected regions (Albertus et al., 2020). Four decades later, this historical intervention offers a unique opportunity to examine whether major asset redistribution creates lasting effects on how citizens perceive their economic position. The question gains urgency given Peru's persistent inequality, pandemic-era economic shocks, and renewed policy attention to agrarian issues through the official "Second Agrarian Reform" framework launched in 2021 (Ministerio de Desarrollo Agrario y Riego, Gobierno del Perú, 2021)).

We bridge two literatures that rarely intersect: work on distributional perceptions and comparative studies of land-reform legacies. We address whether Peru's historical land redistribution created durable effects on beliefs about income rank, examining how asset redistribution might reshape the local anchors informing status judgments. We analyze individual-level " bias," defined as the difference between perceived and objective national income deciles, where negative values indicate underestimation of one's true position. Our empirical strategy exploits the quasi-random assignment of districts to central departments within agrarian zones—administrative boundaries established for agricultural research purposes before the reform, creating plausibly exogenous variation in exposure intensity. We leverage this administrative geography through an instrumental variables approach, using districts' membership in reform-era central departments to identify causal effects. We apply this identification to Peruvian household surveys spanning 2012–2019, making novel use of the survey's previously unexplored perception module to construct our bias measure.

We find that greater historical exposure to land redistribution generates stronger negative bias today—more pronounced underestimation of income position. A one-percentage-point increase in redistributed land share increases the magnitude of underestimation by 0.134 deciles. Two otherwise identical districts differing by 10 percentage points in reform intensity exhibit, on average, 1.34 deciles greater underestimation. Given a sample mean bias of -2.44 deciles, this represents a 55 percent increase in the absolute magnitude of underestimation, indicating that historically affected areas display substantially stronger pessimism about relative economic status.

Historical asset redistribution may depress perceived decades later through anchoring mechanisms that our findings help illuminate within broader perceptions research. The causal sequence operates as follows: land reform fundamentally reshapes local economic structures through multiple channels—cooperative legacies, property-rights instability, reduced human capital accumulation as children were induced to work rather than attend school (Albertus et al., 2020), and persistent rural disadvantage. These structural changes create local economies that systematically lag national development, altering the local anchors that inform status judgments and producing underestimation even as individuals' objective national may improve over time. Individuals infer position from local reference groups; in segregated or assortative networks, these comparison sets compress perceived dispersion and pull self-placement toward the center, generating a middle-class bias (Cruces et al., 2013; Hvidberg et al., 2023*b*). However, Peru exhibits a modified pattern: while the poorest 20% overestimate their position, most of the distribution systematically underestimates, suggesting local anchoring in environments that remain below national averages. Our evidence supports this mechanism: contemporary inequality (measured by district-level Gini coefficients) remains lower in historically treated areas despite larger underestimation bias. This pattern suggests individuals conflate historical asset redistribution with current income distributions, while identity-based or midpoint anchoring maintains self-placement near perceived local centers despite absolute income gains (Karadja et al., 2017; Trump, 2018).

Our contributions are twofold. First, we provide novel evidence that transformative historical asset redistribution can leave durable distortions in beliefs about economic rank, extending perceptions research beyond fiscal redistribution to asset-based policies. This finding connects to broader theories of institutional persistence, suggesting that major redistributive interventions can create lasting changes in social cognition alongside their more commonly studied economic and political legacies (Robinson and Acemoglu, 2012). Second, we bridge perceptions and land reform literature, demonstrating how historical asset policies shape contemporary political economy through belief channels rather than only through direct economic effects.

The remainder of this paper proceeds as follows. Section 2 describes Peru's agrarian reform and contemporary perceptions, establishing the empirical setting. Section 3 presents our data sources and instrumental variables identification strategy. Section 4 reports main results of land reform on bias, followed by mechanism tests examining inequality, perceived stability, and labor formality channels, as well as, heterogeneous effects across birth cohorts and reference groups. Section 5 concludes.

2 Setting

2.1 Historical Setting: From Class Warfare to Revolutionary Land Reform

By the mid-twentieth century, Peru maintained one of Latin America's most concentrated land distributions, with deep colonial roots that perpetuated class divisions and social tensions. The 1961 Agricultural Census documented an extreme concentration: 0.4% of agricultural holdings exceeded 500 hectares yet controlled 76% of total agricultural land, while 83% of holdings comprised fewer than five hectares and represented only 5.5% of available land (Caballero, 1984). This structure confined wealth and power to a narrow landowning elite while marginalizing the vast majority of rural workers, many of indigenous descent, who labored under precarious conditions reminiscent of colonial servitude. Large estates (haciendas) operated through systems of debt peonage and labor coercion that trapped workers in cycles of poverty and dependence. Landowners exercised quasi-feudal authority over rural populations, controlling not only economic opportunities but also access to education, healthcare, and political participation.

This extreme inequality generated profound class antagonisms that exploded into revolutionary movements throughout the 1950s and early 1960s. Peru witnessed escalating rural mobilization as peasant communities and agricultural workers challenged the existing order through land invasions, particularly in the southern highlands where indigenous communities reclaimed territories they considered ancestral. The emergence of guerrilla movements like the Movimiento de Izquierda Revolucionaria (MIR) and the Ejército de Liberación Nacional (ELN) transformed rural unrest into organized insurgency. These groups established footholds in remote highland areas and coordinated with peasant organizations to challenge landowner authority directly, introducing revolutionary language into land struggles with slogans like "la tierra es para quien la trabaja" (the land belongs to those who work it) becoming rallying cries for dispossessed communities.

The first legislative response came with the 1963 *Ley de Bases para la Reforma Agraria* (Land Reform under President Fernando Belaúnde Terry's administration. However, this initial reform proved largely symbolic, targeting primarily areas of guerrilla influence in an attempt to undermine insurgent movements rather than addressing structural inequities comprehensively. The law's limited scope and weak implementation mechanisms failed to satisfy popular demands for fundamental change, while landowner resistance prevented meaningful redistribution.

The political landscape transformed dramatically following General Juan Velasco Alvarado's military coup on October 3, 1968. Unlike typical Latin American military interventions that protected elite interests, Velasco's "Revolutionary Government of the Armed Forces" embraced radical restructuring of Peru's economic and social order. The military leadership, influenced by nationalist and socialist ideologies, viewed Peru's concentrated land ownership as incompatible with national development and social justice. Decree Law 17716, promulgated on June 24, 1969, launched one of the twentieth century's most ambitious agrarian reforms. The law established maximum landholding limits of 150 hectares per parcel (with variations based on land quality and location), requiring immediate expropriation of properties exceeding these thresholds along with their capital assets, machinery, and livestock.

The military government framed land redistribution in explicitly class-based terms, rejecting gradual reform in favor of comprehensive transformation. Military leaders argued that Peru's development required dismantling the landowning oligarchy's economic base and political power. Expropriated lands transferred primarily to agricultural workers organized into production cooperatives, marking a sharp departure from individual land distribution models prevalent elsewhere in Latin America. The cooperative model reflected the military government's vision of collective ownership and management as alternatives to both capitalist exploitation and socialist collectivization.

The reform's scope proved unprecedented in Latin American history. The transformation dismantled the traditional hacienda system entirely, replacing it with a complex array of cooperatives, peasant communities, and reformed enterprises that fundamentally altered rural Peru's social and economic structure. This massive redistribution created the conditions for long-term changes in local economic

structures, social hierarchies, and potentially the reference groups through which individuals assess their economic position—effects that may persist in contemporary distributional perceptions.

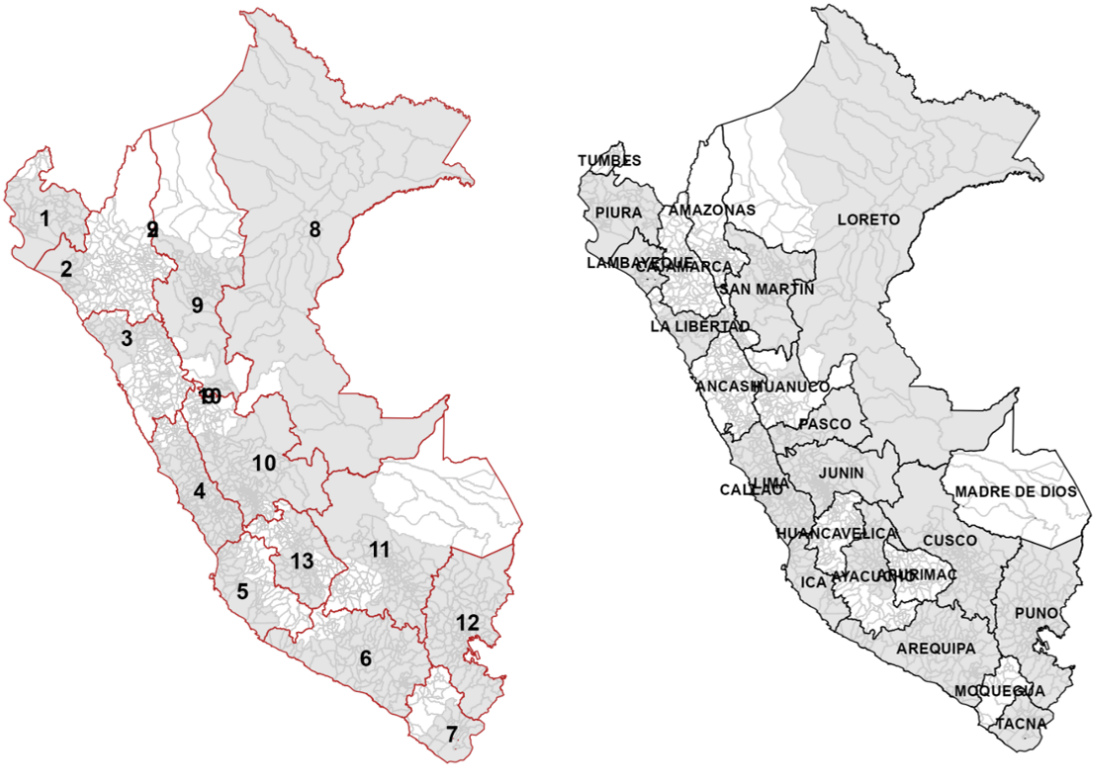
2.2 Agrarian Zones and the Core Department Instrument

The implementation of Peru's agrarian reform through pre-existing administrative units provides our identification strategy for measuring causal effects on distributional perceptions. In 1960, nine years before reform initiation, the Servicio de Investigación y Promoción Agraria (SIPA) established twelve agrarian zones covering the entire national territory for agricultural research and development purposes, receiving technical support from the Organization of American States and the United States Agency for International Development. SIPA delineated these zones based on ecological conditions entirely unrelated to subsequent reform objectives or political considerations. The zones reflected technical agricultural planning rather than political or social engineering, with boundaries drawn to create coherent agro-ecological units suitable for research and extension activities.

Three factors motivated the military government's adoption of existing agrarian zones as reform administrative units (Albertus, 2020): establishing entirely new organizational structures would have delayed implementation and increased vulnerability to elite resistance; the manageable number of zones facilitated central planning by encompassing diverse agricultural systems within single administrative units; and the limited number of zones enabled greater centralized control and appointment of trusted military officers and civilian technocrats to lead implementation. This administrative choice proved crucial for creating the variation we exploit in our empirical analysis.

The military government established reform administrative offices in the most developed urban centers within each agrarian zone, creating a clear hierarchical structure that generates our instrumental variable. We define these locations as "core departments"—the single department per agrarian zone that housed the principal administrative office and concentrated reform personnel, resources, and decision-making authority. All other departments within each zone remained peripheral, receiving less intensive attention and fewer resources. Figure 1 illustrates the administrative division by agrarian zone and department, with shaded areas representing districts in core departments within each agrarian zone. This administrative centralization generated systematic variation in reform exposure across districts within the same agrarian zone, with districts located in core departments receiving priority attention from reform officials, benefiting from proximity to technical expertise, and experiencing more intensive implementation efforts.

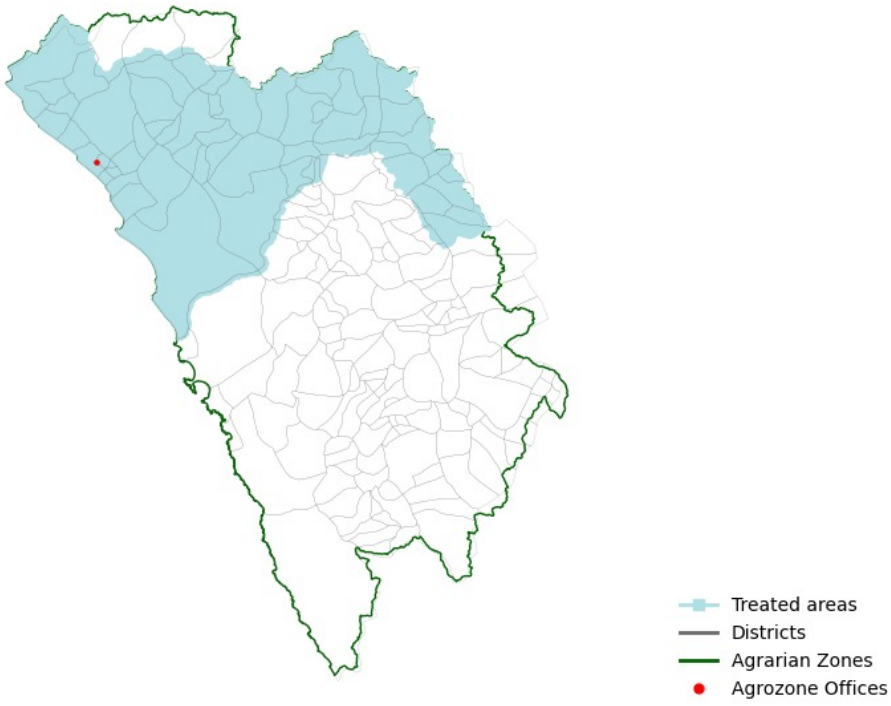
Figure 1: Agrarian Zones and Departmental Boundaries



Note: The figure uses the geo-dataset from Albertus (2020). Red solid lines show agrarian reform zone boundaries (left panel), and black solid lines show department boundaries (right panel). Colored areas indicate the core department of an agrarian zone; white areas indicate districts in peripheral departments.

Multiple sources document the differential treatment that resulted from this administrative hierarchy. Echevarria (1978) reported that peripheral areas within agrarian zones received minimal attention from reform officials, who concentrated efforts near administrative headquarters. Official Ministry of Agriculture documents cited by Albertus (2020) indicate that budgetary constraints severely limited resources available for training administrative personnel outside core departments, creating capacity gaps that affected reform implementation quality. Condor (2024) demonstrates negative correlations between land redistribution intensity and distance from agrarian zone administrative offices, confirming that proximity to core departments influenced reform exposure. Figure 2 provides a detailed view of how core and peripheral departments operate within a specific agrarian zone, illustrating the geographic basis for our identification strategy.

Figure 2: Agrarian Zones and Departmental Boundaries



Note: The figure zooms in on Agrarian Zone 3, which covers the departments of Cajamarca, La Libertad, and Ancash. The agrarian zone office is located in La Libertad, the core department of this zone. Figure reproduced courtesy of Condor (2024).

Our instrumental variables approach exploits the quasi-random assignment of districts to core versus peripheral departments within agrarian zones as a source of exogenous variation in reform exposure. This identification strategy builds upon and extends the work by Albertus (2020), who employed a regression discontinuity design exploiting marginal variations around departmental boundaries. Our approach offers complementary advantages for studying perceptual outcomes by capturing broader distinctions between core and peripheral departments to identify aggregate treatment differences across larger geographic areas, which proves particularly well-suited for analyzing distributional perceptions that likely respond to community-wide treatment effects rather than hyperlocal boundary discontinuities.

The quasi-random assignment assumption underlying our identification strategy rests on the pre-reform establishment of agrarian zones for purely technical purposes. SIPA created these administrative boundaries in 1960 based on agricultural research considerations, without knowledge of subsequent reform plans or political developments. Within agrarian zones, the assignment of districts to core versus peripheral departments represents a form of administrative lottery, where districts gained core status through their department's historical urban development and transportation advantages rather than characteristics directly related to agricultural productivity, social organization, or political preferences that might influence long-term perceptual outcomes.

Importantly, our sample restrictions and empirical design mitigate concerns that these historical urban development advantages might directly influence contemporary perceptions independent of reform intensity. We exclude all districts with populations above 75,000 inhabitants, eliminating the major urban centers where historical development advantages would be most pronounced and persistent. Our analysis thus focuses on smaller towns and rural areas within both core and peripheral departments, where residual differences in urban development are minimal. Moreover, our outcome variable—bias defined as the gap between perceived and actual income position—mechanically controls for any direct effects of core status on contemporary income levels, isolating perceptual distortions rather than

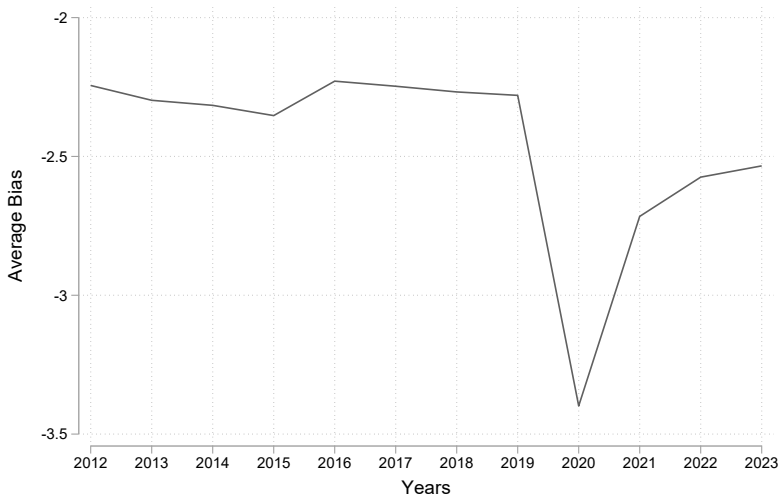
objective economic differences. This administrative geography, combined with our sample restrictions and the structure of our dependent variable, provides the foundation for credible causal identification of how historical land redistribution continues affecting contemporary beliefs about economic position.

2.3 Contemporary Distributional Perceptions: Beyond the Middle-Class Bias

Four decades after reform completion, Peru exhibits distinctive patterns of distributional perceptions that deviate from the canonical "middle-class bias" documented in developed countries, providing insights into how historical structural transformations may shape contemporary beliefs about economic position. The literature on distributional perceptions typically finds that individuals cluster their self-assessments around the middle of income distributions, with high-income individuals underestimating their position while low-income individuals overestimate theirs—a pattern attributed to reference group effects where people anchor judgments in local rather than national comparisons (Cruces et al., 2013; Hvidberg et al., 2023*a*).

Peru presents a modified pattern that connects directly to our analysis of historical land reform effects. We analyze contemporary perceptual patterns using Peruvian household survey (ENAHO) data from 2012-2019, focusing on this period to avoid confounding effects from the COVID-19 pandemic that began affecting Peru in early 2020 (see figure 3). Post-2019 data reveal systematic increases in negative bias—Peruvians underestimate their economic position even more severely after the pandemic—suggesting economic disruptions that could confound estimates of historical reform effects. Our analysis exploits ENAHO's perception module, which asks household heads about their perceived position in Peru's national income distribution, allowing us to construct individual-level "bias" measures as the difference between perceived and objective national income deciles.

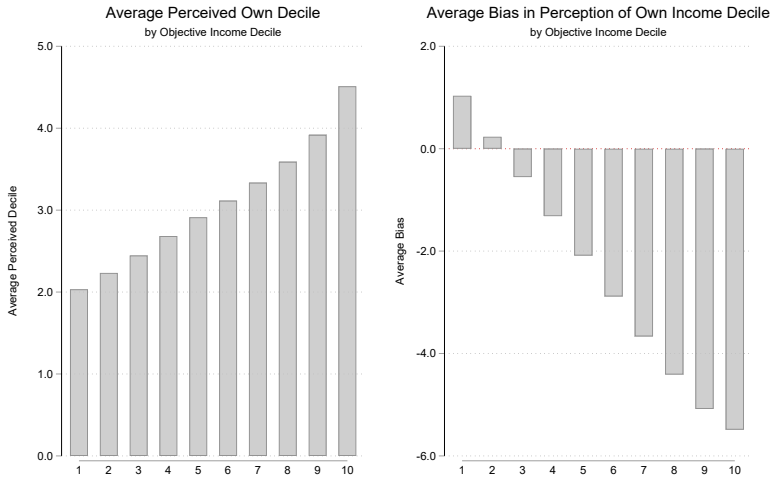
Figure 3: Raw Trends in Average Bias



Notes: Note: The figure displays temporal trends in average bias (perceived minus objective income decile) from 2012 to 2023 using ENAHO household survey data. Bias is calculated as the difference between respondents' perceived position and their actual position in Peru's national income distribution. Negative values indicate underestimation of economic position. The vertical line at 2019 marks the end of the pre-pandemic period used in the main analysis. The sharp decline in 2020 reflects the onset of the COVID-19 pandemic. Data are weighted using ENAHO sampling weights.

Contemporary data reveal that while the bottom 20% of income earners overestimate their position consistent with canonical patterns, individuals from the third decile onward systematically underestimate their true rank, with underestimation intensifying as actual income rises (see figure 4).

Figure 4: Perceived Income Decile and Average Bias by Objective Income Decile



Notes: The left panel displays average perceived income decile by objective income decile; the right panel shows average bias (perceived minus objective decile) by objective income decile. The 45-degree line in the left panel would indicate perfect accuracy. Results show that individuals in the bottom two deciles overestimate their position (positive bias), while those from decile 3 onward systematically underestimate their position (negative bias), with underestimation increasing in magnitude at higher income levels. Sample period: 2012-2019 ENAHO rounds. Data are weighted using ENAHO sampling weights.

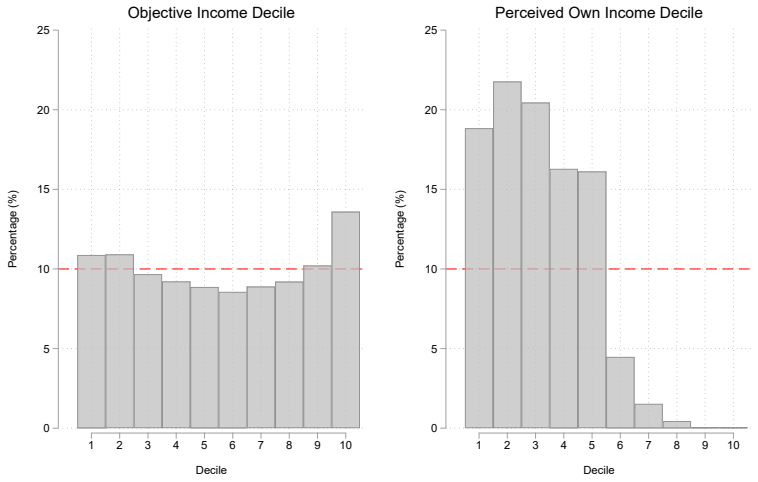
Figure 5 illustrates the distribution of objective and perceived income deciles. The perceived distribution is concentrated in the lower-middle deciles (2-5), with particularly high concentration in deciles 3-4. This pattern deviates from the canonical middle-class bias documented in developed countries: while respondents cluster self-assessments away from the extremes, the concentration in lower deciles combined with the systematic underestimation shown in Figure 4 reveals a modified pattern where most Peruvians place themselves below their true position rather than symmetrically around the middle.

Figure 6 shows the distribution of average bias, which concentrates left of zero, indicating widespread underestimation of relative economic position. This widespread underestimation differs markedly from the symmetric middle-class bias patterns documented in developed countries, suggesting systematic factors that pull perceptions toward pessimistic assessments of relative economic position.

The prevalence of negative bias in Peru may reflect the anchoring effects of historical structural changes that continue shaping local reference groups and economic environments. In contexts where major redistributive interventions fundamentally altered local economic structures—as occurred during Peru's land reform—individuals may anchor their distributional judgments in local environments that systematically lag national development patterns. Areas that experienced intensive land redistribution may have developed local economies characterized by cooperative legacies, altered property rights systems, and modified production patterns that generate persistently lower local income levels compared to national averages. When individuals use these local environments as reference points for assessing their national position, they may systematically underestimate their true even as their objective national standing improves over time.

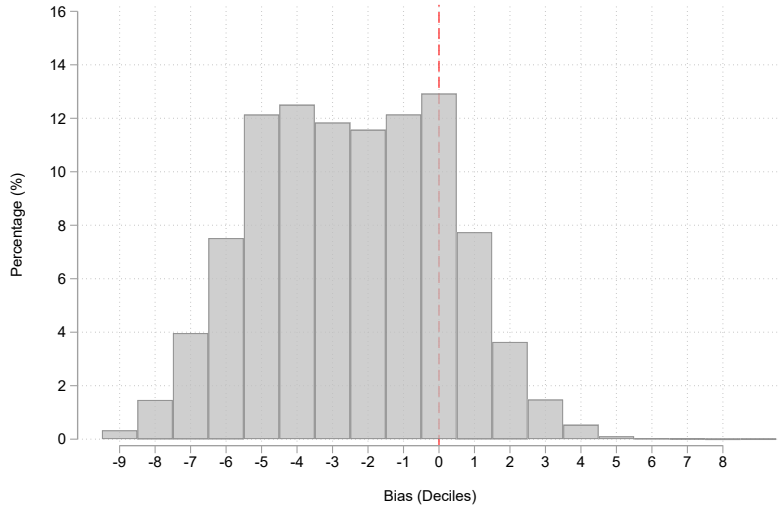
Substantial geographic variation exists in perceptual biases across Peru's districts and provinces, providing the foundation for our identification strategy linking historical reform exposure to contemporary beliefs. Figure 7 displays the spatial distribution of bias across Peru, revealing clear heterogeneous patterns across regions. The map shows darker areas experiencing more negative bias (greater underestimation of economic position), while lighter areas exhibit less negative bias. The spatial clustering evident in the map suggests that local economic structures—potentially shaped by historical interventions like land reform—continue influencing how individuals assess their national economic position

Figure 5: Distribution of objective and perceived own-income decile



Notes: The figure displays the distribution of objective (left panel) and perceived (right panel) income deciles using 2012-2019 ENAHO rounds. The red dashed line indicates the expected 10% frequency under a uniform distribution. The objective distribution approximates uniformity by construction. Data are weighted using ENAHO sampling weights.

Figure 6: Distribution of Average Bias



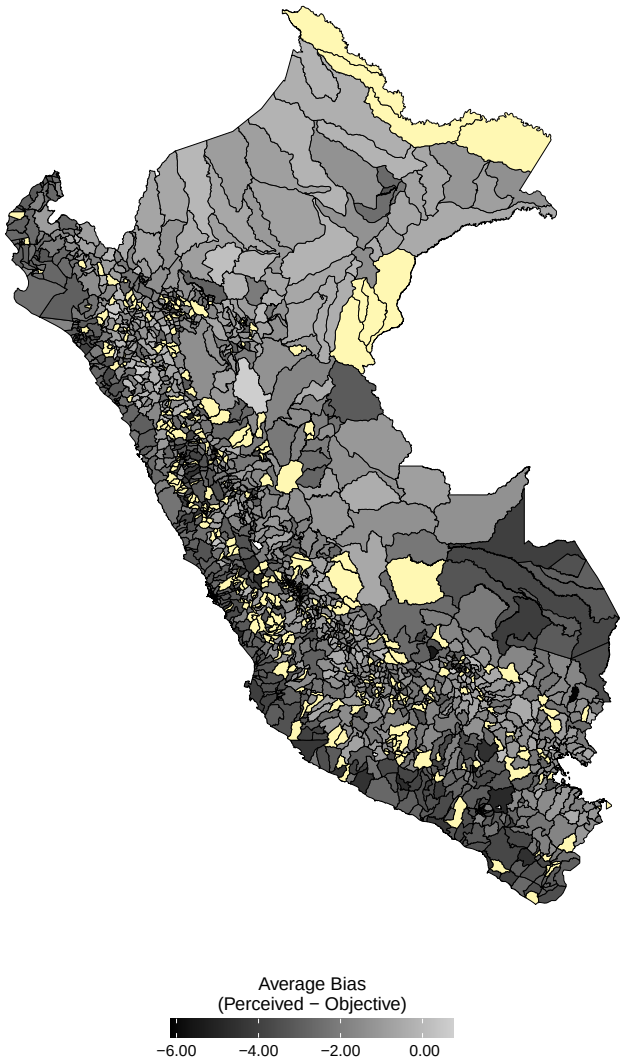
Notes: The figure displays the distribution of average bias (perceived minus objective income decile) using 2012-2019 ENAHO rounds. The red dashed vertical line indicates zero bias (accurate perception). Data are weighted using ENAHO sampling weights.

decades after policy implementation.

The connection between Peru's historical land reform and contemporary distributional perceptions operates through the transformation of local anchoring environments that inform status judgments. If land redistribution fundamentally altered local economic structures, social hierarchies, and development trajectories, these changes may have created persistent differences in the local reference groups that individuals use to assess their national economic position. Districts that experienced intensive reform may exhibit systematically different local economic characteristics—lower average incomes, different occupational structures, distinct patterns of inequality—that generate more pessimistic distributional perceptions even when residents' objective national rankings remain stable or improve. Understanding these connections illuminates how major historical redistributive interventions con-

tinue shaping political beliefs and policy preferences through their lasting effects on the cognitive anchors that inform citizens' understanding of inequality and economic position.

Figure 7: Spatial Distribution of Average Bias



The figure displays the spatial distribution of average bias (perceived minus objective income decile) across Peruvian districts using 2012-2019 ENAHO rounds. Darker shading indicates more negative bias (greater underestimation). Yellow districts lack survey observations for reliable bias estimates. District-level averages calculated using ENAHO sampling weights.

3 Data and Methodology

3.1 Data Sources and Sample Construction

We combine two primary data sources to examine the causal effect of Peru's agrarian reform on contemporary distributional perceptions. Our main outcome data come from ENAHO for the period 2012-2019, which we selected to avoid confounding effects from the COVID-19 pandemic that began systematically affecting Peruvian economic perceptions from 2020 onward. We aggregate individual-level responses to the district level to construct a pooled cross-section, matching respondents to their districts of residence during the survey period.

Historical reform exposure data come from the comprehensive database developed by Albertus (2020), who examined official documents and historical records from Peru's Ministry of Agriculture covering the 1969-1980 reform period. This database provides district-level information on land redistribution intensity, measured as the percentage of total district area redistributed during the reform, along with precise geographic information about agrarian zone boundaries and administrative structures. We supplement these core data sources with additional district-level controls from multiple sources to address potential confounding factors.

To capture historical institutional legacies that might correlate with contemporary perceptions, we incorporate information about colonial forced labor institutions using Dell (2010) database on mining mita zones. Geographic and agricultural controls come from the United Nations Food and Agriculture Organization (FAO) Global Agro-Ecological Zones database, from which we calculate district altitude, total area, and proportion of arable land. These variables help control for geographic factors that influenced both historical reform exposure and contemporary economic conditions.

Following Albertus (2020), we restrict our sample based on three criteria designed to ensure clean identification. First, we limit analysis to districts with populations below 75,000 inhabitants to focus on areas where land reform represented the primary economic transformation rather than broader urbanization processes. Second, we restrict analysis to agrarian zones 1 through 7 and zone 11, excluding zones where reform had minimal impact (zones 8 and 9 in the Amazon region) or where administrative boundaries changed during the reform period (zone 10, which split into zones 10 and 13) or coincided perfectly with departmental boundaries (zone 12, which matched Puno department exactly). Third, we focus on zones where the reform actually operated, ensuring meaningful variation in treatment intensity.

3.2 Measurement of Key Variables

Our dependent variable, bias, captures the gap between perceived and objective economic position using ENAHO's perception module. This module asks household heads: "In which decile of Peru's income distribution do you think your household is located?" [1] We compare these responses to households' actual national income decile calculated from ENAHO's comprehensive income module, which includes labor income, business profits, rental income, transfers, and other sources. bias equals perceived decile minus objective decile, where negative values indicate underestimation of true economic position—the predominant pattern we observe in Peru.

We construct district-level measures by averaging individual bias across all households surveyed in each district during 2012-2019, weighting by ENAHO's sampling weights to ensure representativeness. This aggregation approach captures community-wide perceptual patterns that likely reflect local economic structures and reference group effects rather than individual-specific factors. Districts with more negative average bias exhibit stronger systematic underestimation of economic position among their residents.

Our key explanatory variable measures historical land redistribution intensity as the percentage of total district area redistributed during Peru's 1969-1980 agrarian reform, drawn directly from Albertus (2020). This measure captures the comprehensive scope of reform exposure, ranging from zero in districts that experienced no redistribution to 100 percent in districts where reform covered all agricultural land. The variable exhibits substantial variation across districts within agrarian zones, providing the foundation for our identification strategy.

Our instrumental variable exploits the administrative structure of reform implementation through agrarian zones. We construct a binary indicator for districts located in "core departments"—the single department per agrarian zone that housed the reform's principal administrative office and concentrated personnel, resources, and decision-making authority. This variable equals one for districts in core departments and zero for districts in peripheral departments within the same agrarian zones, capturing quasi-random variation in administrative attention and reform intensity.

[1] See appendix figure A1 for question details.

Table 1 presents a summary of the variables used in the analysis.

Table 1: Summary statistics

Variable	Mean	Std. Dev.	N
Bias	-2.441	1.376	4801
Redistributed Area (%)	17.137	25.643	4801
Gini Index	0.28	0.096	4801
Perceived Stability (Share)	0.362	0.236	4135
Labor Force (Share)	0.824	0.139	4800
Altitude (km a.s.l)	2.333	1.484	4801
Mita Zone (= 1)	0.15	0.357	4801
Area (hundreds of km2)	7.023	20.287	4801
Cultivable land (% area)	7.75	11.123	4801

Note: The sample is restricted to agrarian zones 1 through 7 and zone 11, and districts with population below 75,000 inhabitants.

3.3 Empirical Strategy

We employ a two-stage least squares (2SLS) approach to identify causal effects of land redistribution on contemporary distributional perceptions. Our identification strategy exploits the quasi-random assignment of districts to core versus peripheral departments within agrarian zones, which created systematic variation in reform exposure unrelated to pre-existing district characteristics that might independently influence contemporary perceptions.

The first stage estimates the relationship between core department location and actual redistribution intensity:

$$\text{Redistribution}_{d,z} = \text{CoreDepartment}_{d,z}\pi + X'_{d,z}\theta + \varepsilon_{d,z} \tag{1}$$

where $\text{Redistribution}_{d,z}$ measures the percentage of area redistributed in district d within agrarian zone z, $\text{Core Department}_{d,z}$ indicates location in the core department of agrarian zone z, $X'_{d,z}$ includes district-level controls (altitude, area, arable land proportion, and mita zone indicator), and $\varepsilon_{d,z}$ captures the error term.

The second stage estimates the causal effect of redistribution on contemporary perceptions:

$$\text{Bias}_{d,z,t} = \hat{\text{Redistribution}}_{d,z}\delta + X'_{d,z}\beta + \lambda_t + \nu_{d,z,t} \tag{2}$$

where $\text{Bias}_{d,z,t}$ represents average bias in district d of agrarian zone z during survey year t, $\widehat{\text{Redistribution}}_{d,z}$ represents predicted redistribution intensity from the first stage, $X'_{d,z}$ includes district-level controls (altitude, area, arable land proportion, and mita zone indicator), λ_t captures survey-year fixed effects to control for time-varying economic conditions that affect perceptions uniformly across districts, and $\nu_{d,z,t}$ represents the error term.

The coefficient δ captures the causal effect of a one-percentage-point increase in redistributed area on average bias.

3.4 Identification Assumptions

Our identification strategy rests on two key assumptions standard in instrumental variables approaches: instrument relevance and the exclusion restriction. The relevance assumption requires that core department location significantly predicts redistribution intensity. We verify this assumption through

first-stage F-statistics and demonstrate substantively meaningful relationships between administrative centralization and reform exposure.

The exclusion restriction requires that core department location affects contemporary distributional perceptions only through its impact on historical redistribution intensity, not through alternative channels that might independently influence how residents assess their economic position decades later. This assumption proves more challenging to test directly but gains plausibility through several institutional and historical arguments.

First, the pre-reform establishment of agrarian zones for purely technical agricultural research purposes, nine years before reform initiation and before the First Agrarian Census of 1961, ensures that administrative boundaries reflected ecological and infrastructure considerations rather than social or political factors that might correlate with contemporary perceptions. SIPA drew zone boundaries to create coherent agro-ecological units suitable for research activities, without knowledge of subsequent reform plans or their potential long-term effects.

Second, the assignment of districts to core versus peripheral departments within agrarian zones represents a form of administrative lottery based on historical urban development and transportation infrastructure rather than characteristics directly related to social organization, political preferences, or cultural factors that might independently influence contemporary distributional perceptions. Districts gained core status through their department's existing infrastructure advantages rather than features that would predict different patterns of belief formation decades later.

Third, Peru's historically centralized state structure limits the likelihood that departmental boundaries created independent policy channels that might confound our estimates. Throughout Peru's modern history, departments have functioned primarily as administrative units subordinate to central government authority, with limited autonomous policy-making capacity that might generate differential effects on citizen beliefs independent of specific programs like land reform.

4 Results

4.1 Main Results

We employ our instrumental variables strategy to examine how Peru's historical land redistribution affects contemporary distributional perceptions. Table 2 presents our core findings using two-stage least squares estimation, where we instrument the percentage of redistributed area with core department location within agrarian zones.

The results demonstrate a statistically significant and economically meaningful relationship between historical land reform exposure and contemporary bias. Column 1 shows that a one-percentage-point increase in redistributed land area increases the absolute magnitude of negative bias by 0.134 deciles (coefficient = -0.134), controlling for district altitude, area, arable land proportion, and colonial mita zone exposure. Column 2, estimated without controls, yields a slightly larger coefficient of -0.169 deciles. Both specifications confirm our central finding: districts that experienced more intensive land redistribution exhibit systematically stronger underestimation of residents' true income position.

To contextualize these magnitudes, consider two otherwise identical districts where one experienced 10 percentage points more land redistribution than the other—a difference representing roughly one standard deviation in our sample. Our estimates predict that residents in the more intensively reformed district would underestimate their national income position by approximately 1.3-1.6 additional deciles compared to residents in the less reformed district. Given that the sample mean for bias equals -2.44 deciles in our preferred specification, this represents a substantial 55-65 percent increase in the absolute magnitude of underestimation.

These findings support our hypothesis that transformative historical asset redistribution creates lasting distortions in how citizens assess their economic position. The persistence of these effects

four decades after reform completion suggests that land redistribution fundamentally altered the local economic structures and reference groups that inform contemporary distributional perceptions.

Table 2: Effect of Agrarian Reform on the Bias of Income Distribution

	Bias	
	(1)	(2)
Redistributed area (%)	-0.134***	-0.169***
	(0.039)	(0.046)
Controls	Yes	No
Mean Dep. Var.	-2.44	-2.44
Observations	4801	4801
First-stage F-statistic	44.30	2.11

Notes: Robust standard errors in parentheses. Redistributed area (%) is instrumented using a binary variable for core department of the agrarian zone. Controls include altitude (km above sea level), area (hundreds of km^2), cultivable land (% of area), and mita zone indicator. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

4.2 First-Stage Results and Instrument Validity

Our identification strategy exploits the quasi-random assignment of districts to core versus peripheral departments within pre-established agrarian zones. The first-stage results demonstrate that our core department instrument significantly predicts land redistribution intensity across both specifications.

Districts located in core departments experienced substantially higher redistribution intensity. In our preferred specification with full controls, the core department indicator predicts a 2.85 percentage-point increase in redistributed land area, with an F-statistic of 44.30 that substantially exceeds conventional weak instrument thresholds. The specification without controls shows a similar coefficient magnitude of 2.59 percentage points.

The first-stage diagnostics reveal that instrument strength depends critically on controlling for geographic and historical confounders. The controlled specification yields an F-statistic of 44.30, well above conventional weak instrument thresholds, while the uncontrolled specification produces an F-statistic of only 2.11, falling well below the conventional threshold of 10 and indicating a weak instrument. Importantly, the coefficient on the core department indicator remains virtually identical across specifications (2.85 with controls vs. 2.89 without), while the standard error changes minimally (0.75 vs. 0.73). This pattern demonstrates that controls do not alter the first-stage relationship itself but rather reduce residual variation that obscures the signal, thereby strengthening instrument relevance.

This finding strengthens our identification argument rather than undermining it. The pre-reform establishment of agrarian zones for agricultural research purposes intersected with Peru's heterogeneous geography and colonial institutional legacies. Geographic factors like altitude and arable land proportion influenced both which departments became core administrative centers and long-run agricultural productivity. Colonial institutions like the mita system created persistent regional disparities that correlated with subsequent administrative choices. By conditioning on these confounders, we isolate the quasi-random variation arising specifically from reform administrators' decisions to concentrate resources in the most developed urban centers within each agrarian zone, net of the geographic and historical factors that independently predict both reform exposure and contemporary economic outcomes. This conditional identification strategy aligns with established practice in development economics, where instruments commonly require controls to satisfy the exclusion restriction even when unconditional correlations exist.

This conditional identification strategy aligns with established practice in development economics,

where instruments commonly rely on controlling for geographic characteristics to satisfy the exclusion restriction. Our results identify the causal effect of land redistribution among districts that vary in administrative centralization but share similar geographic and institutional backgrounds—precisely the variation our theoretical framework predicts should matter for contemporary perceptual outcomes.

4.3 Mechanisms

Having established that historical land redistribution increases the magnitude of negative bias, we examine three potential transmission mechanisms through which this effect operates: changes in local inequality, perceived economic stability, and labor force composition. Understanding these channels illuminates how transformative asset redistribution creates lasting effects on distributional perceptions decades after implementation.

4.4 Inequality and Local Reference Groups

We first test whether land reform affected contemporary inequality patterns within districts, potentially altering the local reference groups that inform assessments. The reference group literature demonstrates that individuals anchor distributional judgments in local rather than national comparisons, but the specific relationship between local inequality and bias depends on the relative position of local versus national distributions.

Our results confirm this mechanism operates as hypothesized. Table 3 shows that a one-percentage-point increase in redistributed land area reduces the contemporary Gini coefficient by 0.003 points in our preferred specification with controls. Given a sample mean Gini of 0.28, this represents a substantial reduction in local inequality. Districts that experienced 20 percentage points more intensive reform—roughly one standard deviation—exhibit Gini coefficients that are 0.06 points lower, equivalent to a 21% reduction in inequality relative to the sample mean.

Table 3: Effects of Agrarian Reform on Inequality

	Gini Index	
	(1)	(2)
Redistributed area (%)	-0.003**	-0.002*
	(0.001)	(0.001)
Controls	Yes	No
Mean Dep. Var.	0.28	0.28
Observations	4801	4801

Notes: Robust standard errors in parentheses. Redistributed area (%) is instrumented using a binary variable for core department of the agrarian zone. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This finding supports our theoretical framework: land reform created more egalitarian local environments that serve as compressed reference groups for national assessments. When individuals anchor their distributional perceptions in these more equal local contexts while competing in national labor and product markets, they systematically underestimate their true national position. The persistence of this inequality effect four decades post-reform demonstrates how major asset redistribution can durably reshape the local economic structures that inform social cognition.

4.5 Perceived Stability and Labor Market Effects

We examine two additional channels through which land reform may influence contemporary bias: perceived economic stability and labor market composition. The cooperative-based production systems created during the reform may have created lasting effects on economic perceptions and labor market structures, though the specific mechanisms linking historical reform to contemporary outcomes remain theoretically ambiguous.

Table 4 presents results for both mechanisms. We find that more intensive historical land redistribution significantly reduces both contemporary perceived stability and labor force participation. A one-percentage-point increase in redistributed area decreases the share of residents reporting stable household income by 1.8 percentage points and reduces labor force participation by 0.9 percentage points in our controlled specifications.

Table 4: Effects of Agrarian Reform on Perceived Stability and Labor Force

	Perceived Stability (Share)		Labor Force (Share)	
	(1)	(2)	(3)	(4)
Redistributed Area (%)	-0.018***	-0.023***	-0.009**	-0.016***
	(0.005)	(0.005)	(0.006)	(0.005)
Controls	Yes	No	Yes	No
Mean Var. Dep.	0.36	0.36	0.82	0.82
Observations	4135	4135	4800	4800

Notes: Robust standard errors in parentheses. Redistributed area (%) is instrumented using a binary variable for core department of the agrarian zone. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The magnitudes are economically meaningful. Given sample means of 36% for perceived stability and 82% for labor force participation, these effects represent a 5% relative reduction in perceived stability and 1.1% relative reduction in labor force participation per percentage point of reform intensity. For districts experiencing one standard deviation more intensive reform (roughly 20 percentage points), these translate to substantial differences in economic perceptions and labor market engagement.

These mechanisms may contribute to underestimation through distinct pathways. Lower perceived stability could lead individuals to anchor their assessments in pessimistic scenarios rather than current income levels, while reduced labor force participation may limit exposure to market wages and occupational mobility that would inform broader economic comparisons. Both channels suggest that land reform's institutional legacies continue shaping economic perceptions through multiple complementary pathways beyond direct effects on local inequality.

4.6 Heterogeneous Effects

The effects of historical land redistribution on contemporary bias may vary systematically across different population subgroups. We examine heterogeneity along two theoretically motivated dimensions: birth cohorts, which capture differential exposure to reform-era changes, and reference group identifications, which may influence how individuals process distributional information within their social networks.

4.6.1 Effects by Birth Cohort

Table 5 presents results disaggregated by birth cohort, revealing how reform effects vary across generations with different levels of exposure to the transformation period. We construct cohorts based

on decade of birth, allowing us to distinguish between individuals who experienced the reform during their formative years versus those born after its completion.

Table 5: Effects of Agrarian Reform on the Bias of Income Distribution by Birth Cohort

Cohort	Coefficient	SE	p-value	Control (Mean)	N
Panel A. Base with controls					
1950s	-0.170	0.064	0.008	-3.23	4054
1960s	-0.122	0.036	0.001	-2.98	4178
1970s	-0.107	0.036	0.003	-2.33	4168
1980s	-0.111	0.031	0.000	-2.11	3775
1990s	-0.112	0.036	0.002	-2.50	3075
2000s	-0.084	0.113	0.457	-2.97	132
Panel B. Base without controls					
1950s	-0.202	0.063	0.001	-3.23	4054
1960s	-0.166	0.047	0.000	-2.98	4178
1970s	-0.154	0.050	0.002	-2.33	4168
1980s	-0.150	0.044	0.001	-2.11	3775
1990s	-0.171	0.055	0.002	-2.50	3075
2000s	-0.102	0.121	0.399	-2.97	132

Notes: Panel A includes controls; Panel B omits them. Control (Mean) is the sample mean of the dependent variable for each subgroup. Redistributed area (%) is instrumented using a binary indicator for being in the agrarian zone's central department. Robust standard errors.

The results demonstrate that land reform effects on bias remain remarkably consistent across most birth cohorts. In our preferred specification with controls (Panel A), coefficient magnitudes range from -0.107 to -0.170, with all cohorts except those born in the 2000s showing statistically significant effects at conventional levels. The 1950s cohort exhibits the largest effect (-0.170), while the 1970s cohort shows the smallest significant effect (-0.107). The consistency of effects across cohorts suggests that land reform's influence on distributional perceptions operates through persistent changes in local economic structures rather than through direct experiential effects on individuals who lived through the reform period.

The consistency of effects across cohorts suggests that land reform's influence on distributional perceptions operates through persistent changes in local economic structures rather than through direct experiential effects on individuals who lived through the reform period. Even individuals born decades after reform completion exhibit substantial negative bias in areas that experienced intensive redistribution, indicating that the mechanisms we identify—altered local inequality, reduced perceived stability, and modified labor market structures—continue shaping perceptions across generations.

The cohort-specific estimates reveal a remarkably stable pattern rather than a monotonic decline with generational distance from the reform. The 1950s cohort—individuals who experienced the reform during their formative years—exhibits the largest effect (-0.170), consistent with direct exposure creating durable perceptual anchors. However, subsequent cohorts show effects that remain quantitatively similar and statistically significant despite having no direct memory of the reform period. Coefficients for the 1960s through 1990s cohorts cluster tightly between -0.107 and -0.122, with no clear downward trend across birth decades. This stability indicates that reform effects operate primarily through persistent local economic structures—compressed income distributions, altered labor markets, and reduced economic stability—that continue anchoring distributional judgments for residents regardless of when they were born. The slightly larger effect for the oldest cohort suggests some additional role for formative exposure, but the predominant pattern is one of structural persistence rather than cohort-specific socialization.

The one exception appears among those born in the 2000s, where the coefficient becomes statistically insignificant (-0.084, p=0.457) despite maintaining the expected negative sign. However, this cohort comprises a small sample (N = 132) of very young adults surveyed between ages 12-19, making statistical inference unreliable. The maintained coefficient sign and similar point estimate magnitude suggest underlying patterns consistent with other cohorts, with the lack of significance reflecting

limited statistical power rather than a genuine difference in reform effects.

4.6.2 Effects by Reference Group

Table 6 examines heterogeneity based on respondents' self-reported primary reference group identification. This analysis tests whether reform effects vary depending on the social networks through which individuals process distributional information and form assessments.

We identify four primary reference group categories based on survey responses: locality (geographic community), ethnicity or race, indigenous community, and religious community. The results reveal substantial heterogeneity in how land reform effects manifest across different social identification patterns.

Table 6: Effects of Agrarian Reform on the Bias of Income Distribution by Reference Group

Group	Coefficient	SE	p-value	Control (Mean)	N
Panel A. Base with controls					
Locality	-0.143	0.044	0.001	-2.763	4626
Ethnicity or Race	-0.303	0.223	0.174	-2.995	1456
Indigenous Community	-0.067	0.021	0.001	-2.548	3563
Religious Community	-0.166	0.048	0.001	-2.819	3753
Panel B. Base without controls					
Locality	-0.186	0.056	0.001	-2.763	4626
Ethnicity or Race	-0.379	0.307	0.217	-2.995	1456
Indigenous Community	-0.085	0.023	0.000	-2.548	3563
Religious Community	-0.224	0.071	0.002	-2.819	3753

Notes: Panel A includes controls; Panel B omits them. Control (Mean) reports the sample mean of the dependent variable for each subgroup. Redistributed area (%) is instrumented using a binary indicator for being in the agrarian zone central department. Robust standard errors.

Locality-based reference groups show strong negative effects (-0.143), consistent with our theoretical framework emphasizing geographic anchoring in assessments. Religious community identification produces similarly large effects (-0.166), suggesting that faith-based social networks may reinforce local economic perceptions in ways that amplify reform impacts. While indigenous community identification generates significant but smaller effects (-0.067), potentially reflecting different information processing mechanisms within indigenous social networks or distinct historical relationships with land reform policies. The coefficient remains economically meaningful despite its smaller magnitude. However, ethnicity or race identification shows the largest point estimate (-0.303) but lacks statistical significance, likely due to the smaller sample size for this category.

These patterns indicate that social identity shapes how individuals incorporate local economic conditions into their distributional perceptions. Reference groups that emphasize geographic or community-based identity appear most susceptible to the anchoring effects we identify, while other forms of social identification may provide alternative information sources that partially offset local anchoring biases.

The heterogeneity by reference group supports our interpretation that land reform effects operate primarily through altered local economic environments rather than through individual-level psychological mechanisms, as the effects manifest most strongly among individuals whose social identities emphasize local community connections.

5 Conclusions

This study demonstrates that Peru's 1969-1980 agrarian reform continues to shape citizens' distributional perceptions four decades after its completion. We exploit quasi-random variation in reform intensity generated by the administrative structure of implementation to identify causal effects on

contemporary beliefs about income position. Districts that experienced more intensive land redistribution exhibit systematically stronger underestimation of their national income position, with a one-percentage-point increase in redistributed area raising average underestimation by 0.134 deciles.

Our findings carry profound implications for understanding the political economy of redistribution in developing countries. The persistence of these perceptual effects across generations reveals how transformative asset redistribution creates lasting changes in local economic structures that continue anchoring social cognition decades later. When governments implement major redistributive interventions, they set in motion long-term changes in how citizens understand their economic position that extend far beyond immediate policy objectives. These findings carry immediate relevance for contemporary policy debates across the developing world, where Peru's official "Second Agrarian Reform" framework launched in 2021 reflects renewed global interest in asset redistribution as governments confront persistent inequality and rural poverty. Our results suggest that policymakers implementing such programs should consider their long-term cognitive consequences alongside immediate economic objectives. Asset redistribution programs that compress local income distributions may generate lasting pessimism about economic mobility and national position, potentially creating constituencies with systematically distorted views of national inequality that influence political support for future redistributive policies.

The magnitude of effects we identify—where historically reformed areas exhibit 55-65 percent larger underestimation bias—demonstrates that asset policies represent powerful but underexplored instruments for shaping citizen beliefs about inequality. This creates both opportunities and risks for contemporary governments. Leaders seeking to build political coalitions around redistributive policies might leverage these perceptual effects, but the persistence across generations suggests that such interventions carry substantial long-term commitments that extend far beyond their immediate policy objectives. Our evidence fundamentally challenges conventional approaches to understanding redistributive preferences in developing countries. The canonical Meltzer-Richard framework assumes that citizens form policy preferences based on objective inequality and their actual economic position. Our findings demonstrate that major historical interventions durably alter the cognitive anchors through which citizens interpret economic reality, creating systematic deviations between objective conditions and political preferences that persist across generations.

This insight opens critical research directions for political economy. If transformative policies create path-dependent effects on social cognition, then understanding contemporary political preferences requires examining the historical processes that shaped the cognitive foundations of citizen judgment. Other major asset redistribution programs—including urban housing policies in Singapore and Chile, industrial nationalization in Eastern Europe and Africa, and contemporary wealth transfer programs—may generate similar lasting effects on distributional beliefs that influence political development long after policy completion. The cross-national implications prove particularly important for comparative political economy. Countries with different histories of asset redistribution may exhibit systematically different patterns of citizen beliefs about inequality, even controlling for objective economic conditions. This suggests that standard approaches to modeling redistributive politics may systematically mispredict policy outcomes in contexts shaped by major historical interventions with mixed effects.

Cross-national comparative studies could illuminate which institutional features of asset redistribution programs generate the most persistent effects on distributional perceptions, while longitudinal research could trace the precise pathways through which local economic structures translate into individual beliefs about national position. Understanding these mechanisms becomes essential as governments worldwide confront rising inequality and political polarization while designing effective responses to contemporary distributional challenges. The enduring influence of Peru's agrarian reform on contemporary distributional beliefs demonstrates that understanding political preferences requires recognizing how historical policies continue shaping current beliefs through their lasting effects on the local reference groups and economic structures that inform citizen judgment about inequality and economic opportunity.

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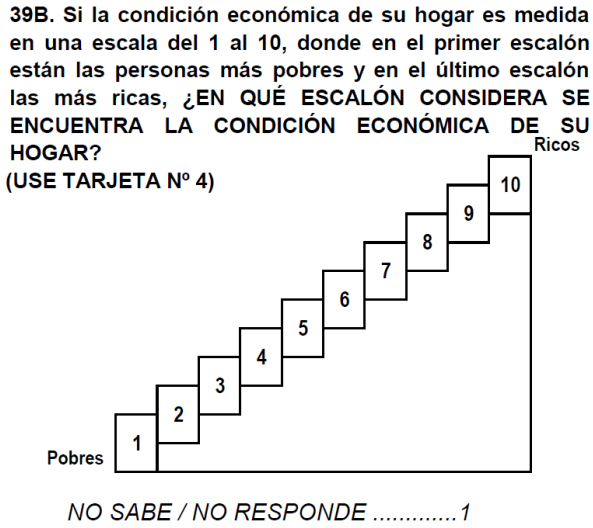
A.1 Appendix

Appendix Figure A1: Ladder card: income-distribution perception question



Note: Enumerators presented respondents with this printed 10-rung ladder and asked the question in Spanish: "¿En qué escalón considera que se encuentra la condición económica de su hogar?" (English translation: "In which decile of Peru's income distribution do you think your household is located?").