Appendix

1 Summary Statistics

Table A.1: Summary statistics

Statistic	N	Mean	St. Dev.	Min	Max
Economically Active Population in Agriculture (1961)	180	0.764	0.162	0.031	0.972
Rural Poverty (1961)	163	0.192	0.169	0.000	1.000
Rural Population Living in Haciendas (1961)	180	0.202	0.208	0.000	0.951
Elevation	180	2,910.810	1,115.409	1.359	4,922.819
Slope	180	7.884	3.296	0.038	15.632
Cultivated Land	180	5.921	9.609	0	68
Road Density	180	0.028	0.047	0.000	0.248
Population Density	180	0.483	1.967	0.007	25.135
Attainable Cotton Yield	174	84.983	200.956	0.000	727.000
Attainable Sugarcane Yield	174	971.452	2,234.661	0.000	7,686.562
Pct. Land Reformed	180	26.926	29.308	0.000	100.000
Poverty Headcount Ratio (2009)	180	50.163	20.961	4.500	87.800
Poverty Gap Index (2009)	180	15.866	10.007	0.700	40.700
Poverty Severity (2009)	180	6.882	5.412	0.200	22.500
Poverty Headcount Ratio (2013)	180	47.442	18.784	3.343	97.377
Primary School Enrollment	180	84.680	6.724	43.900	98.261
Secondary School Enrollment	180	50.380	14.466	9.091	79.382
Malnutrition Rate	180	0.378	0.141	0.052	0.728
Rural population (2007)	180	0.637	0.257	0.001	0.979
Registered Land Titles (1994)	180	0.229	0.178	0.002	0.889
Farms with Irrigation Systems (2012)	180	0.632	0.330	0.003	1.000
Electoral Competition (1985)	177	1.999	0.536	1.083	3.617
Left Vote Share (1985)	177	0.955	0.045	0.742	1.000
Immigration (1989-1993)	175	7.703	5.840	1.040	42.340
Immigration (2003-2007)	180	6.479	5.363	0.526	40.480
State Employees (1961)	166	55.434	218.630	2.000	2,558.000
Public water and sewer access (1993)	180	9.014	15.751	0.000	88.300
Public water and sewer access (2007)	180	35.533	24.988	0.000	89.080
Population without electricity (1993)	180	0.798	0.240	0.086	1.000
Population without electricity (2007)	180	0.405	0.241	0.028	1.000
Bank Density (2008)	180	0.00003	0.0001	0.000	0.001
Land Gini (1994)	179	0.758	0.144	0.379	0.990
Rural Conflict Deaths (1980-2000)	180	0.400	2.677	0	32
Turnout Rate (1980)	180	0.239	0.112	0.063	1.000
Electoral Competition (1980)	180	2.438	0.984	1.138	6.446
Mayoral Win Margin (2010)	146	0.100	0.096	0.001	0.562

2 Variable Description

Table A.2: Variable Description

variable label	source	explanation
Economically Active Population in Agriculture (1961)	Population and Housing Census, 1961	Percentage of economically active population that works in the agricultural sector.
Rural Poverty (1961)	Population and Housing Census, 1961	Percentage of houses built of natural and temporary materials acquired locally, such as stones, mud, and sticks.
Rural Population Living in Haciendas (1961)	Population and Housing Census, 1961	Percentage of rural dwellers living on haciendas, estancias, and fundos in settlements larger than 50 people.
Elevation	USGS	This is the mean municipality elevation obtained by overlaying a map of Peruvian districts in 1975 on 30 arc second (1 km) resolution elevation data included in the National Elevation Dataset by USGS. We downloaded from `https://earthexplorer.usgs.gov` all the dataset tiles under "ASTER GLOBAL DEM" that correspond to Peru (Last checked: May 18, 2018). We created a raster dataset based on such tiles and reprojected the compiled dataset to WGS 84 / UTM zone 18S projection system. We then created zonal statistics by district. The unit of measurement is meters.
Slope	USGS	We calculated slope using the slope tool in ArcGIS 10.5 based on the USGS elevation raster, where higher values mean higher slope. We then calculated zonal statistics by district. The unit of measurement is the degree.
Cultivated Land	Global Agro-Ecological Zones (GAEZ) dataset	The estimated share of cultivated land (majority), which includes both rain-fed and irrigated land. This variable is obtained by overlaying a district map with a raster from GAEZ and calculating majority zonal statistics. Values range from 0 to 100.
Road Density	Carreteras del Peru (1973). Touring y Automovil Club del Peru and Banco del Credito del Peru.	Road density for 1973 is obtained by adding the cumulative of the following road densities: afirmada (dirt road), pavimentada (paved road) and sin afirmado (unpaved road). The densities were obtained in the following way: (1) We intersected the road polyline with the 1975 district polygons, (2) We added surface information (the DEM from USGS previously mentioned), (3) We added up all the segments by unique polygon ID, (4) We joined the total length back to the polygons. Finally, we calculated road density by dividing the total length of the road per municipality polygon by the district polygon area. The measurement unit is kilometer by square kilometer.
Population Density	Population Census, 1972	Population in 1972 divided by district land area.
Attainable Cotton Yield	Global Agro-Ecological Zones (GAEZ) dataset	Attainable cotton yield in kilograms of dry weight per hectare under conditions of intermediate input for irrigated crops. This variable is obtained by overlaying a district map with a raster from GAEZ.
Attainable Sugarcane Yield	Global Agro-Ecological Zones (GAEZ) dataset	Attainable cotton yield in kilograms of dry weight per hectare under conditions of intermediate input for irrigated crops. This variable is obtained by overlaying a district map with a raster from GAEZ.
Pct. Land Reformed	Original data	The percent of district land area expropriated via land reform. These expropriations were identified in a comprehensive search through publications of the official government daily, El Peruano. By law, El Peruano published all supreme decrees, supreme resolutions, and ministerial resolutions that expropriated individual properties.
Poverty Headcount Ratio (2009)	INEI-Mapa de Pobreza Provincial y Distrital 2009. Published in 2010.	Poverty head count captures the percentage of all people living below poverty line in a given population.
Poverty Gap Index (2009)	INEI-Mapa de Pobreza Provincial y Distrital 2009	Poverty gap index estimates the depth of poverty by considering how far, on the average, the poor are from that poverty line.
Poverty Severity (2009)	INEI-Mapa de Pobreza Provincial y Distrital 2009	A weighted sum of poverty gaps where the weights are the proportionate gaps; this measure therefore takes into account inequality among the poor.
Poverty Headcount Ratio (2013)	INEI-Mapa de Pobreza Provincial y Distrital, 2013	Percentage of the population living in poverty.
Primary School Enrollment	Population Census, 2007	Net enrollment rate in primary school in 2007.
Secondary School Enrollment	Population Census, 2007	Net enrollment rate in secondary school in 2007.
Malnutrition Rate	Population Census and ENDES, 2007	Malnutrition, in all its forms, includes undernutrition (wasting, stunting, underweight), inadequate vitamins or minerals, overweight, obesity, and resulting diet-related noncommunicable diseases.
Rural population (2007)	Population Census, 2007	Percentage of people living in rural areas.
Registered Land Titles (1994)	Data are from the Peruvian Land Tilting and Registration Program (PETT), collected by Fort (2007).	Percentage of people with registered land titles in 1994.
Farms with Irrigation Systems (2012)	Agricultural Census, 2012	Percentage of agricultural plots that have irrigation.
Electoral Competition (1985)	Calculated using election results from the Jurado Nacional de Elecciones (1985)	This is an electoral competition index using election results from Jurado Nacional de Elecciones and Herfindahl index of competition based on 1985 elections (presidential vote).

Table A.2: Variable Description - *continued*

variable label	source	explanation
Left Vote Share (1985)	Calculated using election results from the Jurado Nacional de Elecciones (1985)	Percentage of people who voted for a leftist party in 1985 elections. Leftist parties include: Accion popular, El Frente, Izquierda Nacionalista, Izquierda Unida, El frente revolucionario de izquierda de Huanuco, Mariateguista para la Liberacion Nacional, Partido Aprista Peruano, Partido Socialista de los Trabajadores and Partido Socialista del Peru.
Immigration (1989-1993)	Population Census, 1993	Percentage immigrants from 1989-1993.
Immigration (2003-2007)	Population Census, 2007	Percentage immigrants from 2003-2007.
State Employees (1961)	Population and Housing Census, 1961	Number of individuals who worked for a government entity or agency and received a salary or commission for that work. Examples include members of the Civil Guard, Republican Guard, and Investigative Police.
Public water and sewer access (1993)	Population Census, 1993	Percentage of households with improved public water and sewer access.
Public water and sewer access (2007)	Population Census, 2007	Percentage of households with improved public water and sewer access.
Population without electricity (1993)	Population Census, 1993	Percentage of households without access to electricity.
Population without electricity (2007)	Population Census, 2007	Percentage of households without access to electricity.
Bank Density (2008)	Finclusion Lab	Bank density is obtained by dividing the number of financial enterprises in a district by the population size.
Land Gini (1994)	Calculated from the 1994 agricultural census	Gini of landholdings.
Rural Conflict Deaths (1980-2000)	Truth and Reconciliation Commission (CVR) 2003 report	Number of deaths and disappearances in civil conflict.
Turnout Rate (1980)	Jurado Nacional de Elecciones	Pecentage of total population that cast votes in 1980 elections.
Electoral Competition (1980)	Calculated using election results from the Jurado Nacional de Elecciones	Herfindahl index of competition based on 1980 elections (presidential vote).
Mayoral Win Margin (2010)	Calculated using election results from the Jurado Nacional de Elecciones	Vote margin between mayoral winner and second-place candidate.

3 Additional details on creation of Agrarian Reform Zones

This section supplements the discussion of the operation of Agrarian Reform Zones and the consequences for land reform.

3.1 Operational Locations of Agrarian Zone Offices and Their Consequences

Figure A.1 lists where each Agrarian Zone was centered when SIPA first created them. These locations are where land reform offices were later installed when Agrarian Zones were converted to Agrarian Reform Zones. As the paper discusses, these offices often operated out of department capitals, where they interfaced with local bureaucracies. This in turn generated unevenness in land reform implementation. Whereas districts inside the core department where the agrarian zone (and regional land reform office) was centered received substantial attention from the Ministry of Agriculture for land reform, peripheral districts outside of these core areas got "trapped" in zones far from land reform offices, therefore reducing their degree of exposure to land reform.

Figure A.1: Operational Locations of Main Agrarian Zone Offices

Zona Agraria I	- Piura	Zona Agraria VII	- Tacna
Zona Agraria II	- Lambayeque	Zona Agraria VIII	- Iquitos
Zona Agraria III	- Trujillo	Zona Agraria IX	- Tingo María
Zona Agraria IV	- Lima	Zona Agraria X	- Huancayo
Zona Agraria V	- Ica	Zona Agraria XI	- Cuzco
Zona Agraria VI	- Arequipa	Zona Agraria XII	- Puno

Source: Servicio de Investigación y Promoción Agraria. 1963. *Organización, Funciones y Dependencias*. Lima, Peru: Ministerio de Agricultura, p. 10.

Officials within the Ministry of Agriculture at the National Center for Training and Research for the Agrarian Reform (CENCIRA) did a study of Agrarian Zones at the outset of the land reform and many officials raised deficiencies with the design. Among several functions, CENCIRA headed the Comité Zonal de Capacitación, which did the planning for land reform implementation within agrarian zones. CENCIRA also called a conference of directors of the Agrarian Zones to hear their concerns. They reported that their personnel and resources at the time were insufficient to do a thorough job with land reform and that, furthermore, they did not have the resources to train administrators in far-flung areas that were directly involved in doing land reform (CENCIRA 1971). They therefore correctly anticipated the consequences of zonal delimitation: that the Ministry of Agriculture would dedicate the bulk of their attention and resources to core areas, whereas in peripheral districts, peasants would have little chance of interacting with their agrarian reform zone officials. Although they sought more time and resources to devise a better implementation plan, they were denied by the military command, which sought to implement the reform rapidly.

The government admitted unevenness in agrarian reform implementation in 1971 at a conference of directors of the Agrarian Reform Zones in Lima but defended the choice to

move ahead rapidly. This was embodied in a speech given by Efraín Ruíz Caro, the early Director of Promotion and Diffusion of Agrarian Reform, entitled "The Agrarian Policy of the Revolutionary Government" (CENCIRA 1971). Ruíz stated that "[A]lthough the Agrarian Reform is not progressing at the same speed in all departments, this reflects the necessity to consolidate, for example, the application of the Law...For human and technical reasons, as well, it is necessary to observe an order of priority."

3.2 Operation of Agrarian Reform Zones

Data on budgeting and personnel allocation provide evidence that the early concerns of CENCIRA and other Ministry of Agriculture officials about the unevenness of land reform implementation within Agrarian Reform Zones came to pass. An agricultural sector survey of Peru by the World Bank in 1975 provides data on Ministry of Agriculture expenditures on land reform taken from the Oficina General de Administración of the Ministry of Agriculture. These data, presented below in Figure A.2, cover the period 1971-1972 and 1973-1974, which includes many of the most intense years of land reform, including the intense years in Zone 3. Despite CENCIRA's early concerns over whether there was adequate funding to train and place staff in peripheral areas within Agrarian Reform Zones, both operating and investment expenditures were even lower than budgets for 1971-1972 across all zones. In Zone 3, operating expenditures were roughly 5% smaller than what was budgeted and investment expenditures were less than 50% of what was budgeted. The Zone 3 operating budget for the 1973-1974 period was then even lower than for the 1971-1972 period, as occurred for many zones.

Figure A.2: Zonal Allocation of Ministry of Agriculture Expenditures During Land Reform

Table H.3: MINISTRY OF AGRICULTURE EXPENDITURE, 1971/72 AND 1973/74
(Millions of current soles)

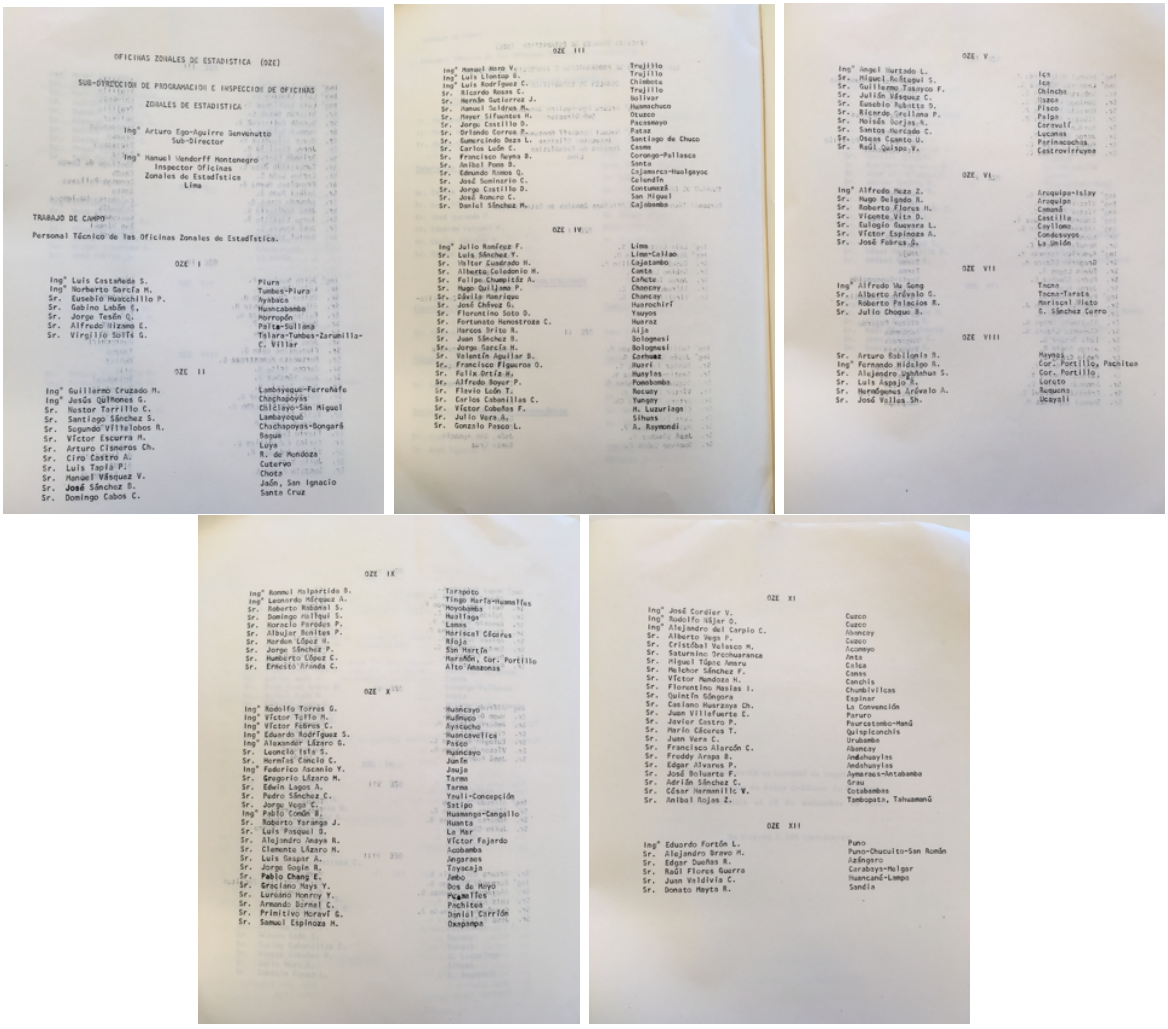
	Operating Expenditure			Investment Expenditure			Total	
	Budget4/ 1971/72	Actual 1971/72	Budget 1973/74	Budget4/ 1971/72	Actual 1971/72	Budget 1973/74	Actual 1971/72	Budget 1973/74
Central Offices	1,292	1,213	1,953	3,125	999	844	2,212	2,813
Planning and central Administration	588	574	1,425	79	70	93	644	1,518
Engineering and Projects	,	,	91	.	.	295		386
Water and Irrigation	136	130	48	2,497	790	196	920	244
Agrarian Reform and Settlement	197	181	105	13	17	10	198	115
Production Promotion	177	150	151	439	68	132 L5	218	283 L5
Marketing	84	76	91	30	8	36	84	127
Forestry and Wildlife	29	27	20	40	26	75	53	111
Research	80	75	22	27	20	7	95	29
Agrarian Zones	1.771	1.692	1,784	853	506	1.010	2.198	2,794
Zone I, Piura	203	198	194	90	61	89	259	283
Zone II, Chiclayo	235	216	210	107	57	144	273	354
Zone III, Huaraz	162	157	157	14	6	54	163	211
Zone IV, Lima	160	147	180	7	5	38	152	218
Zone V, ICa	124	119	145	20	14	88	133	233
Zone VI, Arequipa	104	100	113	150	65	148	165	261
Zone VII, Tacna	49	46	60	37	31	49	77	109
Zone VIII, Iquitos	61	60	65	17	11	47	71	112
Zone IX, Tarapoto	216	204	169	319	199	188 L5	403	357 L5
Zone X, Huancayo	190	185	206	55	32	56	217	262
Zone XI, Cuzco	155	153	161	13	6	60	159	221
Zone XII, Puno	112	107	124	24	19	49	126	173
Research ReaLons 2/	.	.	192	.	.	137	.	329
Lima			81			32		113
Northern			51			55		106
Eastern			32			25		57
Southern			28			25		53
Special Projects 3/ 1	,	_		.	.	4.039		4.039
Majes-Sihuas						309		309
Chira-Piura						2,220		2,220
Tinajones						662		662
Small and Nedium Irrigation						620		620
Marketing Infrastructure						228		228
Financial PaNments	_	.	_	982	1,028	746	1.028	746
Expropriation-Agricultural Reform				683	689	600	689	600
Capital Transfers				255	295	146	295	146
Debt Service				44	44		44	
Subtotal	3,062	2,905	3,945	4,960	2,533	6,776	5,438	10,721
Food Aid Office 6/	35	32	.	12	10	,	42	
Total	3,097	2,937	3,945	4.972	2,543	6,776	5,480	10,721

1/ This office was created in the 1973 reorganization; its functions mainly belonged to the Directorate of Water and Irrigation in 1971/72
2/ These were created in the 1973 reorganization, before that research was an administratively centralized activity
3' These were shown as part of central offices in 1971 72 (mainly Directorate of Water and Irrigation).
4/ Budget in the final version, after various reprogrammings during the fiscal period.
5l The amounts shown are somewhat lower than in the original budget, as certain programs were transferred to EPSA during 1973 and the assignations correspondingly reduced.
6/ This office was set up as a semi-autonomous agency in 1973 and thus no longer is part of the Ministry of Agriculture.
Source: Data from Ministerio de Agricultura. Oficina General de Administracion.
June 6, 1974

Source: World Bank. 1975. *Agricultural Sector Survey*: Peru. Washington, D.C.: World Bank Group.

Agrarian reform personnel were also disproportionately stationed in core areas of Agrarian Reform Zones. Land reform offices were typically set up in department capitals and the chief personnel and field officers operated out of these offices. This was also true of Zone 3. Although data on the allocation and operation of Ministry of Agriculture personnel from the time are hard to come by, we collected data on where personnel were stationed who were charged with collecting agrarian reform statistics - a fundamental bureaucratic task for evaluating reform progress and agricultural production. Lists of the location of these personnel are provided below for the year 1971. It demonstrates that the most important and highly trained personnel – the engineers - were stationed in the department capitals of the core areas of Agrarian Reform Zones. In Zone 3, two out of the three chief zonal agro-engineers were based in Trujillo. The third was based in Chimbote, a coastal city in Ancash bordering the Valley of Santa and La Libertad department. None were located in Ancash's department capital of Huaraz, which was over 300 kilometers away and a punishing journey into the highlands.

Figure A.3: Location of Ministry of Agriculture Statistics Personnel by Agrarian Reform Zone



OFICINAS ZONALES DE ESTADISTICA (OZE)

SUB-DIRECCION DE PROGRAMACION E INSPECCION DE OFICINAS ZONALES DE ESTADISTICA

Ing° Arturo Ego-Aguirre Sanvenutto
Sub-Director

Ing° Manuel Vandorff Montenegro
Inspector Oficinas Zonales de Estadística
Lima

TRABAJO DE CAMPO

Personal Técnico de las Oficinas Zonales de Estadística.

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Sr. Fortunato Hanostroza C.	Huaraz
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Sr. Horacio Paredes P.	Lamas
Sr. Albujar Benites P.	Moriscal Cáceres
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Sr. Primitivo Moravi G.	Daniel Carrión
Sr. Samuel Espinoza M.	Oxapampa

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Sr. Edgar Alvarez P.	Andahuaylas
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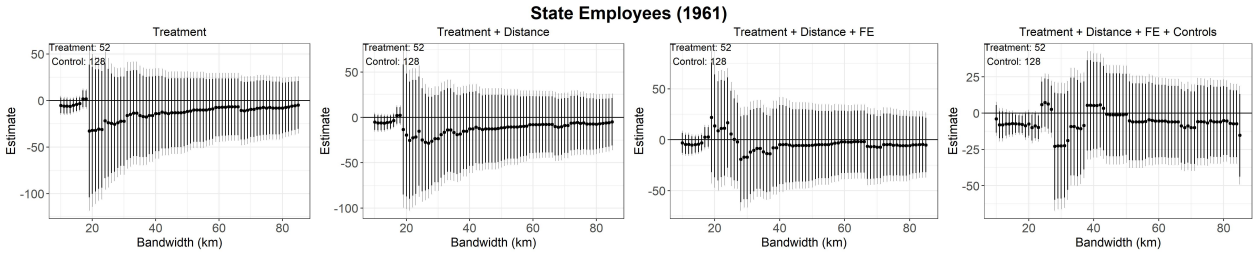
Sr. Juan Valdivia C.	Huancané-Lampa
Sr. Donato Mayta R.	Sandia

Source: Oficina de Estadística. 1971. *Estadística agraria Perú.* Lima, Peru: Ministerio de Agricultura.

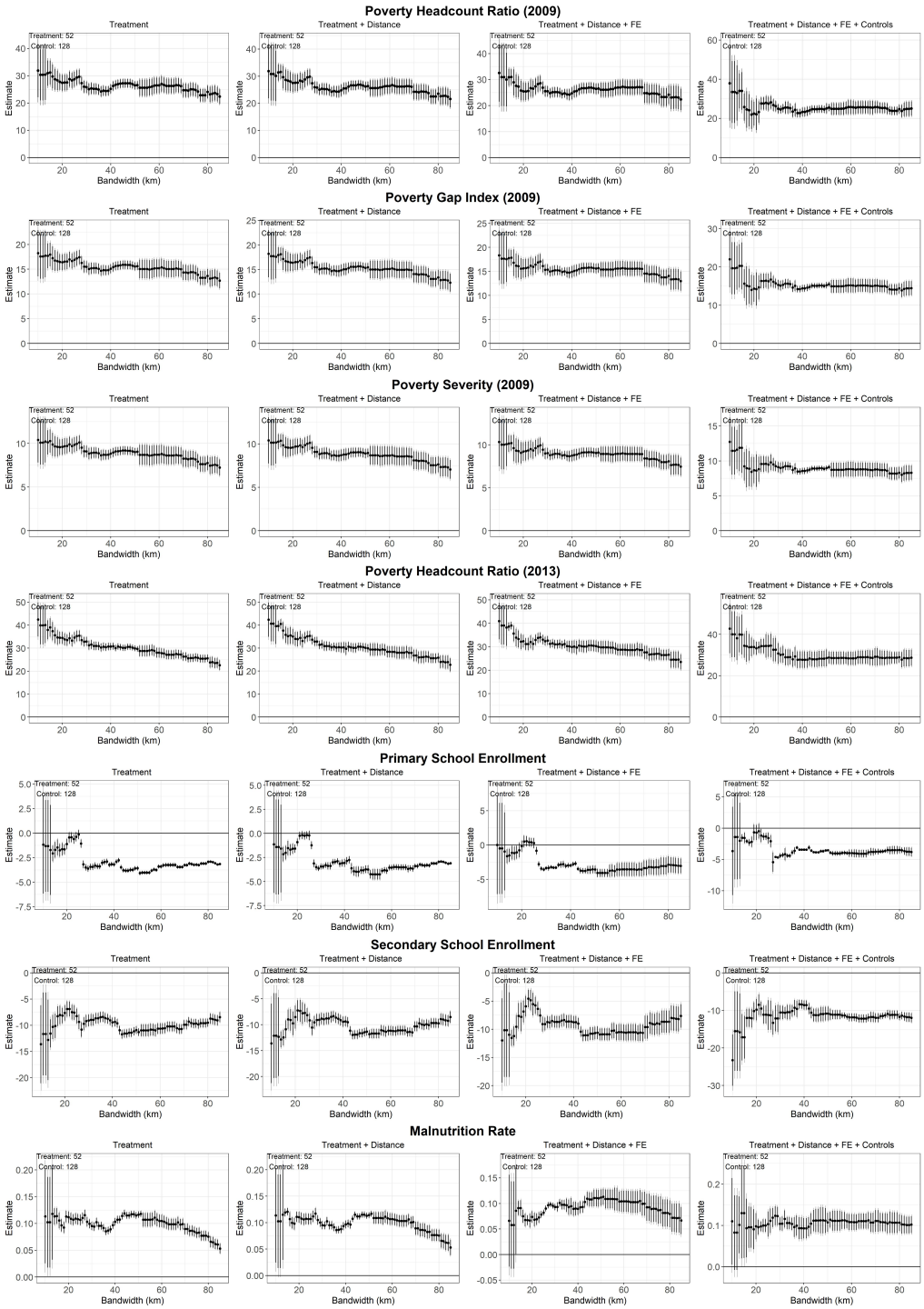
4 State Capacity Balance Tests Prior to Land Reform

Figure A.4: State Capacity



5 Main outcomes using one-degree cell fixed effects and standard errors clustered by department

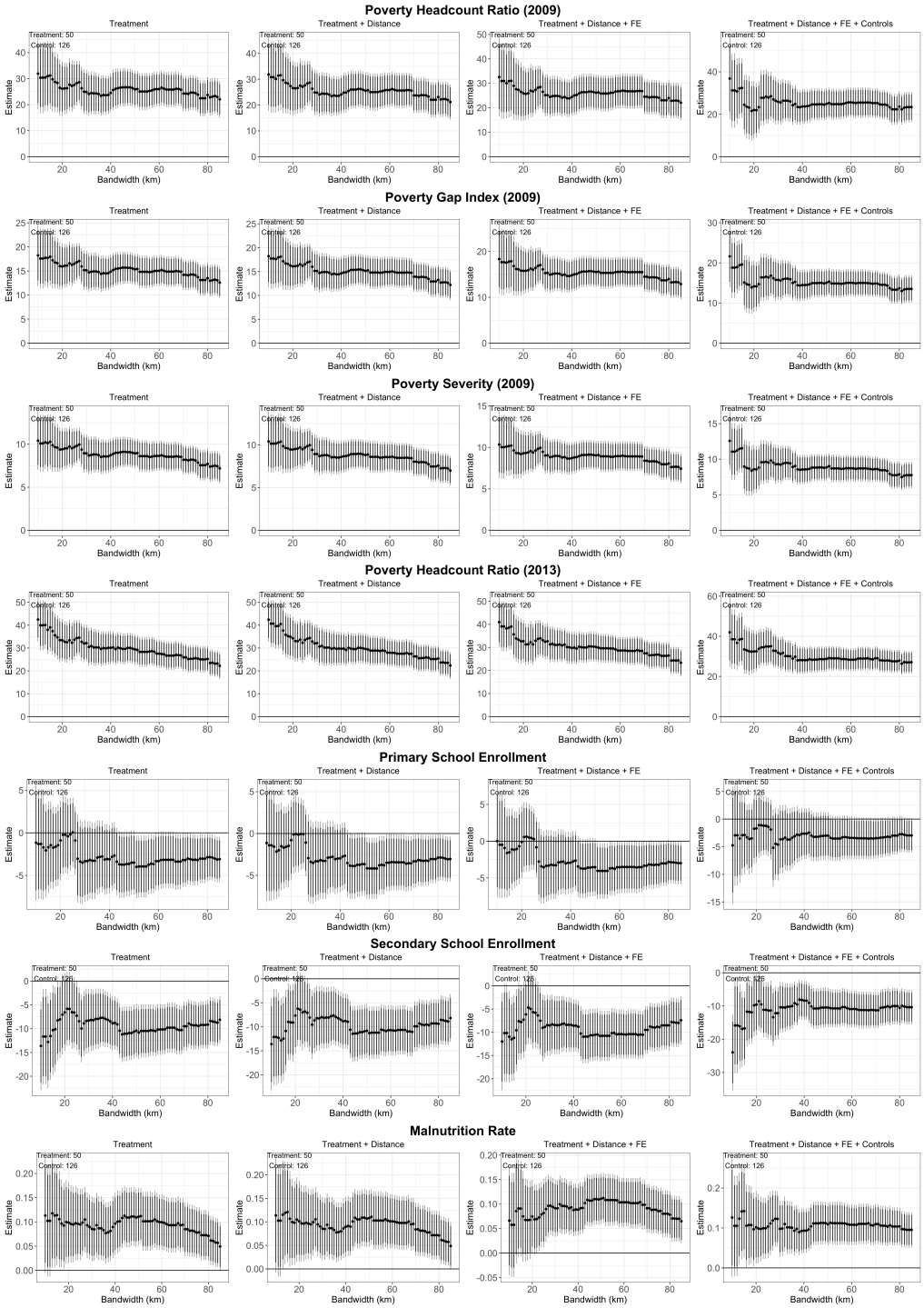
Figure A.5: Development Outcomes



6 Poverty outcomes excluding districts with more than 25,000 inhabitants

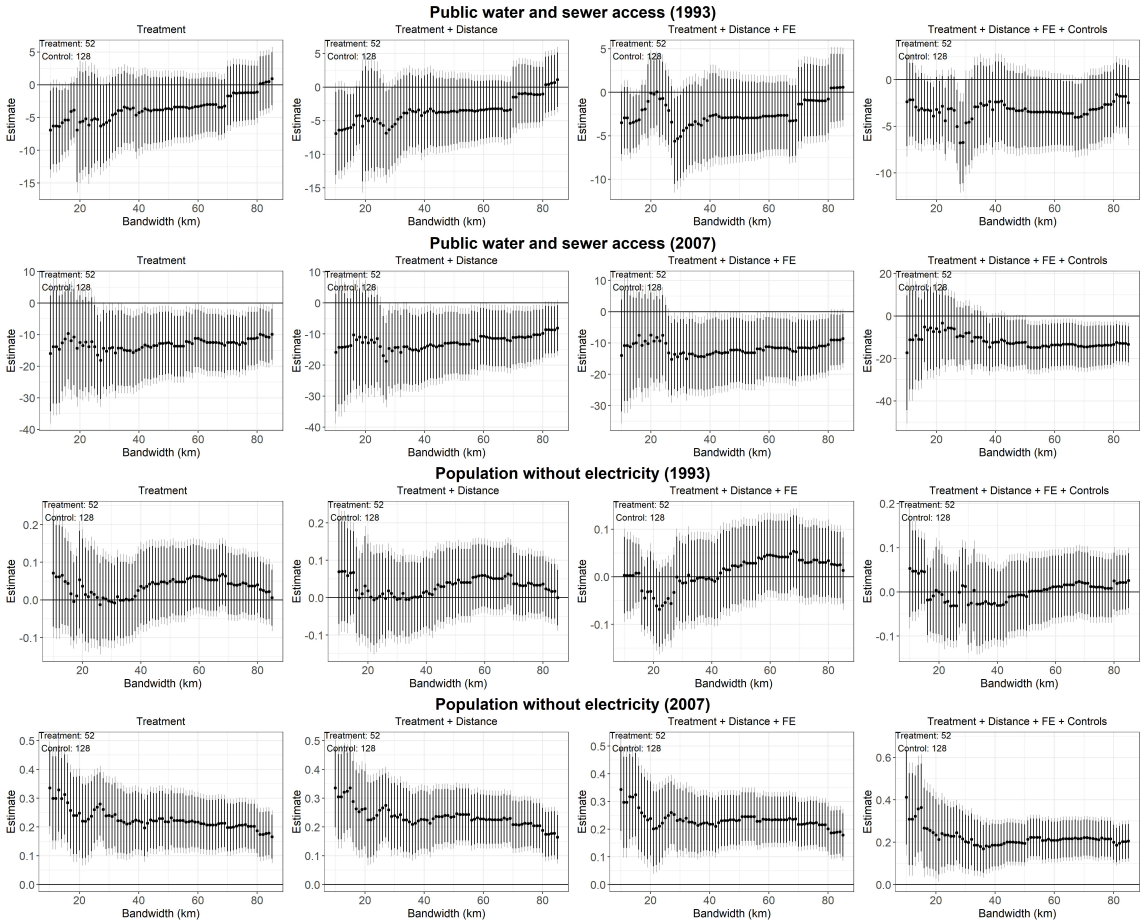
This section analyzes the robustness of the results to dropping districts that have more than 25,000 inhabitants. There are five of these districts, and they are more urban districts where land reform was relatively less important economically.

Figure A.6



7 Other outcomes: Public Goods Provision

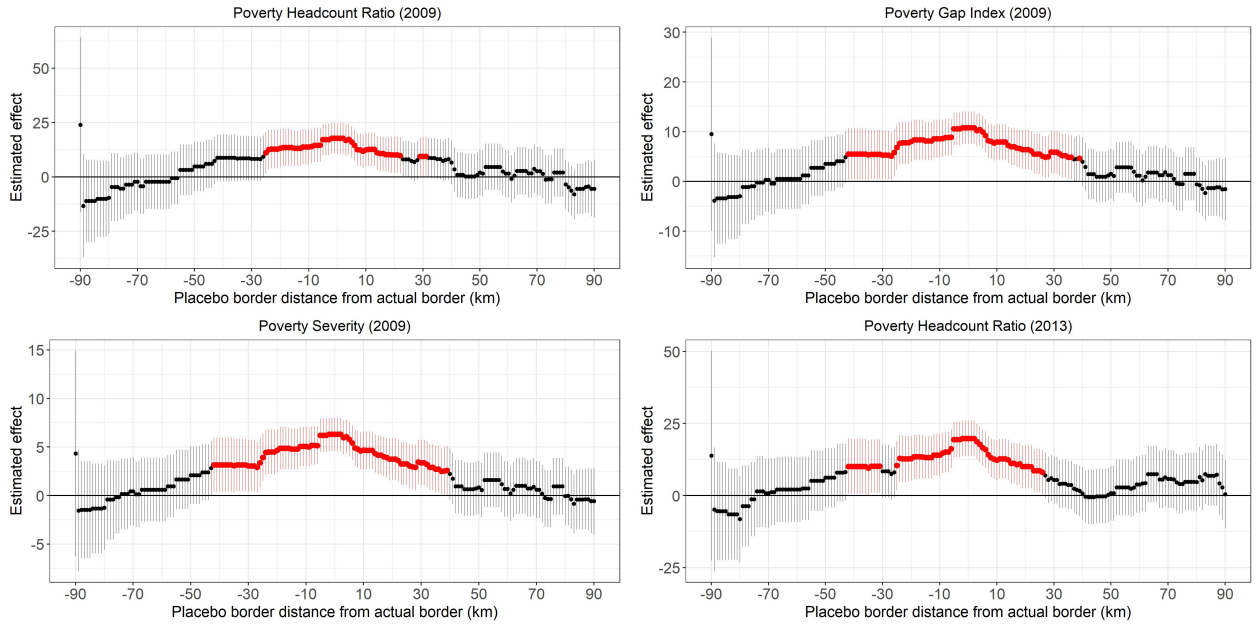
Figure A.7



8 Placebo Tests

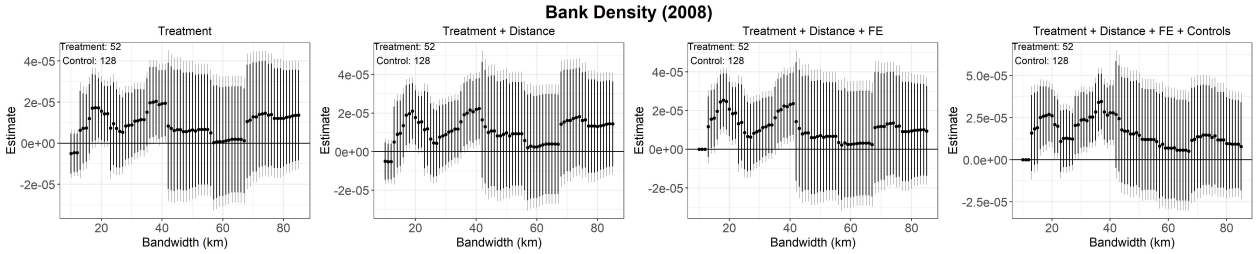
In a set of falsification tests, we created "placebo" boundaries at intervals of 1 kilometer from the actual Agrarian Reform Zone core/periphery border and then reran the local linear regressions. This approach is similar to that used by Lee & Schultz (2012). The results, presented in Figure A.8, show that for nearly all of the regressions, and for all of those far from the true border, a "placebo" border in a different location will not return statistically significant results. The results generally show that placing the border in another arbitrary location generally returns results that are not distinguishable from zero.

Figure A.8



9 Bank Density

Figure A.9



10 Additional Alternative Explanations

Ineffective or Quickly Reversed Land Reform Treatment

One alternative explanation is that the land reform did not significantly improve the livelihood of beneficiaries in the short term. It may have been captured or may have been ineffective such that land reform "treatment" was really no treatment at all and the findings are picking up some unaccounted for relationship that is correlated with land reform. The literature casts doubt on this. Peru's land reform was massively redistributive in the short term (Albertus, 2015). And while there are accounts of elites attempting to avoid the reform by subdividing their plots – indeed, this was legal for a short period – the regime successfully cracked down on most of this behavior and made it illegal ex post (Mayer, 2009). Finally, the military regime that implemented the reform did so in an orderly way that followed strict processes (Cleaves & Scurrah, 1980); there are therefore few if any accounts of insider regime elites themselves effectively capturing the reform and doling out properties to their cronies. Given the scale of the expropriated haciendas and large resident workforces, such activities would have easily been noticed.

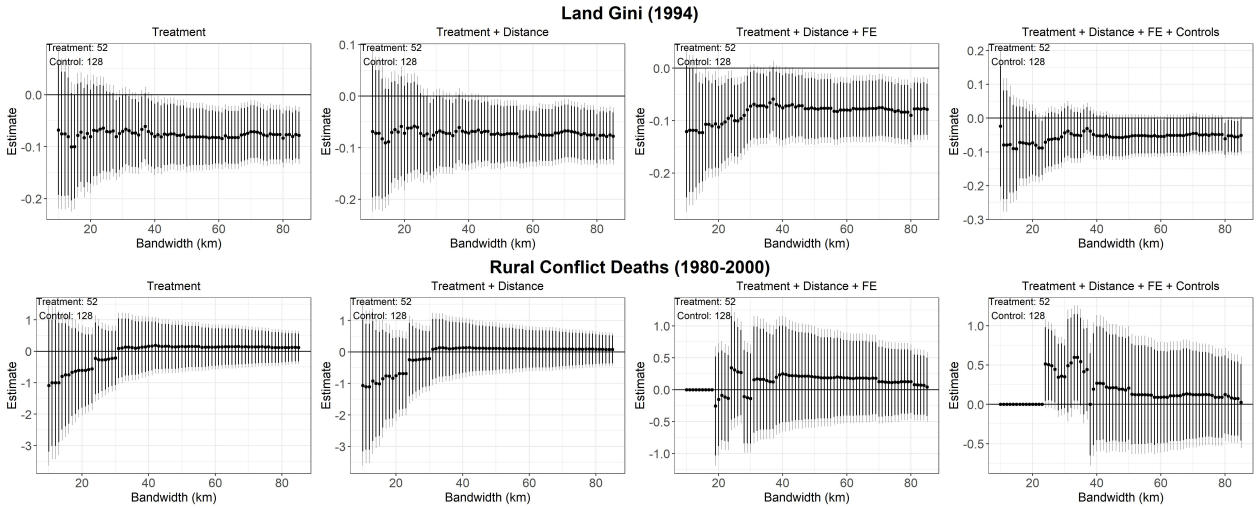
The upshot is that even by 1994, the first agrarian census after the land reform, landholding inequality remained substantially lower in the areas impacted most intensely by the land reform. The first row of Figure A.10 displays the results for the district-level Gini coefficient of land inequality in 1994. The estimated average effect is about a ten percent decrease in inequality in core districts, a large effect that represents about a half of a standard deviation in the land inequality variable.

Land Reform and Conflict

An additional alternative explanation is exposure to conflict. The end of Peru's land reform coincided with the onset of a brutal twenty-year insurgency driven by the Shining Path. The conflict ultimately killed roughly 70,000 people and resulted in many more human rights violations (Comisión de la Verdad y Reconciliación (CVR), 2004). If the land reform catalyzed more violence and if more violent areas suffered greater devastation and lower investment due to insecurity and an absence of state personnel, then this channel could account for the observed relationship between land reform and higher poverty later on.

Most scholars, however, hypothesize that land reform should mitigate unrest by alleviating grievances over landholding and creating smallholders that have a stake in supporting the status quo over radical alternatives (Huntington, 1968; Wood, 2003). This outcome may nonetheless have been complicated in Peru due to local factors such as the indiscriminate counterinsurgency tactics employed by the military in the first half of the conflict (Mason, 1998). We test the possibility that land reform operated through conflict to impact development by examining rural conflict deaths over the course of Peru's internal conflict. Data on conflict deaths are from Peru's Truth and Reconciliation Commission, which rigorously and systematically compiled what are widely viewed as the most comprehensive accounts of Peru's internal conflict. Figure A.10 indicates scant evidence that the land reform generated greater local conflict intensity; if anything, conflict deaths declined with greater land reform exposure.

Figure A.10


Land Gini (1994)
Treatment
Treatment + Distance
Treatment + Distance + FE
Treatment + Distance + FE + Controls
Treatment: 52
Control: 128
Estimate
Bandwidth (km)
Rural Conflict Deaths (1980-2000)

11 Recapturing Lost Potential? Land Titling in Peru in the 1990s-2000s

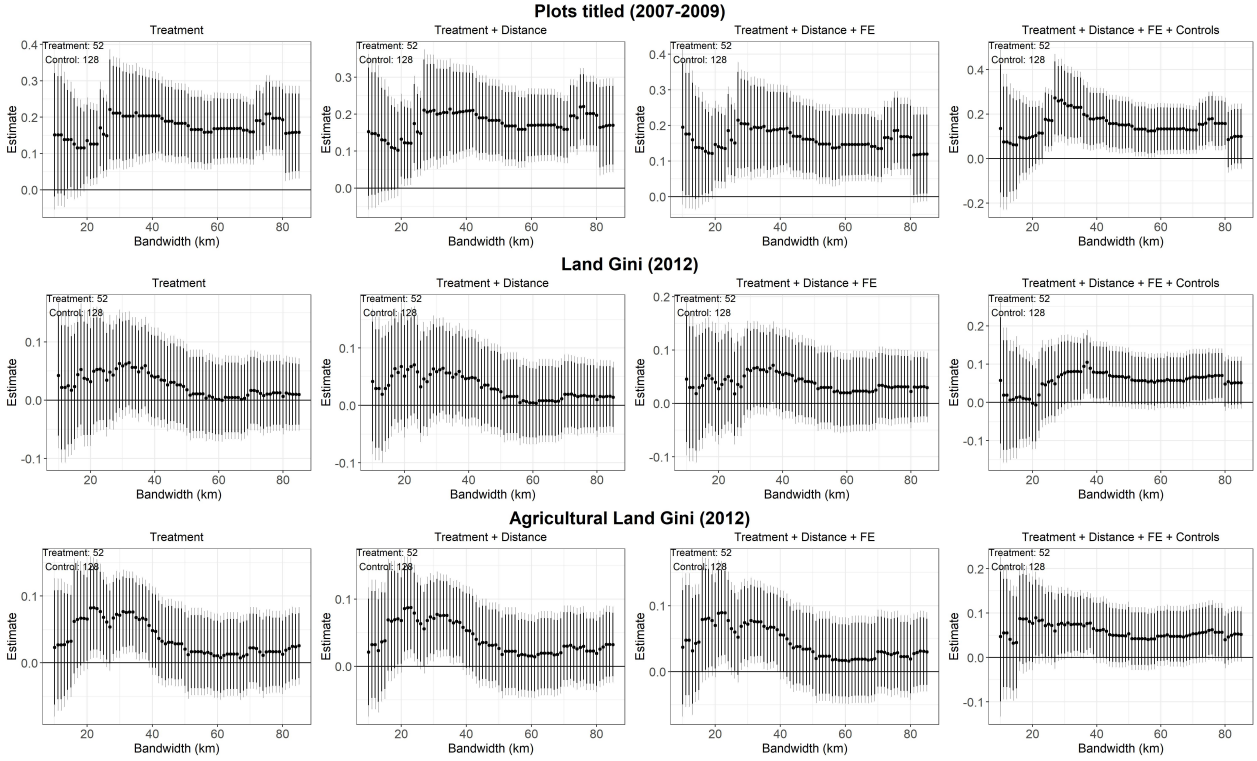
One channel that worked to stunt the development potential of land reform in Peru was the withholding land titles from beneficiaries. But can the extension of more complete property rights to former land reform beneficiaries through land formalization and titling programs help to recapture the development potential of land reform?

Peru's experience demonstrates that early choices in land reform program design can have long-term consequences that are not easily reversed. Encouraged by the World Bank and other international actors, Peru embarked on a massive land titling and formalization effort in the 1990s and 2000s. Efforts at land formalization began with the 1992 creation of the Special Land Titling and Cadastre Project (PETT). PETT was charged with formalizing rural land rights, including mapping land, creating a land cadaster, and issuing and registering titles. It took time, however, for PETT to make substantial progress. The first row of Figure A.10 demonstrates that, if anything, land formalization rates in 1994 remained lower in areas that experienced greater land reform.

Peru made substantial progress on land formalization by the 2000s. PETT had provided formal titles to 1.9 million plots of rural land by 2007 (USAID/Fort). Its successor agency, Cofopri, doubled down on this progress with a flurry of additional titling. This significantly impacted the region of focus in this paper: Figure A.11 demonstrates that land titling from 2007-2009 was greater in the land reform core region of former Agrarian Zone 3.

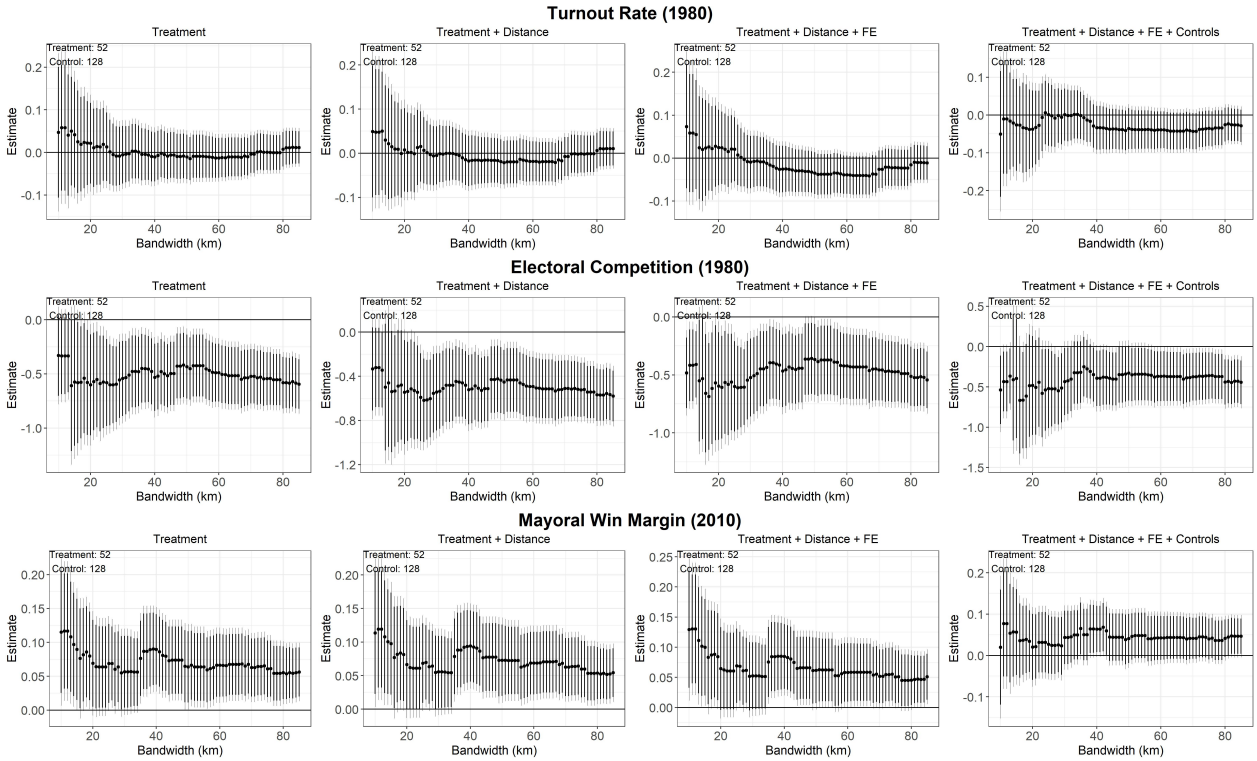
This land titling effort, however, came too late to capture the potential economic gains of a more egalitarian distribution of land. By the time of the 2012 agricultural census, which was the subsequent census to the 1994 agricultural census, landholding inequality patterns in former Agrarian Zone 3 had changed significantly. By this point in time land inequality was actually slightly higher in districts of the core of former Agrarian Zone 3 (see Figure A.11). Although district-level data do not exist because of initial informality and incomplete property registers, many individuals likely sold or transferred their land between the mid-1990s and mid-2000s. There were also economic shocks during this period that could have encouraged distressed smallholders to sell their land.

Figure A.11


Plots titled (2007-2009)
Land Gini (2012)
Agricultural Land Gini (2012)
Treatment
Treatment + Distance
Treatment + Distance + FE
Treatment + Distance + FE + Controls
Treatment: 52
Control: 128
Estimate
Bandwidth (km)

12 Additional election results

Figure A.12



13 Keele and Tiutiunik (2015) Procedure

This section tests the robustness of our results to an alternative estimation approach that follows Keele and Titiunik (2015). In this approach, we first use matching to balance the sample on a set of geographic covariates before we estimate the main models. Although this approach discards observations, it ensures that each treated unit is paired with a control unit that is geographically proximate with respect to both latitude and longitude.

To implement this design, we trim the sample to the set of districts within 85km of the agrarian zone core/periphery border and then use nearest neighbor matching without replacement. Units were matched on geographic distance to the border line, latitude and longitude, and the main covariates from Figure 5:, elevation, slope, cultivated land, road density, population density, attainable cotton yield, and attainable sugarcane yield.

The following graphs first display balance statistics followed by results for several bandwidths ranging from 10 to 85km using the revised sample.

Figure A.13: Covariate Balance Tests Using Keele and Titiunik Procedure

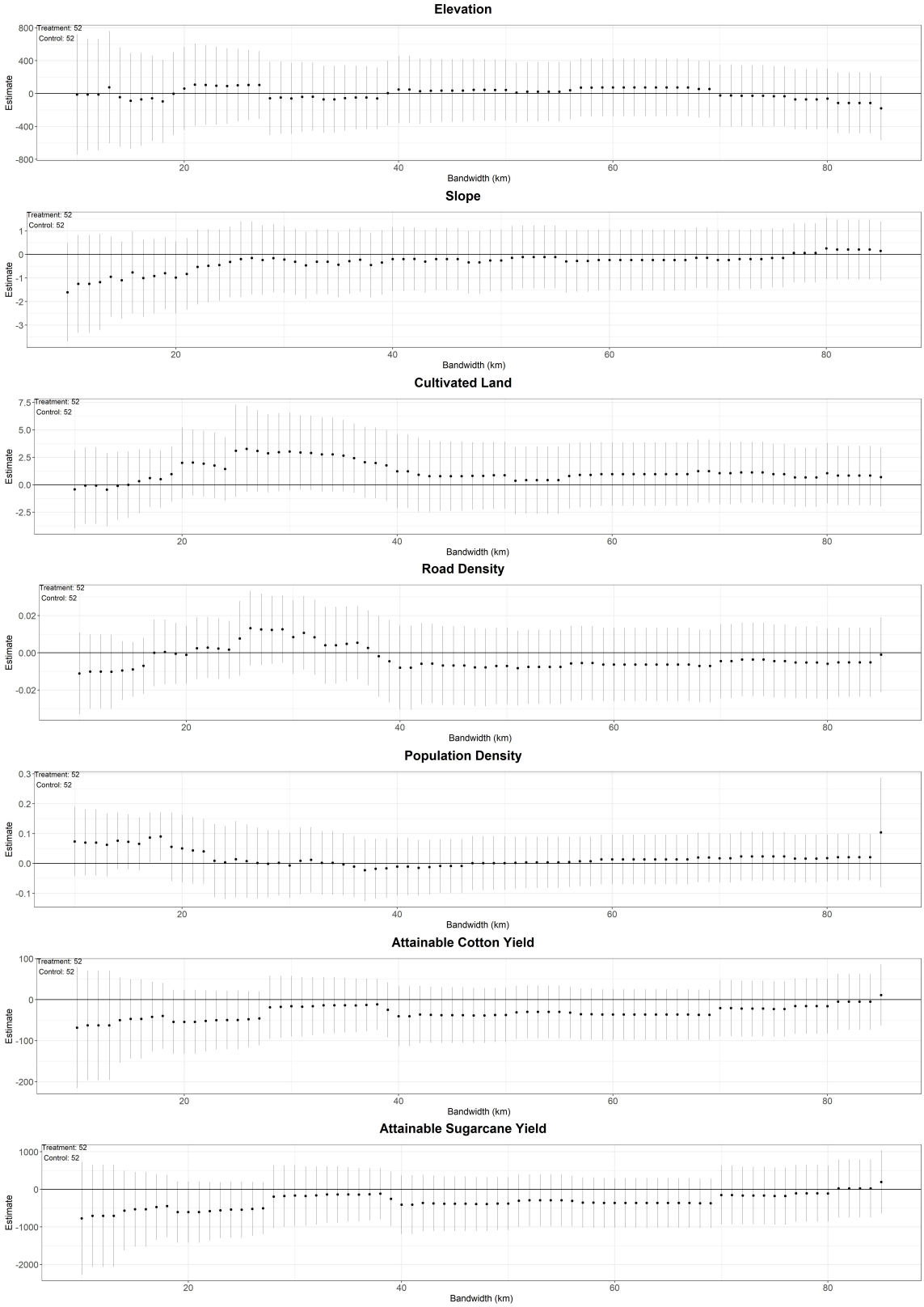
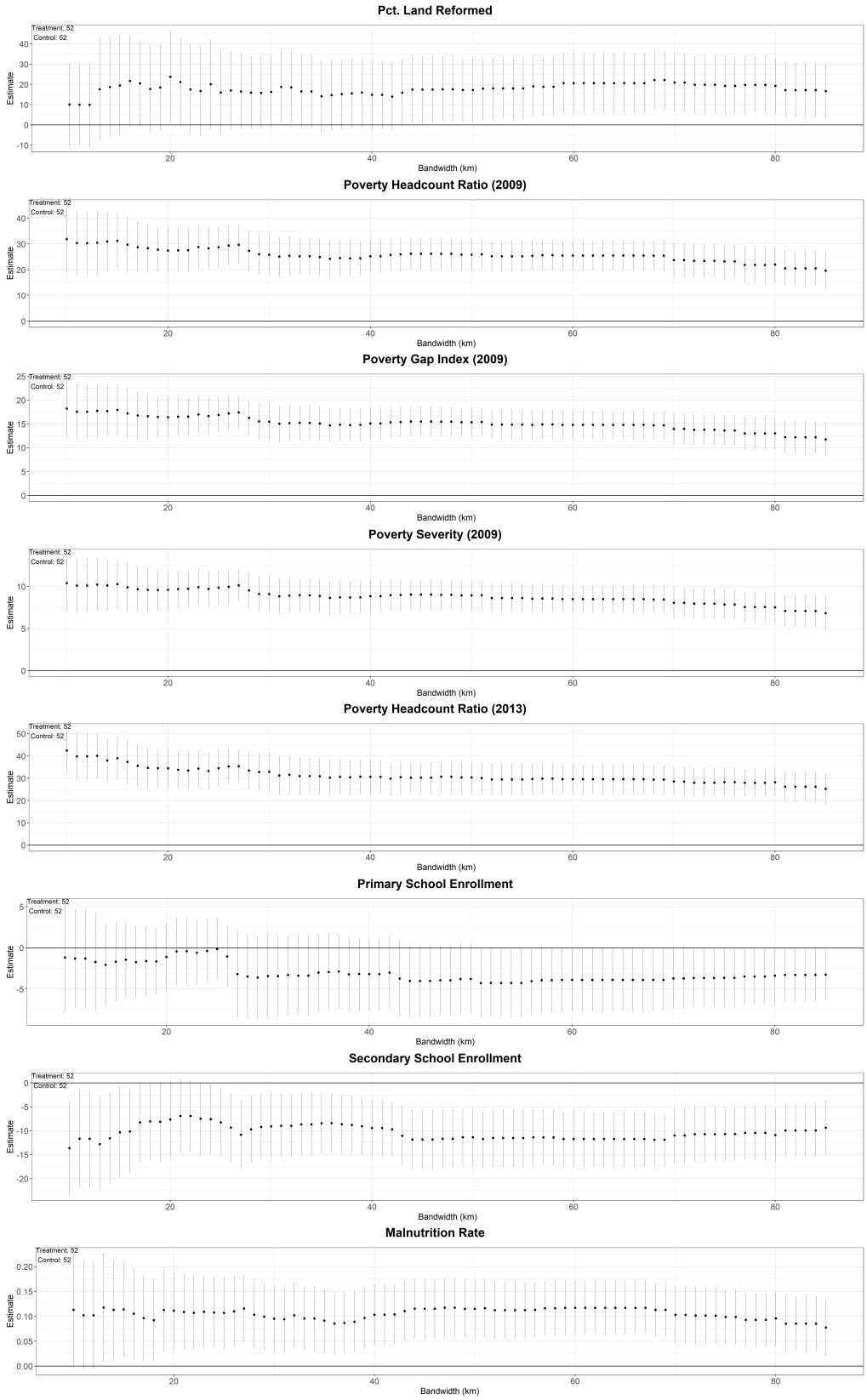


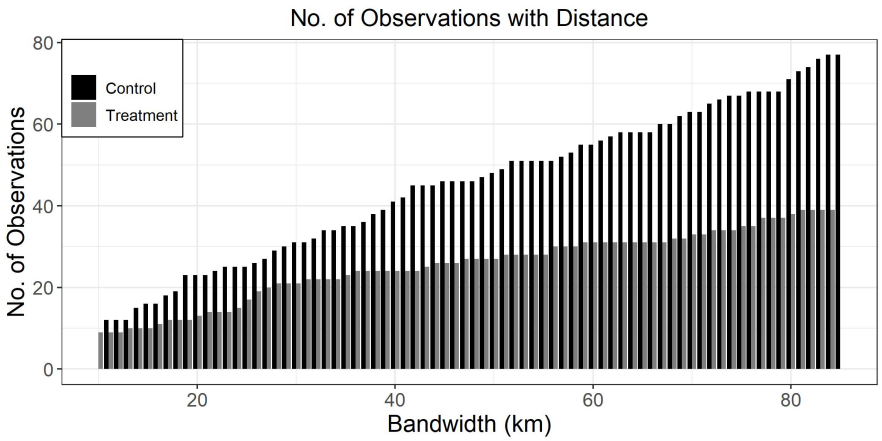
Figure A.14: Land Reform and Main Outcomes Using Keele and Titiunik Procedure



14 Number of Observations with Distance from Core/Periphery Boundary

The following graph depicts the number of observations for the treatment and the control group for every bandwidth distance from the demarcation line between the core and the periphery.

Figure A.15



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