THE PERSISTENT EFFECTS OF PERU'S MINING MITA

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The Role of Historical Institutions

- The author examine the long-run impacts of the mining mita, a forced labor system instituted by the Spanish government in Peru and Bolivia in 1573 and abolished in 1812.
- Studies find quantitative support for an impact of history on current economic outcomes **but have not focused on channels of persistence.**
- The paper use variation in the assignment of an historical institution in Peru (Mita) to identify land tenure, public goods and Market Participation as channels through which its effects persist.

The Role of Historical Institutions (Cont)

- The mita required over 200 indigenous communities to send one-seventh of their adult male population to work in the Potosí silver and Huancavelica mercury mines

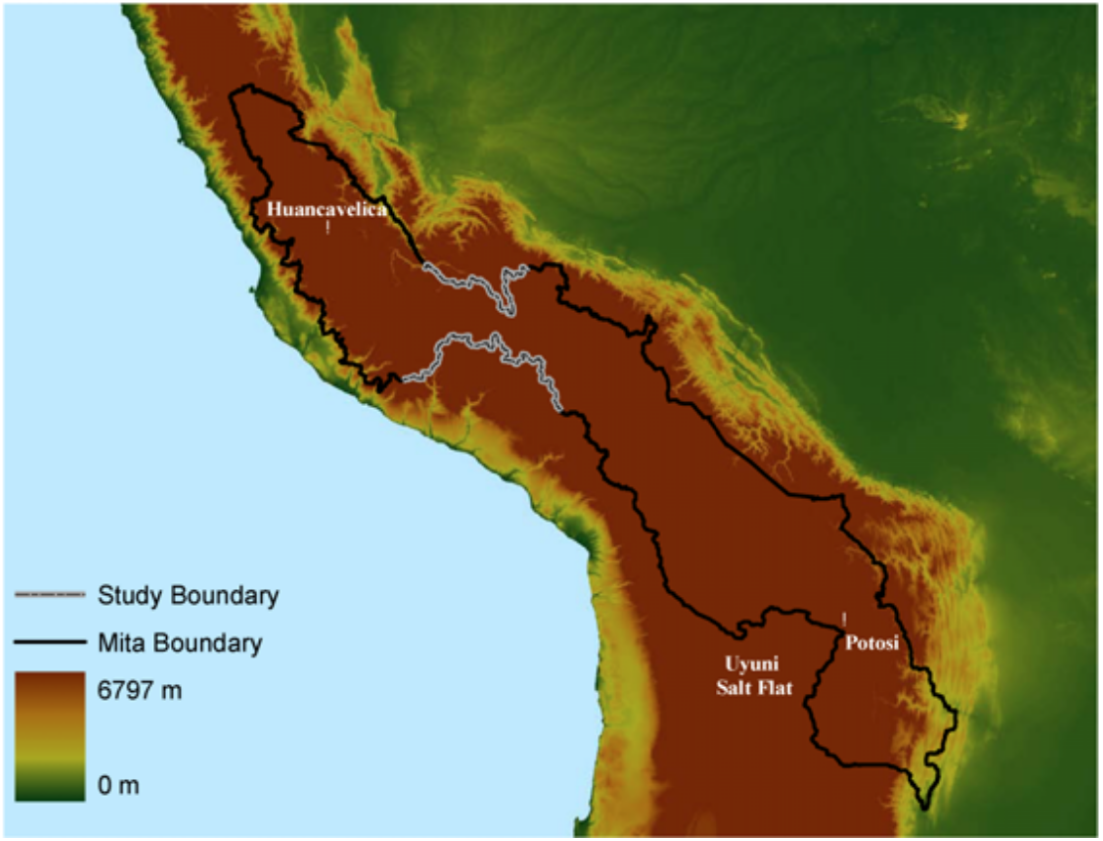

FIGURE 1.—The *mita* boundary is in black and the study boundary in light gray. Districts falling inside the contiguous area formed by the *mita* boundary contributed to the *mita*. Elevation is shown in the background.

The Role of Historical Institutions (Cont)

- The paper estimate that a long- run mita effect lowers equivalent household consumption by around 25 % in subjected districts.
- The paper also shows that the mita's persistent impact increases childhood stunting by around 6 percent- age points in subjected districts.
- **This support the well known hypothesis that extractive historical institutions influence long-run economic prosperity.**

3 Channels of persistence

- The haciendas developed primarily outside the mita catchment.
- The mita effect lowered education historically, and today mita districts remain less integrated into road networks.
- There are evidence that a long-run mita impact increases the prevalence of subsistence farming.

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The Mining Mita

- The Potosí mines, discovered in 1545, contained the largest deposits of silver in the Spanish Empire, and the state-owned Huancavelica mines provided the mercury required to refine silver ore.
- The mita assigned 14,181 conscripts from southern Peru and Bolivia to Potosí and 3280 conscripts 5 from central and southern Peruto Huancavelica.
- Men in subjected districts were supposed to serve once every 7 years.

The Mining Mita (cont)

- Historical documents and scholarship reveal two criteria used to assign the mita: distance to the mines at Potosí and Huancavelica and and the belief that only highland peoples could survive intensive physical labor in the mines, located at over 4000 meters.

- When silver deposits were depleted, the mita was abolished in 1812, after nearly 240 years of operation.

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Data

Since the paper examine the mita's long-run impact on economic development by testing whether it affects living standards today, the data used was:

- A list of districts subjected to the mita and matched to modern districts as detailed in the Supplemental Material.

For the measure of living standards two independent data sets are used:

- 2001 Peruvian National Household Survey - collected by the National Institute of Statistics.
- Microcensus data set, obtained from the Ministry of Education, that records the heights of all 6- to 9-year- old school children in the region.

The basic model

$$c_{idb} = \alpha + \gamma mita_d + X_{id}\beta + f(geographiclocation_d) + \delta_b + \epsilon_{idb}$$

where :

- c_{idb} is the outcome variable of interest for observation i in district d along segment b of the mita boundary.
- $mita_d$ is an indicator equal to 1 if district d contributed to the mita and equal to 0 otherwise.
- X_{id} is a vector of covariates that includes the mean area weighted elevation and slope for district d and demographic variables giving the number of infants, children, and adults in the household.
- $f(geographiclocation_d)$ is the RD polynomial, which controls for smooth functions of geographic location.
- δ_b is a set of boundary segment fixed effects that denote which of four equal length segments of the boundary is the closest to the observations district capital.

Results

TABLE II

LIVING STANDARDS[a]

	Dependent Variable						
	Log Equiv. Household Consumption (2001)			Stunted Growth, Children 6–9 (2005)			
Sample Within:	<100 km of Bound.	<75 km of Bound.	<50 km of Bound.	<100 km of Bound.	<75 km of Bound.	<50 km of Bound.	Border District
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Cubic Polynomial in Latitude and Longitude							
Mita	−0.284	−0.216	−0.331	0.070	0.084*	0.087*	0.114**
	(0.198)	(0.207)	(0.219)	(0.043)	(0.046)	(0.048)	(0.049)
R^2	0.060	0.060	0.069	0.051	0.020	0.017	0.050
Panel B. Cubic Polynomial in Distance to Potosí							
Mita	−0.337***	−0.307***	−0.329***	0.080***	0.078***	0.078***	0.063*
	(0.087)	(0.101)	(0.096)	(0.021)	(0.022)	(0.024)	(0.032)
R^2	0.046	0.036	0.047	0.049	0.017	0.013	0.047
Panel C. Cubic Polynomial in Distance to *Mita* Boundary							
Mita	−0.277***	−0.230**	−0.224**	0.073***	0.061***	0.064***	0.055*
	(0.078)	(0.089)	(0.092)	(0.023)	(0.022)	(0.023)	(0.030)
R^2	0.044	0.042	0.040	0.040	0.015	0.013	0.043
Geo. controls	yes	yes	yes	yes	yes	yes	yes
Boundary F.E.s	yes	yes	yes	yes	yes	yes	yes
Clusters	71	60	52	289	239	185	63
Observations	1478	1161	1013	158,848	115,761	100,446	37,421

[a]The unit of observation is the household in columns 1–3 and the individual in columns 4–7. Robust standard errors, adjusted for clustering by district, are in parentheses. The dependent variable is log equivalent household consumption (ENAHO (2001)) in columns 1–3, and a dummy equal to 1 if the child has stunted growth and equal to 0 otherwise in columns 4–7 (Ministro de Educación (2005a)). *Mita* is an indicator equal to 1 if the household's district contributed to the *mita* and equal to 0 otherwise (Saignes (1984), Amat y Juniet (1947, pp. 249, 284)). Panel A includes a cubic polynomial in the latitude and longitude of the observation's district capital, panel B includes a cubic polynomial in Euclidean distance from the observation's district capital to Potosí, and panel C includes a cubic polynomial in Euclidean distance to the nearest point on the *mita* boundary. All regressions include controls for elevation and slope, as well as boundary segment fixed effects (F.E.s). Columns 1–3 include demographic controls for the number of infants, children, and adults in the household. In columns 1 and 4, the sample includes observations whose district capitals are located within 100 km of the *mita* boundary, and this threshold is reduced to 75 and 50 km in the succeeding columns. Column 7 includes only observations whose districts border the *mita* boundary. 78% of the observations are in *mita* districts in column 1, 71% in column 2, 68% in column 3, 78% in column 4, 71% in column 5, 68% in column 6, and 58% in column 7. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5%, and

Results(Cont)

- Columns 1–3 of Table II estimate that a long-run mita effect lowers household consumption in 2001 by around 25% in subjected districts.
- The mita coefficients are economically similar across the three specifications of the RD polynomial.
- When using only observations in districts that border the mita boundary,point estimates of the mita effect on stunting range from 0.055 (s.e. = 0.030) to 0.114 (s.e. = 0.049) percentage points.

Robustness tests

TABLE III

SPECIFICATION TESTS[a]

	Dependent Variable						
	Log Equiv. Household Consumption (2001)			Stunted Growth, Children 6–9 (2005)			
Sample Within:	<100 km of Bound. (1)	<75 km of Bound. (2)	<50 km of Bound. (3)	<100 km of Bound. (4)	<75 km of Bound. (5)	<50 km of Bound. (6)	Border District (7)
Alternative Functional Forms for RD Polynomial: Baseline I							
Linear polynomial in latitude and longitude							
Mita	−0.294***	−0.199	−0.143	0.064***	0.054**	0.062**	0.068**
	(0.092)	(0.126)	(0.128)	(0.021)	(0.022)	(0.026)	(0.031)
Quadratic polynomial in latitude and longitude							
Mita	−0.151	−0.247	−0.361	0.073*	0.091**	0.106**	0.087**
	(0.189)	(0.209)	(0.216)	(0.040)	(0.043)	(0.047)	(0.041)
Quartic polynomial in latitude and longitude							
Mita	−0.392*	−0.324	−0.342	0.073	0.072	0.057	0.104**
	(0.225)	(0.231)	(0.260)	(0.056)	(0.050)	(0.048)	(0.042)
Alternative Functional Forms for RD Polynomial: Baseline II							
Linear polynomial in distance to Potosí							
Mita	−0.297***	−0.273***	−0.220**	0.050**	0.048**	0.049**	0.071**
	(0.079)	(0.093)	(0.092)	(0.022)	(0.022)	(0.024)	(0.031)
Quadratic polynomial in distance to Potosí							
Mita	−0.345***	−0.262***	−0.309***	0.072***	0.064***	0.072***	0.060*
	(0.086)	(0.095)	(0.100)	(0.023)	(0.022)	(0.023)	(0.032)
Quartic polynomial in distance to Potosí							
Mita	−0.331***	−0.310***	−0.330***	0.078***	0.075***	0.071***	0.053*
	(0.086)	(0.100)	(0.097)	(0.021)	(0.020)	(0.021)	(0.031)
Interacted linear polynomial in distance to Potosí							
Mita	−0.307***	−0.280***	−0.227**	0.051**	0.048**	0.043*	0.076***

Robustness tests

TABLE IV

ADDITIONAL SPECIFICATION TESTS[a]

	Log Equivalent Household Consumption (2001)							Stunted Growth, Children 6–9 (2005)				
	Baseline	Control for Ethnicity	Includes Cusco	Excludes Districts With Inca Estates	Excludes Portions of Boundary Formed by Rivers	Flexible Estimation of Consump. Equivalence	Migration	Baseline	Includes Cusco	Excludes Districts With Inca Estates	Excludes Portions of Boundary Formed by Rivers	Migration
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Panel A. Cubic Polynomial in Latitude and Longitude												
Mita	−0.331	−0.202	−0.465**	−0.281	−0.322	−0.326	−0.223	0.087*	0.147***	0.093*	0.090*	0.069
	(0.219)	(0.157)	(0.207)	(0.265)	(0.215)	(0.230)	(0.198)	(0.048)	(0.048)	(0.048)	(0.048)	(0.049)
R^2	0.069	0.154	0.104	0.065	0.070	0.292	0.067	0.017	0.046	0.019	0.018	0.016
Panel B. Cubic Polynomial in Distance to Potosí												
Mita	−0.329***	−0.282***	−0.450***	−0.354***	−0.376***	−0.328***	−0.263***	0.078***	0.146***	0.077***	0.081***	0.060**
	(0.096)	(0.073)	(0.096)	(0.101)	(0.114)	(0.099)	(0.095)	(0.024)	(0.030)	(0.026)	(0.024)	(0.025)
R^2	0.047	0.140	0.087	0.036	0.049	0.275	0.042	0.013	0.039	0.014	0.013	0.012
Panel C. Cubic Polynomial in Distance to *Mita* Boundary												
Mita	−0.224**	−0.195***	−0.333***	−0.255**	−0.217**	−0.224**	−0.161*	0.064***	0.132***	0.066***	0.065***	0.046*
	(0.092)	(0.070)	(0.087)	(0.110)	(0.098)	(0.095)	(0.088)	(0.023)	(0.027)	(0.025)	(0.023)	(0.024)
R^2	0.040	0.135	0.088	0.047	0.039	0.270	0.037	0.013	0.042	0.014	0.013	0.012
Geo. controls	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Bound. F.E.s	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Clusters	52	52	57	47	51	52	52	185	195	180	183	185
Observations	1013	1013	1173	930	992	1013	997	100,446	127,259	96,440	99,940	98,922

[a]Robust standard errors, adjusted for clustering by district, are in parentheses. All regressions include soil type indicators and boundary segment fixed effects (F.E.s). Columns 1–5 and 7 include demographic controls for the number of infants, children, and adults in the household. Column (6) includes controls for the log of household size and the ratio of children to household members, using the log of household consumption as the dependent variable. The samples include observations whose district capitals are less than 50 km from the *mita* boundary. Coefficients that are significantly different from zero are denoted by the following system: *10%, **5%, and ***1%.

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Data

The second part of the paper uses data from the Spanish Empire and Peruvian Republic to test channels of persistence.

- Land Tenure: Looking the impact of the mita on the formation of haciendas.
- Public Goods: Looking the mita's impact on education in 1876, 1940, and 2001. Also looking by the effect over roads.
- Market Participation: Looking at the percentage of the district labor force whose primary occupation is agriculture, taken from the 1993 Population Census.

Results

Land Tenure

- Very large mita effect on the concentration of haciendas in the 17th century (robust support for a persistent impact) .
- Mita lowered the percentage of the rural tributary population in haciendas in 1845 by around 20 percentage points.
- The percentage of the rural population in haciendas nearly doubled between 1845 and 1940. This expansion was spurred by a large increase in land values due to globalization and seems to have been particularly coercive inside the mita catchment.

Results

Public Goods

- The paper find little evidence that a mita effect persists through access to schooling. Most of results were no significant.

- Pronounced disparities in road networks across the mita boundary.

Results

TABLE VII

EDUCATION[a]

	Dependent Variable		
	Literacy 1876 (1)	Mean Years of Schooling 1940 (2)	Mean Years of Schooling 2001 (3)
Panel A. Cubic Polynomial in Latitude and Longitude			
Mita	−0.015	−0.265	−1.479*
	(0.012)	(0.177)	(0.872)
R^2	0.401	0.280	0.020
Panel B. Cubic Polynomial in Distance to Potosí			
Mita	−0.020***	−0.181**	−0.341
	(0.007)	(0.078)	(0.451)
R^2	0.345	0.187	0.007
Panel C. Cubic Polynomial in Distance to *Mita* Boundary			
Mita	−0.022***	−0.209***	−0.111
	(0.006)	(0.076)	(0.429)
R^2	0.301	0.234	0.004
Geo. controls	yes	yes	yes
Boundary F.E.s	yes	yes	yes
Mean dep. var.	0.036	0.470	4.457
Clusters	95	118	52
Observations	95	118	4038

[a]The unit of observation is the district in columns 1 and 2 and the individual in column 3. Robust standard errors, adjusted for clustering by district, are in parentheses. The dependent variable is mean literacy in 1876 in column 1 (Dirección de Estadística del Perú (1878)), mean years of schooling in 1940 in column 2 (Dirección de Estadística del Perú (1944)), and individual years of schooling in 2001 in column 3 (ENAHO (2001)). Panel A includes a cubic

Results

Market Participation

- There are evidence that the mita's effects persist in part through an economically meaningful impact on agricultural market participation, although the precise magnitude of this effect is difficult to convincingly establish given the properties of the data.

- Most residents in mita districts are engaged in subsistence farming. This is related to the increase in transaction costs due to the early results of the effect of the mita in roads.

Results

TABLE IX

CONSUMPTION CHANNELS[a]

	Dependent Variable		
	Percent of District Labor Force in Agriculture—1993 (1)	Agricultural Household Sells Part of Produce in Markets—1994 (2)	Household Member Employed Outside the Agricultural Unit—1994 (3)
Panel A. Cubic Polynomial in Latitude and Longitude			
Mita	0.211	−0.074**	−0.013
	(0.140)	(0.036)	(0.032)
R^2	0.177	0.176	0.010
Panel B. Cubic Polynomial in Distance to Potosí			
Mita	0.101	−0.208***	−0.033
	(0.061)	(0.030)	(0.020)
R^2	0.112	0.144	0.008
Panel C. Cubic Polynomial in Distance to *Mita* Boundary			
Mita	0.092*	−0.225***	−0.038**
	(0.054)	(0.032)	(0.018)
R^2	0.213	0.136	0.006
Geo. controls	yes	yes	yes
Boundary F.E.s	yes	yes	yes
Mean dep. var.	0.697	0.173	0.245
Clusters	179	178	182
Observations	179	160,990	183,596

[a] Robust standard errors, adjusted for clustering by district in columns 2 and 3, are in parentheses. The dependent variable in column 1 is the percentage of the district's labor force engaged in agriculture as a primary occupation (INEI

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Conclusions

- The model estimate that its long-run effects lower house- hold consumption by around 25% and increase stunting in children by around 6 percentage points.
- Land tenure, public goods, and market participation are channels through which the impact persists. Roads, market participation, and formation of haciendas are some examples but that does not exclude some other sectors of the economy of being affected too.