The Persistent Effects of Peru-s Mining Mita

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Introduction

- The role of historical institutions in explaining contemporary underdevelopment has generated significant debate in recent years.
- Studies find quantitative support for an impact of history on current economic outcome, but have not focused on channels of persistence.
- This paper uses variation in the assignment of an historical institution in Peru to identify **land tenure** and **public goods** as channels through which its effects persist.

Introduction

- 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.
- 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.
- The contribution of mita conscripts changed discretely at the boundary of the subjected region: on one side, all communities sent the same percentage of their population, while on the other side, all communities were exempt.

Introduction

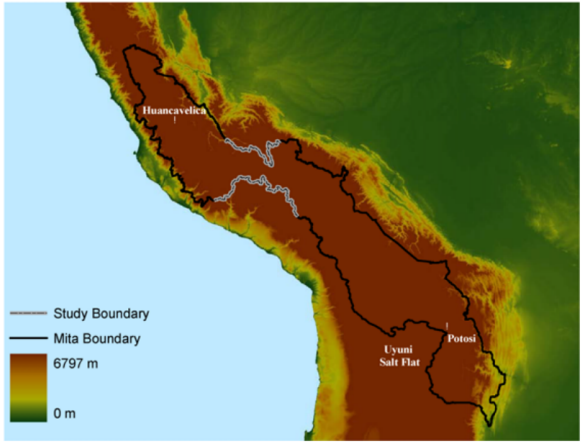

FIGURE 1.—The *mita* boundary is in black and the study boundary in light gray. Districts falling inside the contiguous area formed by the *mita* boundary contributed to the *mita*. Elevation is shown in the background.

Figura: Dell (2010), Page 1864

Introduction

- This discrete change suggests a regression discontinuity (RD) approach for evaluating the long-term effects of the mita, with the mita boundary forming a multidimensional discontinuity in longitude–latitude space.
- Because validity of the RD design requires all relevant factors besides treatment to vary smoothly at the mita boundary, I focus exclusively on the portion that transects the Andean range in southern Peru.
- Much of the boundary tightly follows the steep Andean precipice, and hence has elevation and the ethnic distribution of the population changing discretely at the boundary. In contrast, elevation, the ethnic distribution, and other observables are statistically identical across the segment of the boundary on which this study focuses.

Hypothesis

- 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.**

Theory

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.
- Beginning in 1573, indigenous villages located within a contiguous region were required to provide one-seventh of their adult male population as rotating mita laborers to Potosí or Huancavelica, and the region subjected remained constant from 1578 onward.
- 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

- Why did Spanish authorities require only a portion of districts in Peru to contribute to the mita and how did they determine which districts to subject?
- The aim of the Crown was to revive silver production to levels attained using free labor in the 1550s, before epidemic disease had substantially reduced labor supply and increased wages.
- Yet coercing labor imposed costs: administrative and enforcement costs, compensation to conscripts for traveling as much as 1000 kilometers (km) each way to and from the mines, and the risk of decimating Peru's indigenous population, as had occurred in earlier Spanish mining ventures in the Caribbean.

THE MINING MITA

- 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.

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 (ENAHO) - 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.

Model

$$c_{idb} = \gamma mita_d + X'_{id}\beta + f(geographiclocation_d) + \delta_b + \epsilon_{idb}$$

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

- Columns 1–3 of Table below estimate that a long-run mita effect lowers house- hold 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.

Results

Figura: Living Standards

	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)
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 ***1%.

Figura: Dell (2010), Page 1878

Results

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

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.

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.