The Persistent Effects of Peru's Mining *Mita*

by Melissa Dell, Econometrica (2010)

Microeconometrics, Summer Semester 2017

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Outline

Introduction and Motivation

Historical Background

Data and Estimation Method

Results

Conclusion and Discussion

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Conclusion and Discussion

What "big picture" issues does the paper address?

- Massive divergence in economic prosperity within the developing world since the mid-20th century
- **How do we explain this divergence?**
- **Historical institutions** and **governance organizations** $\rightarrow$ contemporary (under)development and differential growth paths:
  - Africa: organization of pre-colonial states (Michalopoulos & Papaioannu, 2013; Gennaioli & Rainer, 2007)
  - Europe, South America, Asia: organization of historical states (Acemoglu et al., 2015; Boeckh et al., 2014, Dell et al., WP, ...)

Research question

This paper:

- Examines the long-run impacts of the **mining *mita***, a forced labor system instituted by the Spanish government in Peru and Bolivia (1573-1812)
- Implements a geographic (multidimensional) regression discontinuity (RD) design across the *mita* boundary
- Identifies statistically significant impacts on:
  - Contemporary living standards
  - Channels of persistence (land tenure and public goods provision)

Contributions

1. **Methodological**
   - Multidimensional, semiparametric Regression Discontinuity approach
2. **Literature on long-run development**
   - First paper focusing on channels of persistence and potential mechanisms
   - Starting point for modeling Latin America's long-run growth trajectory $\rightarrow$ role of large landowners in shielding individuals from an extractive state; extent to which the state can be used to shape economic interactions

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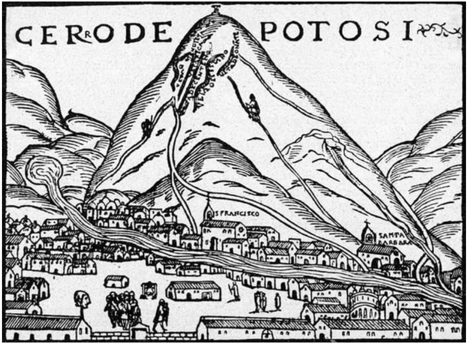
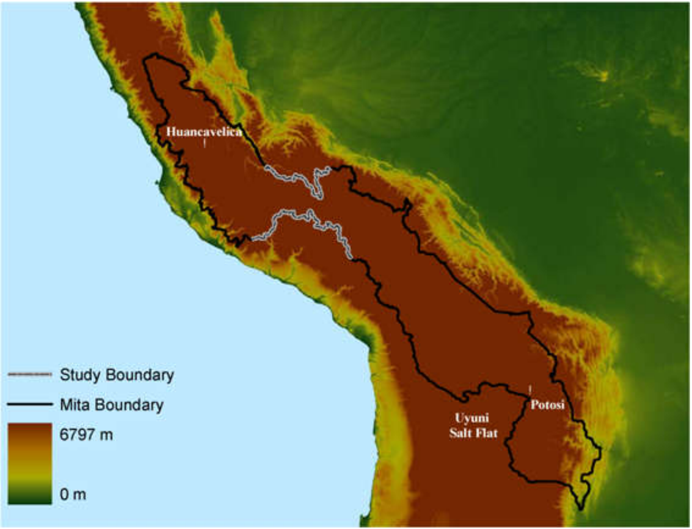
"The mountain that eats men"



Source: The Guardian, *"Story of cities #6: how silver turned Potosí into the first city of capitalism"*, 21 March 2016

- Potosí mines discovered in 1545 → largest deposit of silver in the Spanish Empire
- Huancavelica mines
- **The mining *mita***: indigenous villages within a *contiguous region* were required to provide one-seventh of their adult male population as *mita* laborers
- Subjected region: constant from 1578 onwards

The *mita* boundary



The *Mita*'s assignment

- The Spanish authorities required only a portion of districts in today's Peru to contribute to the *mita* Map
- Administrative and enforcement costs of coercing labor
- Two criteria:
  1. **Distance** to the mines at Potosí and Huancavelica → *increasing administrative and enforcement costs in distance*
  2. **Elevation** → *only highland people could survive intensive physical labor*

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Outcomes, channels of persistence and data

Mining *Mita*

↓

- Land tenure and labor systems
- Public goods
- Proximate determinants of household consumption

↓

Long run development:

- Household consumption
- Stunting in children

Outcomes, channels of persistence and data

Mining *Mita* - Saignes (1984), Amat y Junient (1947)

↓

- Land tenure and labor systems
- Public goods
- Proximate determinants of household consumption

↓

Long run development:

- Household consumption
- Stunting in children

Outcomes, channels of persistence and data

Mining *Mita*

↓

- Land tenure and labor systems - Parish reports, Cusco regional government, Peruvian Population Census
- Public goods - Population Census, 2001 Peruvian National Household Survey (ENAHO)
- Proximate determinants of household consumption 1993 Population Census

↓

Long run development:

- Household consumption
- Stunting in children

Outcomes, channels of persistence and data

Mining *Mita*

↓

- Land tenure and labor systems
- Public goods
- Proximate determinants of household consumption

↓

Long run development:

- Household consumption - 2001 Peruvian National Household Survey
- Stunting in children - Census from the Ministry of Education

Estimation Strategy

- How do we identify the *mita* effect on the aforementioned outcomes?
- Can we simply compare *mita* to non-*mita* districts (in today's Peru)?

→ Assignment to the *mita* based on (at least) two geographic criteria
→ Districts might differ in (observed/unobserved) predetermined characteristics, **in turn responsible for differential outcomes today**

Sharp Regression Discontinuity (Reminder)

Treatment D is a function of a known running variable X:

$$D_i = \mathbb{1}\{X_i \geq c\}$$

where c is the threshold. Therefore:

$$D_i = \begin{cases} 1 & \text{if } X_i \geq c \\ 0 & \text{if } X_i < c \end{cases}$$

Multidimensional RDD

- In this context, the **running (or assignment) variable** X for the Regression Discontinuity Design is "geography"
- *Mita* treatment is a deterministic and discontinuous function of known covariates: longitude and latitude
- The **border** between *mita* and non-*mita* areas forms a **multidimensional (geographic) discontinuity** in longitude-latitude space
- Idea: compare "*mita*" to "*non-mita*" households situated *close enough* to the border

Estimation Strategy

Basic Regression

$$c_{idb} = \alpha + \gamma mita_d + f(\text{geographic location}_d) + X'_{id}\beta + \Phi_b + \epsilon_{idb}$$

where:

- c_{idb} is the outcome variable of interest for observation i in district d along segment b of the boundary
- $mita_d$ is an indicator equal to 1 if the observation i belongs to a district which was subject to *mita*
- $f(\text{geographic location}_d)$ is the multidimensional RD polynomial
- X'_{id} is a vector of covariates (mean elevation/slope, demographic variables)
- Φ_b is a vector of boundary segment fixed effects

Estimation Strategy

Basic Regression

$$c_{idb} = \alpha + \gamma mita_d + f(\text{geographic location}_d) + X'_{id}\beta + \Phi_b + \epsilon_{idb}$$

where:

- Bandwith: 100km, 75km, 50km
- RD polynomial:
  - Cubic in latitude and longitude (preferred specification)
  - Cubic in distance to Potosí (single dimension)
  - Cubic in distance to the *mita* boundary (single dimension)
- Semiparametric vs nonparametric RD
  - Georeferencing
  - Sample size

Estimation strategy - Stata implementation

Basic Regression

$$c_{idb} = \alpha + \gamma mita_d + f(\text{geographic location}_d) + X'_{id}\beta + \Phi_b + \epsilon_{idb}$$

Example with:

- Cubic polynomial in latitude and longitude
- 100 km bandwidth

```
regress /*
*/lhhequiv /* c_{idb}
*/pothuan_mita /* mita_{i}
*/x y x2 y2 xy x3 y3 x2y xy2 /* f(geographic location_{d})
*/elv_sh slope infants children adults /* X_{id}
*/bfe4_1 bfe4_2 bfe4_3 /* phi_{b}
*/ if (cusco!=1 & d_bnd<100), /* exclude Cusco, bandwidth 100 km
*/robust cluster (ubigeo) /* clustered at the district level
```

Identifying assumptions

1. **Continuity**: all relevant factors besides treatment vary smoothly at the *mita* boundary
2. **No selective sorting** across the treatment threshold

1. Continuity

Let c_1 and c_0 denote potential outcomes under treatment and control respectively, let x denote longitude and y denote latitude.

Identification requires:

$E[c_1 \mid x, y]$ **and** $E[c_0 \mid x, y]$ **are continuous at the discontinuity threshold**

$\downarrow$

Individuals located just outside the *mita* catchment are an **appropriate counterfactual** for those located just inside it

1. Continuity

- Not entirely testable, but **balancing tests** help assessing its plausibility
- Test for difference in means for geographic and demographic characteristics: $c_{gd} = \alpha + \beta mita_d + \epsilon_{gd}$

```
foreach Y of num 100 75 50 25 { // Test at different bandwidths
    drop if d_bnd>`Y'
    bys pothuan_mita: sum elev
    regress elev pothuan_mita, robust // Roubust standard errors
}
```

- Identifying assumption: $\beta = 0$ for such outcomes

1. Continuity

TABLE I

SUMMARY STATISTICS[a]

	Sample Falls Within <100 km of *Mita* Boundary		
	Inside	Outside	s.e.
GIS Measures			
Elevation	4042	4018	[188.77] (85.54)
Slope	5.54	7.21	[0.88]* (0.49)**
Observations	177	95	
% Indigenous	63.59	58.84	[11.19] (9.76)
Observations	1112	366	
Log 1572 tribute rate	1.57	1.60	[0.04] (0.03)

```
-> pothuan_mita = 0

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        elev |        95    4018.429    728.9468    2000.04    4925.94

-> pothuan_mita = 1

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        elev |       177    4042.055     554.804    1759.93    5079.17

Linear regression                               Number of obs     =        272
                                                F(1, 270)         =       0.08
                                                Prob > F          =     0.7826
                                                R-squared         =     0.0003
                                                Root MSE          =        621

------------------------------------------------------------------------------
             |               Robust
        elev |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
pothuan_mita |   23.62669   85.54197     0.28   0.783    -144.7874    192.0408
       _cons |   4018.429   74.66873    53.82   0.000     3871.422    4165.436
------------------------------------------------------------------------------
```

1. Continuity

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1. Continuity

Conley

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------------------------------------------------------------------------------
```

1. Continuity

TABLE I—*Continued*

	Sample Falls Within <100 km of *Mita* Boundary		
	Inside	Outside	s.e.
% 1572 tribute to			
Spanish Nobility	59.80	63.82	[1.39]*** (1.36)***
Spanish Priests	21.05	19.10	[0.90]** (0.94)**
Spanish Justices	13.36	12.58	[0.53] (0.48)*
Indigenous Mayors	5.67	4.40	[0.78] (0.85)
Observations	63	41	

1. Continuity

TABLE I—*Continued*

	Sample Falls Within								
	<100 km of *Mita* Boundary			<50 km of *Mita* Boundary			<25 km of *Mita* Boundary		
	Inside	Outside	s.e.	Inside	Outside	s.e.	Inside	Outside	s.e.
% 1572 tribute to									
Spanish Nobility	59.80	63.82	[1.39]*** (1.36)***	62.01	63.07	[1.12] (1.34)	61.01	63.17	[1.58] (2.21)
Spanish Priests	21.05	19.10	[0.90]** (0.94)**	20.59	19.93	[0.76] (0.92)	21.45	19.98	[1.01] (1.33)
Spanish Justices	13.36	12.58	[0.53] (0.48)*	12.81	12.48	[0.43] (0.55)	13.06	12.37	[0.56] (0.79)
Indigenous Mayors	5.67	4.40	[0.78] (0.85)	4.42	4.47	[0.34] (0.33)	4.48	4.42	[0.29] (0.39)
Observations	63	41		35	30		18	24	

2. No Selective Sorting

- Violated if the *mita* effect directly provoked substantial out-migration of productive individuals, leading to a larger indirect effect
- Explore the possibility of migration as an interesting *channel of persistence*
- Low migration rates in the past 130 years → constant aggregate population distribution
- No statistically significant differences in rates of out-migration between *mita* and non-*mita* districts (1993 census)
- Outmigration from *mita* districts **during the period that the mita was in force** may have been substantial → evidence from 17th century population data

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Outcomes and Channels of Persistence

Mining *Mita*

↓

- Land tenure and labor systems
- Public goods
- Proximate determinants of household consumption

↓

Long run development:

- **Household consumption**
- Stunting in children

Household consumption

TABLE II

LIVING STANDARDS[a]

	Dependent Variable		
	Log Equiv. Hausehold Consumption (2001)		
Sample Within:	<100 km of Bound. (1)	<75 km of Bound. (2)	<50 km of Bound. (3)
	Panel A. Cubic Polynomial in Latitude and Longitude		
Mita	−0.284	−0.216	−0.331
	(0.198)	(0.207)	(0.219)
R^2	0.060	0.060	0.069
	Panel B. Cubic Polynomial in Distance to Potosí		
Mita	−0.337***	−0.307***	−0.329***
	(0.087)	(0.101)	(0.096)
R^2	0.046	0.036	0.047
	Panel C. Cubic Polynomial in Distance to *Mita* Boundary		
Mita	−0.277***	−0.230**	−0.224**
	(0.078)	(0.089)	(0.092)
R^2	0.044	0.042	0.040
Geo. controls	yes	yes	yes
Boundary F.E.s	yes	yes	yes
Clusters	71	60	52
Observations	1478	1161	1013

Household consumption

Cubic polynomial in distance to Potosí

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LIVING STANDARDS[a]

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Sample Within:	<100 km of Bound.
	(1)
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	(0.087)
R^2	0.046
Geo. controls	yes
Boundary F.E.s	yes
Clusters	71
Observations	1478

```
regress /*
*/lhhequiv /*
*/pothuan_mita /*
*/dpot dpot2 dpot3 /*
*/elv_sh slope infants children adults /*
*/bfe4* if (cusco!=1 & d_bnd<100), /*
*/robust cluster (ubigeo) /*
```

Household consumption

Cubic polynomial in distance to Potosí

TABLE II

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Dependent Variable	
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Sample Within:	<100 km of Bound. (1)
Mita	−0.337*** (0.087)
R^2	0.046
Geo. controls	yes
Boundary F.E.s	yes
Clusters	71
Observations	1478

```
Linear regression                               Number of obs     =      1,478
                                                F(12, 70)         =       4.14
                                                Prob > F          =     0.0001
                                                R-squared         =     0.0463
                                                Root MSE          =     .99038

                                    (Std. Err. adjusted for 71 clusters in ubigeo)
```

lhhequiv	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
pothuan_mita	-.3368099	.0870028	-3.87	0.000	-.5103315	-.1632884
dpot	-2.838273	4.704792	-0.60	0.548	-12.22169	6.545138
dpot2	.269934	.5655069	0.48	0.635	-.8579338	1.397802
dpot3	-.0082634	.0220649	-0.37	0.709	-.0522705	.0357437
elv_sh	-.1759927	.1184049	-1.49	0.142	-.4121439	.0601584
slope	-.0284839	.0169523	-1.68	0.097	-.0622943	.0053265
infants	-.0106256	.0257637	-0.41	0.681	-.0620097	.0407585
children	.0103591	.016799	0.62	0.539	-.0231454	.0438636
adults	.0169945	.023573	0.72	0.473	-.0300204	.0640094
bfe4_1	.5149854	.1174166	4.39	0.000	.2808055	.7491653
bfe4_2	-.0705154	.2485321	-0.28	0.777	-.5661971	.4251663
bfe4_3	.0839917	.145616	0.58	0.566	-.2064303	.3744137
_cons	16.49349	12.83085	1.29	0.203	-9.096834	42.08382

Outcomes and Channels of Persistence

Mining *Mita*

$\downarrow$

- Land tenure and labor systems
- Public goods
- Proximate determinants of household consumption

$\downarrow$

Long run development:

- Household consumption
- **Stunting in children**

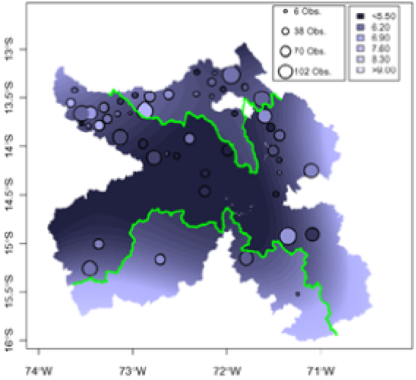
Stunting in children

TABLE II

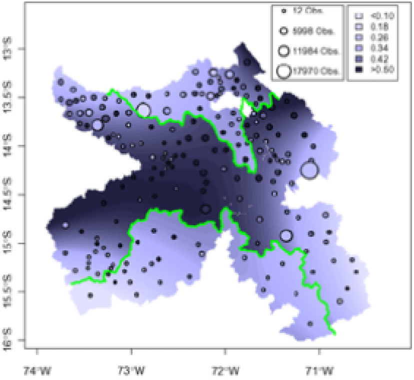
LIVING STANDARDS[a]

	Dependent Variable		
	Stunted Growth, Children 6–9 (2005)		
Sample Within:	<100 km of Bound. (4)	<75 km of Bound. (5)	<50 km of Bound. (6)
	Panel A. Cubic Polynomial in Latitude and Longitude		
Mita	0.070	0.084*	0.087*
	(0.043)	(0.046)	(0.048)
R^2	0.051	0.020	0.017
	Panel B. Cubic Polynomial in Distance to Potosí		
Mita	0.080***	0.078***	0.078***
	(0.021)	(0.022)	(0.024)
R^2	0.049	0.017	0.013
	Panel C. Cubic Polynomial in Distance to *Mita* Boundary		
Mita	0.073***	0.061***	0.064***
	(0.023)	(0.022)	(0.023)
R^2	0.040	0.015	0.013
Geo. controls	yes	yes	yes
Boundary F.E.s	yes	yes	yes
Clusters	289	239	185
Observations	158,848	115,761	100,446

RD Plots



(a) Consumption (2001)



(b) Stunting (2005)

Specification tests and robustness

Results tend to be robust to...

- ...14 different specification of the RD polynomial Robustness
- ...controls for ethnicity
- ...the inclusion of metropolitan Cusco
- ...the exclusion of districts falling along portions of the boundary formed by rivers
- ...accounting for differential rates of migration today
  Other Robustness

Baseline (pre-*mita*) covariates

TABLE V

1572 TRIBUTE AND POPULATION[a]

	Dependent Variable							
		Share of Tribute Revenues				Percent		
	Log Mean Tribute (1)	Spanish Nobility (2)	Spanish Priests (3)	Spanish Justices (4)	Indig. Mayors (5)	Men (6)	Boys (7)	Females (8)
	Panel A. Cubic Polynomial in Latitude and Longitude							
Mita	0.020	−0.010	0.004	0.004	0.003	−0.006	0.011	−0.009
	(0.031)	(0.030)	(0.019)	(0.010)	(0.005)	(0.009)	(0.012)	(0.016)
R^2	0.762	0.109	0.090	0.228	0.266	0.596	0.377	0.599
	Panel B. Cubic Polynomial in Distance to Potosí							
Mita	0.019	−0.013	0.008	0.006	−0.001	−0.012	0.005	−0.011
	(0.029)	(0.025)	(0.015)	(0.009)	(0.004)	(0.008)	(0.010)	(0.012)
R^2	0.597	0.058	0.073	0.151	0.132	0.315	0.139	0.401
	Panel C. Cubic Polynomial in Distance to *Mita* Boundary							
Mita	0.040	−0.009	0.005	0.003	−0.001	−0.011	0.001	−0.008
	(0.030)	(0.018)	(0.012)	(0.006)	(0.004)	(0.007)	(0.008)	(0.010)
R^2	0.406	0.062	0.096	0.118	0.162	0.267	0.190	0.361
Geo. controls	yes	yes	yes	yes	yes	yes	yes	yes
Boundary F.E.s	yes	yes	yes	yes	yes	yes	yes	yes
Mean dep. var.	1.591	0.625	0.203	0.127	0.044	0.193	0.204	0.544
Observations	65	65	65	65	65	65	65	65

Outcomes and Channels of Persistence

Mining *Mita*

↓

- **Land tenure and labor systems**
- Public goods
- Proximate determinants of household consumption

↓

Long run development:

- Household consumption
- Stunting in children

Land tenure and labor systems

TABLE VI

LAND TENURE AND LABOR SYSTEMS[a]

	Dependent Variable				
	Haciendas per District in 1689 (1)	*Haciendas* per 1000 District Residents in 1689 (2)	Percent of Rural Tributary Population in *Haciendas* in ca. 1845 (3)	Percent of Rural Population in *Haciendas* in 1940 (4)	Land Gini in 1994 (5)
	Panel A. Cubic Polynomial in Latitude and Longitude				
Mita	−12.683***	−6.453**	−0.127*	−0.066	0.078
	(3.221)	(2.490)	(0.067)	(0.086)	(0.053)
R^2	0.538	0.582	0.410	0.421	0.245
	Panel B. Cubic Polynomial in Distance to Potosí				
Mita	−10.316***	−7.570***	−0.204**	−0.143***	0.107***
	(2.057)	(1.478)	(0.082)	(0.051)	(0.036)
R^2	0.494	0.514	0.308	0.346	0.194
	Panel C. Cubic Polynomial in Distance to *Mita* Boundary				
Mita	−11.336***	−8.516***	−0.212***	−0.120***	0.124***
	(2.074)	(1.665)	(0.060)	(0.045)	(0.033)
R^2	0.494	0.497	0.316	0.336	0.226
Geo. controls	yes	yes	yes	yes	yes
Boundary F.E.s	yes	yes	yes	yes	yes
Mean dep. var.	6.500	5.336	0.135	0.263	0.783
Observations	74	74	81	119	181

Outcomes and Channels of Persistence

Mining *Mita*

↓

- Land tenure and labor systems
- **Public goods**
- Proximate determinants of household consumption

↓

Long run development:

- Household consumption
- Stunting in children

Public goods

TABLE VII

EDUCATION[a]

	Literacy 1876 (1)	Mean Years of Schooling 1940 (2)	Mean Years of Schooling 2001 (3)
	Dependent Variable		
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

Outcomes and Channels of Persistence

Mining *Mita*

↓

- Land tenure and labor systems
- Public goods
- **Proximate determinants of household consumption**

↓

Long run development:

- Household consumption
- Stunting in children

Proximate determinants of household consumption

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

Outline

Introduction and Motivation

Historical Background

Data and Estimation Method

Results

Conclusion and Discussion

Conclusion

- This paper exploits exogenous variation in the assignment of the *mita* to identify channels through which it influences contemporary economic development
- Its long-run effects lower household consumption by 25% and increase stunting in children by around 6 percentage points
- Land tenure, public goods and market participation are channels through which its impacts persist

Literature

- Governance and Long-Run Development

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- RD Design

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Discussion

1. Density test (see McCrary, 2008) as an additional support for the assumption of **no selective sorting** around the boundary
   Density plots

Discussion

2. → **Continuity assumption**: A portion of the *mita*'s border coincides with today's border between the Aruepica and Cusco **regions** → the first-level administrative unit in Peru

Peru administrative divisions

Lee&Lemieux (2010): *"What are all the things differing between the two regions other than the treatment of interest?"*

- According to the Organic Law of Regional Governments, the responsibilities of regional governments include planning regional development, executing public investment projects, promoting economic activities, and managing public property

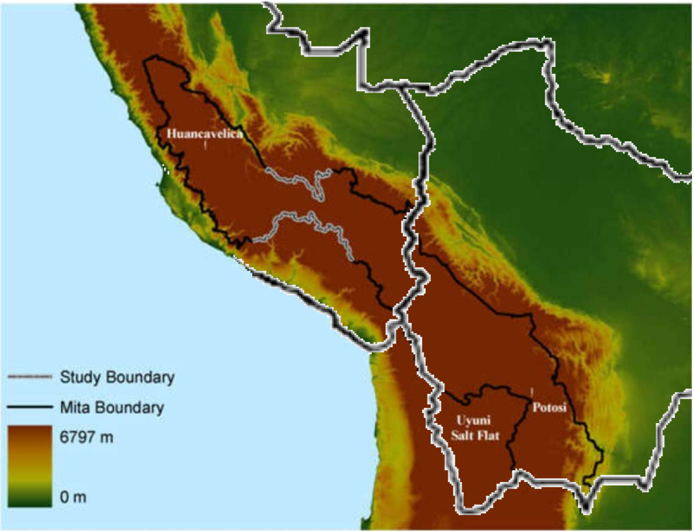
  → The estimates could be capturing the effect of different local policies
  → Placebo: test other regional border

You can access the paper's replication files at:
https://scholar.harvard.edu/dell/publications/persistent-effects-perus-mining-mita

Questions/comments?

Appendix

Mita's region and today's borders Back



Conley standard errors Back

- Geographic data such as elevation, slope, terrain ruggedness (and weather) are *spatially correlated* → they are correlated at physically nearby grids
- Standard errors are corrected for an unknown-form serial dependence based on location (see Conley, T. (1999): GMM estimation with cross sectional dependence, *Journal of Econometrics*, 92, 1-45)
- Stata command: **x_ols**

  x_ols coordlist cutlist dep regressors, coord() xreg()

- download ADO file at: http://economics.uwo.ca/people/conley_docs/code_to_download_gmm.html

Specification tests

TABLE III

SPECIFICATION TESTS[a]

	Dependent Variable						
	Log Equiv. Hausehold 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***
	(0.092)	(0.094)	(0.095)	(0.022)	(0.021)	(0.022)	(0.029)
Interacted quadratic polynomial in distance to Potosí							
Mita	−0.264***	−0.177*	−0.285**	0.033	0.027	0.039*	0.036
	(0.087)	(0.096)	(0.111)	(0.024)	(0.023)	(0.023)	(0.024)

(*Continues*)

Specification tests Back

TABLE III—*Continued*

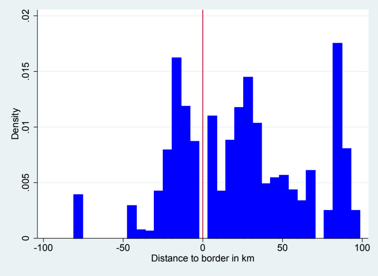
	Dependent Variable						
	Log Equiv. Household Consumption (2001)			Stunted Growth, Children 6–9 (2005)			
Sample Within:	<100 km of Bound. (1)	<75 km of Bound. (2)	<50 km of Bound. (3)	<100 km of Bound. (4)	<75 km of Bound. (5)	<50 km of Bound. (6)	Border District (7)
Alternative Functional Forms for RD Polynomial: Baseline III							
Linear polynomial in distance to *mita* boundary							
Mita	−0.299***	−0.227**	−0.223**	0.072***	0.060***	0.058**	0.056*
	(0.082)	(0.089)	(0.091)	(0.024)	(0.022)	(0.023)	(0.032)
Quadratic polynomial in distance to *mita* boundary							
Mita	−0.277***	−0.227**	−0.224**	0.072***	0.060***	0.061***	0.056*
	(0.078)	(0.089)	(0.092)	(0.023)	(0.022)	(0.023)	(0.030)
Quartic polynomial in distance to *mita* boundary							
Mita	−0.251***	−0.229**	−0.246***	0.073***	0.064***	0.063***	0.055*
	(0.078)	(0.089)	(0.088)	(0.023)	(0.022)	(0.023)	(0.030)
Interacted linear polynomial in distance to *mita* boundary							
Mita	−0.301*	−0.277	−0.385*	0.082	0.087	0.095	0.132**
	(0.174)	(0.190)	(0.210)	(0.054)	(0.055)	(0.065)	(0.053)
Interacted quadratic polynomial in distance to *mita* boundary							
Mita	−0.351	−0.505	−0.295	0.140*	0.132	0.136	0.121*
	(0.260)	(0.319)	(0.366)	(0.082)	(0.084)	(0.086)	(0.064)
Ordinary Least Squares							
Mita	−0.294***	−0.288***	−0.227**	0.057**	0.048*	0.049*	0.055*
	(0.083)	(0.089)	(0.090)	(0.025)	(0.024)	(0.026)	(0.031)
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

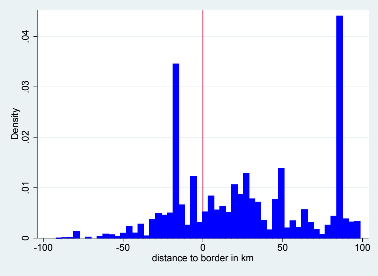
Other robustness checks

Back

	Log Equivalent Household Consumption (2001)							
	Baseline (1)	Control for Ethnicity (2)	Includes Cusco (3)	Excludes Districts With Inca Estates (4)	Excludes Portions of Boundary Formed by Rivers (5)	Flexible Estimation of Consump. Equivalence (6)	Migration (7)	Baseline (8)
				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*
	(0.219)	(0.157)	(0.207)	(0.265)	(0.215)	(0.230)	(0.198)	(0.048)
R^2	0.069	0.154	0.104	0.065	0.070	0.292	0.067	0.017
				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***
	(0.096)	(0.073)	(0.096)	(0.101)	(0.114)	(0.099)	(0.095)	(0.024)
R^2	0.047	0.140	0.087	0.036	0.049	0.275	0.042	0.013
				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***
	(0.092)	(0.070)	(0.087)	(0.110)	(0.098)	(0.095)	(0.088)	(0.023)
R^2	0.040	0.135	0.088	0.047	0.039	0.270	0.037	0.013
Geo. controls	yes	yes	yes	yes	yes	yes	yes	yes
Bound. F.E.s	yes	yes	yes	yes	yes	yes	yes	yes
Clusters	52	52	57	47	51	52	52	185
Observations	1013	1013	1173	930	992	1013	997	100,446

Density Plots - consumption sample (left) and children sample (right) Back





Mita's region and today's borders

Back