The Long Arm of History?
The Impact of Colonial Labor Institutions on Long-Term Development in Peru

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Motivation & framework

Two arguments dominate the current views of Latin American long-run institutional development.

1. Persistence (Acemoglu, Johnson, and Robinson; Dell; Engerman and Sokoloff)

2. Change (Arroyo Abad; Bulmer-Thomas; Coatsworth; Grafe and Irigoin)
Motivation & framework

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Motivation & framework

The case for persistence

- Hostile environment based on settler mortality (Acemoglu et al., 2001)
- Factor endowments and institutional creation (Engerman and Sokoloff, 1997)
- The *mita*’s detrimental effects on development (Dell, 2010)

```
initial (colonial) → settlements → early conditions
                    ↓
current institutions → current institutions performance
```

Source: Based on Acemoglu, Johnson, and Robinson (2001).
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- Motivation & framework

Colonial institutions and economic outcomes

![Graph showing the relationship between log settler mortality and log GDP per capita (1995).](image-url)

Source: Based on Acemoglu et. al (2001).

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Colonial institutions and economic outcomes

Source: Based on Acemoglu et. al (2001).
The case for change

- Colonial patterns of development (Coatsworth, 2011)
- Elite independence (Grafe and Irigoin, 2012)
- Integration to world markets (Arroyo Abad, 2013; Williamson, 2010)
- Compression of history (Austin, 2008)
- Multiple reversals of fortune (Musacchio et al., 2014)
The case for Peru

- Pillar of Spanish colonial empire
- Abundant indigenous labor and silver
- Endured the depth of Spanish colonial institutions

Source: Based on TePaske and Klein (1982).
Questions & answers

1. What was the impact of coercive labor institutions in colonial Peru?
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   Looking at (tributary) population, the presence of coercive labor institutions resulted in a lower population before 1720.

2. How persistent were these institutional arrangements?
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   Looking at (tributary) population, the presence of coercive labor institutions resulted in a lower population before 1720.

2. How persistent were these institutional arrangements?
   These institutions appear to lose their extractive power in the 18th century.

3. What explains this erosion of persistence?
Questions & answers

1. What was the impact of coercive labor institutions in colonial Peru?
Looking at (tributary) population, the presence of coercive labor institutions resulted in a lower population before 1720.

2. How persistent were these institutional arrangements?
These institutions appear to lose their extractive power in the 18th century.

3. What explains this erosion of persistence?
The coexistence of multiple labor arrangements and the response of indigenous populations to existing institutions. In this sense, these institutions lost their bite as the indigenous people challenged them.
Historical background

- The colonization of and settlement in the New World implied the definition of the relationship between Spaniards and indigenous populations.
- Different institutional arrangements adopted to exert control.
- We are interested in labor institutions manifested as the duties Spaniards demanded from the indigenous peoples.
  - These institutions were both a combination of Inca and Spanish practices.
  - *Encomienda*: the Spanish crown granted the new settlers the service of indigenous peoples
  - *Mita*: Compulsory draft to solve the labor shortage in the silver and mercury mines
  - *Tribute*: replaced *encomienda* in the late 17th century; paid to avoid mita duties.
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Data, 1570s-1790s

- Spanish tribute population count data by settlement.
  - Existence of labor service based on
    - Encomienda settlements: Cook (1965), Puente Brunke (1992), and Cook (2004).
- Distance to the nearest urban center and to Cuzco: estimates using the Inca road with cities defined in Arroyo Abad and van Zanden (2017).
- Importance of main urban centers: based on Hardoy (1967).
- Tribute per capita: actual tribute collected per settlement and per tributary from Mansilla (1979) for 1570s.
- Literacy in 1876 and 1940: from Peruvian Censuses (1876, 1940) Matching colonial and contemporary districts based on historical geographical dictionaries and INEI.
- Controls include: altitude, soil type conducive to agriculture, and steepness.
Empirical strategy

- Exploit variation of labor institutional arrangements in 500 settlements in colonial Peru.
- Settlement $i$ could be subject to a coercive labor institutions ($mita$ + labor-based $encomienda$).
- Assess effect on (colonial) tributary population (males, 15-50 years old) over time (1570s-1790s)
  
  $$Tributaries_{it} = \beta_1 + \beta_2 \text{institution}_i + X'_i \beta_3 + \epsilon_{it}$$

- Assess persistent effect of institution on postcolonial outcomes (e.g. education)

Unlike other studies, we chose to incorporate not only the $mita$ service but also the labor-based $encomienda$ as coercive labor institutions.

Figure: Location of indigenous settlements by type
### Colonial outcomes

Table: Effect of colonial coercive labor institutions on tributary population - OLS estimates

The dependent variable is Total tributary population of settlement $i$ and year $t$

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institution</td>
<td>-164.224</td>
<td>-392.336**</td>
<td>63.887</td>
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<tr>
<td></td>
<td>(110.922)</td>
<td>(179.783)</td>
<td>(57.511)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.070</td>
<td>0.105</td>
<td>0.042</td>
</tr>
<tr>
<td>N</td>
<td>2008</td>
<td>1004</td>
<td>1004</td>
</tr>
</tbody>
</table>

**Controls**

- **Geographic**: ✓ ✓ ✓
- **Year**: ✓ ✓ ✓
- **Province**: ✓ ✓ ✓
- **Period**: All 1570-1620 1740-1790

Robust standard errors clustered by province. Province and year fixed effects included. The geographic controls are (average) elevation, (average) elevation square, and district area. Coefficients that are significantly different from zero are denoted as *10%, **5%, and ***1%. The dependent variable is total tributary population. Coercive labor institution refers to mita and labor-based encomienda settlements. Other controls include: Distance to the nearest colonial city over 5,000 people, Agriculture, an indicator variable with value of 1 when the soil type is conducive to agriculture, and Not steep that takes into account steepness of terrain.
Endogeneity concerns I

- Settlement allocation in *mita* and labor-based *encomienda* may not have been randomly allocated.
- Spaniards may have chosen (or lobbied for) settlements with better “possibility of extraction”.

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- Spaniards may have chosen (or lobbied for) settlements with better “possibility of extraction”.
- If any of these conditions are met, then we are facing endogeneity issues of the omitted variable kind...
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  - The absence of labor coercion in some settlements may be compensated by more extraction in the form of tribute – *equalization of extraction*: settlements with extractive institutions should pay *less* tribute per capita.
Endogeneity concerns I

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  - The absence of labor coercion in some settlements may be compensated by more extraction in the form of tribute — *equalization of extraction*: settlements with extractive institutions should pay less tribute per capita.
- Identify a source of exogenous variation, not correlated with outcome but correlated with existence of the extractive institution — *instrumental variable approach*
Endogeneity concerns II

Table: Effect of coercive labor institutions on tribute per capita - OLS estimates

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
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<th>(3)</th>
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</thead>
<tbody>
<tr>
<td>Institution</td>
<td>0.635*</td>
<td>0.378</td>
<td>0.045</td>
</tr>
<tr>
<td></td>
<td>(0.348)</td>
<td>(0.330)</td>
<td>(0.053)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.121</td>
<td>0.043</td>
<td>0.057</td>
</tr>
<tr>
<td>N</td>
<td>252</td>
<td>252</td>
<td>252</td>
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</table>

Robust standard errors clustered by province. Province fixed effects included. The geographic controls are (average) elevation, (average) elevation square, and district area. Coefficients that are significantly different from zero are denoted as *10%, **5%, and ***1%. The dependent variable is (1) total tribute per capita, (2) total tribute per capita in silver and gold, (3) share of total tribute in silver and gold.

Coercive labor institution refers to mita and labor-based encomienda settlements. Other controls include: Distance to the nearest colonial city over 5,000 people, Agriculture, an indicator variable with value of 1 when the soil type is conducive to agriculture, and Not steep that takes into account steepness of terrain.
Endogeneity concerns III

Exogenous source of variation: the Spanish Crown established that settlements near the regional capitals (cabeceras) were supposed to be allocated to the Crown and thus not subject to labor service.

Instrument: indicator variable for settlements outside the “exclusion zone” defined as 50-km from nearest regional capital. (Zone equivalent to half the distance established by Viceroy Toledo as the reach for mita.) We call them “anticabecera”.

In 1533, the Crown established that settlements near the regional capitals –cabeceras– would be reverted to or reserved for the Crown to avoid abuse from Spanish settlers (Puente Brunke, 1992, pp. 120-130).
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Empirical strategy

Endogeneity concerns IV

Table: Effect of colonial coercive labor institutions on tributary population - IV estimates, second stage

The dependent variable is Total tributary population of settlement \( i \) and year \( t \)

<table>
<thead>
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<th>(3)</th>
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<tbody>
<tr>
<td>Institution</td>
<td>-675.267</td>
<td>-1055.239**</td>
<td>-295.294</td>
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<tr>
<td></td>
<td>(304.090)</td>
<td>(422.403)</td>
<td>(282.404)</td>
</tr>
<tr>
<td>N</td>
<td>2004</td>
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<td>1002</td>
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<td>F</td>
<td></td>
<td>40.09</td>
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<tr>
<td>Year</td>
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<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Province</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Period</td>
<td>All</td>
<td>1570-1620</td>
<td>1740-1790</td>
</tr>
</tbody>
</table>

Robust standard errors clustered by province. Province and year fixed effects included. The geographic controls are (average) elevation, (average) elevation square, and district area. Coefficients that are significantly different from zero are denoted as *10%, **5%, and ***1%. The dependent variable is total tributary population. Coercive labor institution refers to mita and labor-based encomienda settlements. Other controls include: Distance to Cuzco, Agriculture, an indicator variable with value of 1 when the soil type is conducive to agriculture, and Not steep that takes into account steepness of terrain.
Endogeneity concerns V

Table: Selection based on economic significance

<table>
<thead>
<tr>
<th>Dependent variable: Existence of coercive institution</th>
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<tbody>
<tr>
<td>not near main city</td>
<td>0.022</td>
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<tr>
<td></td>
<td>(0.071)</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.005</td>
</tr>
<tr>
<td>N</td>
<td>501</td>
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</tbody>
</table>

Robust standard errors clustered by province. Province fixed effects included. The geographic controls are (average) elevation, (average) elevation square, and district area. Coefficients that are significantly different from zero are denoted as *10%, **5%, and ***1%. Coercive labor institution refers to mita and labor-based encomienda settlements. Other controls include: Distance to Cuzco, Agriculture, an indicator variable with value of 1 when the soil type is conducive to agriculture, and Not steep that takes into account steepness of terrain.

Figure: 50-km buffer around main cities
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Empirical strategy

Postcolonial outcomes

Table: Effect of coercive labor institutions on postcolonial outcomes - OLS estimates

The dependent variables are Literacy rate in 1876 and 1940 and Urbanization rate in 1876 in district

<table>
<thead>
<tr>
<th></th>
<th>Literacy rate 1876</th>
<th>Urbanization rate 1876</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Institution</td>
<td>-0.001</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.012)</td>
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<tr>
<td>$R^2$</td>
<td>0.108</td>
<td>0.136</td>
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<tr>
<td>N</td>
<td>404</td>
<td>406</td>
</tr>
</tbody>
</table>

Controls

- Geographic ✓ ✓ ✓
- Province ✓ ✓ ✓

Robust standard errors clustered by province. Province fixed effects included. The geographic controls are (average) elevation, (average) elevation square, and district area. Coefficients that are significantly different from zero are denoted as *10%, **5%, and ***1%. Coercive labor institution refers to mita and labor-based encomienda settlements. Other controls include: Distance to the nearest colonial city over 5,000 people, Distance to Cuzco, Agriculture, an indicator variable with value of 1 when the soil type is conducive to agriculture, and Not steep that takes into account steepness of terrain.
Mechanisms

- The presence of extractive labor institutions appears to have detrimental effects until the 17th century. Why did the detrimental effects of colonial labor institutions fade over time?
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The indigenous populations frequently challenged these coercive institutions through insurrection, negotiation, and migration.

- *Mita* service was negotiable: from half to 70% of the labor used in mines was free labor.
- Most radical strategy to avoid any of these services was migration: “Indian migration was the mita’s main legacy.” (Cole, 1984, 27)
Migration throughout colonial times

**Figure: Forasteros** as a share of adult males (15-50 years) in Canas province

Source: Based on Glave (1992).
Mechanisms

- The presence of extractive labor institutions appears to have detrimental effects until the 17th century. Why did the detrimental effects of colonial labor institutions fade over time?
- The indigenous populations frequently challenged these coercive institutions through insurrection, negotiation, and migration.
  - *Mita* service was negotiable: from half to 70% of the labor used in mines was free labor.
  - Most radical strategy to avoid any of these services was migration: “Indian migration was the mita’s main legacy.” (Cole, 1984, 27)
- These results are consistent with the large literature depicting a range of coexisting labor arrangements with increasing importance of wage labor.
Conclusions

It appears that the nature of extraction—at least in terms of labor institutions—changed substantially during colonial times in Peru.
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Our evidence suggests that settlements under coercive labor institutions experienced, relatively, more rapid population loss until the early 18th century.
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To assuage endogeneity concerns, we looked at other ways that extraction could have manifested—i.e. tribute—and find that there is no systematic difference between settlements. In addition, using an IV approach, our results still hold.
Conclusions

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Our evidence suggests that settlements under coercive labor institutions experienced, relatively, more rapid population loss until the early 18th century.

To assuage endogeneity concerns, we looked at other ways that extraction could have manifested—i.e. tribute—and find that there is no systematic difference between settlements. In addition, using an IV approach, our results still hold.

The presence of extractive labor institutions does not appear to have an effect on later economic outcomes such as education.
Future work

- Match with similar districts without colonial labor arrangements in post-colonial times.
- Look at other postcolonial outcomes
  - Rebellions in late colonial times (e.g. Tupac Amaru rebellion)
  - Political participation (ca. 1930s)
Future work

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  - Political participation (ca. 1930s)
- Incorporate your insightful comments
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- Look at other postcolonial outcomes
  - Rebellions in late colonial times (e.g. Tupac Amaru rebellion)
  - Political participation (ca. 1930s)
- Incorporate your insightful comments
- Address other sources of endogeneity that you will point out.
Figure: Encomienda of Yaurisque, 1683

Source: Archivo General de Indias, LIMA, 203A, N.31
The case for persistence

“After an initial phase of looting, and gold and silver lust, the Spanish created a web of institutions designed to exploit the indigenous people. The full gamut [of institutions] was designed to force indigenous peoples living standards down to a subsistence level and thus extract all income in excess of this for Spaniards. This was achieved by expropriating their land, forcing them to work, offering low wages for labour services, imposing high taxes, and charging high prices for goods that were even voluntarily bought. Though these institutions generated a lot of wealth for the Spanish crown and made the conquistadores and their descendants very rich, they also turned Latin America into the most unequal continent in the world and sapped much of its economic potential.”

Acemoglu and Robinson (2012), pp. 18-19
Population: evolution

Figure: Population, in millions

Source: Arroyo Abad and van Zanden (2017)
Encomienda

- Royal grants of the right to demand indigenous peoples tribute and labor, assigned to individual Spaniards.
- Born out of necessity to control the new territory
- First *encomienda* given in the Antilles ca. 1495
- An *encomienda* translated into economic power and social prestige in a society without lineage.
- Its de-facto demise came at the end of the 17th century.
Development of silver mining: epicenter of the Peruvian colonial enterprise.

Free labor shortage prompted the creation of the mita: forced draft labor to the mines.

Some resemblance to the Incan mit’a.

Extent to 1/7 of the healthy male adult indigenous population.

The mita workers, mitayos, received a minimum wage and travel compensation.

Established by Viceroy Toledo in 1573 and abolished by 1812-1820.
Tribute levied to all physically healthy males (18-50 years old): ca. 20% of the indigenous population.

- It was also based on economic capacity.
- Encomienda was replaced by tribute in the late 17th century.
- In Peru, several districts negotiated paying a higher tribute to avoid mita duties.
First stage

Table: Effect of colonial coercive labor institutions on tributary population - IV estimates, first stage

The dependent variable is Institution in settlement i and year t

<table>
<thead>
<tr>
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<th>(1)</th>
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<tbody>
<tr>
<td>Anticabecera</td>
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<td></td>
<td>(0.489)</td>
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<tr>
<td>F</td>
<td>40.17</td>
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</tbody>
</table>

Controls

- Geographic ✓
- Year ✓
- Province ✓
- Period All

Robust standard errors clustered by province. Province and year fixed effects included. The geographic controls are (average) elevation, (average) elevation square, and district area. Coefficients that are significantly different from zero are denoted as *10%, **5%, and ***1%. The dependent variable is coercive labor institution refers to mita and labor-based encomienda settlements. Other controls include: Distance to the nearest colonial city over 5,000 people, Agriculture, an indicator variable with value of 1 when the soil type is conducive to agriculture, and Not steep that takes into account steepness of terrain.
**Mita draft over time**

![Bar chart showing weekly drafts for the mita in Potosi: official vs. effective counts. (*) Averages from the nearest decade. Sources: Tandeter (1962), Cole (1984), and Tandeter (1993).]

**Figure:** Weekly drafts for the *mita* in Potosi: official vs. effective counts.*

The extent of migration towards the end of colonial times

Figure: Tributaries and *Forasteros* as share of total population by province, 1752
Source: Based on Amat et al. (1959).

Leticia Arroyo Abad (Middlebury College)
The long arm of history

The dependent variable is Total tributary population of settlement i and year t

<table>
<thead>
<tr>
<th></th>
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<th>(3)</th>
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<tbody>
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<td></td>
<td>(110.991)</td>
<td>(180.234)</td>
<td>(57.161)</td>
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<td>Distance to Cuzco</td>
<td>0.151**</td>
<td>0.193**</td>
<td>0.109*</td>
</tr>
<tr>
<td></td>
<td>(0.066)</td>
<td>(0.093)</td>
<td>(0.065)</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.073</td>
<td>0.112</td>
<td>0.044</td>
</tr>
<tr>
<td>N</td>
<td>2004</td>
<td>1002</td>
<td>1002</td>
</tr>
</tbody>
</table>

Controls

- Geographic ✓ ✓ ✓
- Year ✓ ✓ ✓
- Regional ✓ ✓ ✓
- Year#Regional ✓ ✓ ✓
- Period All 1570-1620 1740-1790

Robust standard errors clustered by province. Province and year fixed effects included. The geographic controls are (average) elevation, (average) elevation square, and district area. Coefficients that are significantly different from zero are denoted as *10%, **5%, and ***1%. Coercive labor institution refers to mita and labor-based encomienda settlements. Other controls include: Distance to the nearest colonial city over 5,000 people, Agriculture, an indicator variable with value of 1 when the soil type is conducive to agriculture, and Not steep that takes into account steepness of terrain.
## Summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>All Mean</th>
<th>Std. Dev.</th>
<th>Institution = 1 Mean</th>
<th>Std. Dev.</th>
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<th>Std. Dev.</th>
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</thead>
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