

FISCAL LEGIBILITY & STATE DEVELOPMENT

THEORY & EVIDENCE FROM COLONIAL MEXICO

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How does state capacity develop?

Association between:

- State capacity and economic development

(e.g., Acemoglu, Garcia-Jimeno & Robinson 2015; Dincecco & Katz 2014)

- Direct rule/centralization and economic development

(e.g., Lange 2004,2009; Osafo-Kwaako and Robinson 2013; Gennaioli & Rainer 2007)

What drives state development?

External conflict

(e.g., Tilly 1985, 1990; Gennaioli & Voth 2015)

Internal political conflict

(e.g., Besley & Persson 2011; Dincecco & Wang 2018; Garfias 2018; Garfias & Sellars 2021)

Political geography

(e.g., Boone 2003; Cederman & Girardin 2010; Koyama, Moriguchi & Sng 2019)

Demography

(e.g., Carneiro 1970; Herbst 2000; Fenske 2013)

Observability of production

(e.g., Mayshar, Moav, Neeman 2017; Ahmed & Stasavage 2020)

Today: Theory and evidence from colonial Mexico

FISCAL LEGIBILITY & STATE DEVELOPMENT

Fiscal legibility: ruler's ability to independently observe local economic conditions for the purposes of taxation/control

- Monitoring intermediaries requires information
- If rulers cannot observe effort, need to encourage performance through ceding more revenue
- More information → greater ability to dismiss agents, more revenue for ruler
- **Greater legibility can increase incentives for state centralization & investment in future legibility**



Tribute in the
Chavero Codex

PAPER SUMMARY

Transition to direct rule in colonial Mexico

- Differed greatly across space and time

Introduction of patio process in 1550s

- New technology in silver mining enabled Crown to observe local economic conditions

Difference-in-differences empirical strategy

- Faster transition to direct rule in affected areas after 1550
- Effect larger where cost of transition & prior information lower

Persistent consequences

- Greater state investment in capacity over the long term in affected areas

PRESENTATION OUTLINE

- 1 Theory: Fiscal legibility, centralization, & state development
- 2 Colonial rule & patio process in Mexico
- 3 Data description
- 4 Exogenous legibility shock & political centralization
- 5 Endogenous investment in legibility
- 6 Discussion

DIRECT AND INDIRECT RULE

Indirect rule

- Local elites maintain considerable political/fiscal autonomy
- Keep a large share of tax revenue in exchange for administering territory
- Difficult for a central ruler to fire intermediaries

Direct rule

- State relies on direct agents to administer territory
 - Requires investment in fiscal bureaucracy
- Agents paid a wage, remaining revenue goes to the state
- Ruler can dismiss shirking bureaucrats

THEORY: LEGIBILITY AND CENTRALIZATION

Build on Mayshar et al. (2017) to model interaction between central ruler and local intermediary

Ruler seeks to maximize tax revenue stream R , which depends on:

- Good/bad state of the world $\Theta \in \{G, B\}$, where $P(G) = p$
- High/low effort by intermediary $e \in \{l, h\}$ (effort cost γ)
- Revenue high when $\Theta = G$ and $e = h$, low otherwise

Ruler does not directly observe Θ or e

- Observes tax revenue $R \in \{H, L\}$
- Receives signal $\sigma \in \{g, b\}$ of state of the world
- Legibility: $q_t = P(\Theta = G|g) = P(\Theta = B|b)$, where $q_t \in [0.5, 1]$

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THEORY: ACTIONS/CHOICES

Ruler's decision:

- 1 Type of contract to offer intermediary at start of period
- 2 Whether to invest in future capacity

Intermediary's decision:

- 1 Whether to accept contract
- 2 Whether to exert high effort

POSSIBLE CONTRACTS FOR INTERMEDIARY

Indirect rule (non-dismissal contract)

- Status quo contract
- Must use promise of wage w , bonuses a to encourage effort
- No replacement of intermediary

Direct rule (dismissal contract)

- Requires ruler to pay cost of transition to contract κ
- Ruler can dismiss & replace intermediaries who underperform
- Agents who are dismissed get no further payment
- Dismissing agents is costly for ruler (x)

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INVESTMENT IN FUTURE LEGIBILITY

Ruler can invest I in improving future signal accuracy q_{t+1}

- $q_{t+1} = q_t + g(q_t, I)$
- Technology: $g(q_t, 0) = 0$, $g(\cdot) > 0$, $\frac{\partial g}{\partial I_t} > 0$, $\frac{\partial g}{\partial q_t} < 0$

Tradeoff: Linear cost today for future benefits of legibility

- Make it easier to monitor intermediaries going forward
- Requires forgoing revenue today

MODEL ANALYSIS

Construct stationary MPE in which intermediary exerts high effort each period. Focus on two questions:

- When will the ruler seek to centralize authority (i.e., transition to direct rule)?
- When will the ruler invest in improving legibility/information over the long term?

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FISCAL LEGIBILITY & CENTRALIZATION

Payments to intermediary are higher under indirect rule

- Can only use “carrots” (no dismissal), so payment needs to be greater to induce effort

The relative benefit of implementing direct rule is increasing in q_t

- More information \rightarrow less chance of wrongly replacing a high-effort agent
- Less revenue needs to be ceded to intermediary with dismissal as q_t rises
- Shifts ruler's tradeoff between cost of dismissal, benefit of lower bonuses

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FISCAL LEGIBILITY & CENTRALIZATION

The ruler prefers the dismissal contract only when q_t is larger than a threshold q^*

- At low levels of transparency, cost of monitoring/replacing agents high
- As transparency increases, relative benefit of using dismissal increases
- Threshold q^* : increasing in the cost of transition to dismissal contract κ & the cost of replacing an agent x

Empirical implications:

- An increase in fiscal legibility should lead to an increase in centralization
- This effect should be greater where cost of transition & prior legibility are low

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FISCAL LEGIBILITY & STATE DEVELOPMENT

When will the ruler invest in enhancing future legibility?

- No benefit to enhanced legibility under indirect rule (no monitoring/dismissal)
- Under direct rule: retained revenue is increasing in legibility
- Investment only worthwhile if district can transition to direct rule now or “soon” (q_t close to q^*)
- If $q_t < \hat{q}$: any benefit of investment too far in the future

Empirical implications:

- An increase in fiscal legibility can lead to long-term investment in informational capacity
- A single shock can lead to long-term divergence in state institutions

Context: change in silver mining in colonial Mexico

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THE ENCOMIENDA AS INDIRECT RULE



Crown & Encomienda Towns,
Osuna Codex

- Outsourcing of conquest
 - Extend authority quickly
- Encomienda and tribute collection
 - Elites given right to extract indigenous tribute/labor
 - Provided for local defense
- Crown begins to centralize power
 - Replace encomenderos with direct agents of the state
 - Corregidores: paid a wage, hired/fired by center
- Subnational variation in centralization

SILVER MINING & PATIO PROCESS

- Extracting silver from mined ore:
 - Smelting: costly, traditional method using firewood, lead
 - Patio process: invented in 1554, more efficient, requires mercury
- The Crown establishes a monopoly on mercury in 1558
 - Mercury was imported to Mexico from Europe
 - Approximate ratio of mercury → extracted silver well known

⇒ Gives ruler insight into local economic conditions



Amalgamation via the Patio Process

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SILVER, LEGIBILITY, & TAXATION

Control over mercury made it easier to monitor intermediaries

- Boom in silver production: more demand for inputs, labor, agricultural products, etc.
- Should lead to an increase in local tax revenue

This increased the benefits of political centralization

- Easier to ascertain whether fluctuations in revenue were due to poor conditions or poor effort

→ Systematically examine how introduction of patio process shaped transition to direct rule in colonial Mexico

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DATA DESCRIPTION

Direct rule

- Encomienda holdings by region
- Calculate % of holdings under direct rule
- Source: Gerhard (1993)

Early colonial mines

- Silver and gold mines by decade of discovery
- Source: Gerhard (1993) and Hillerkuss (2013)

Unit of analysis

- 1786 administrative region
- Decades from 1520–1650



Ortelius's *Hispaniae Novae*

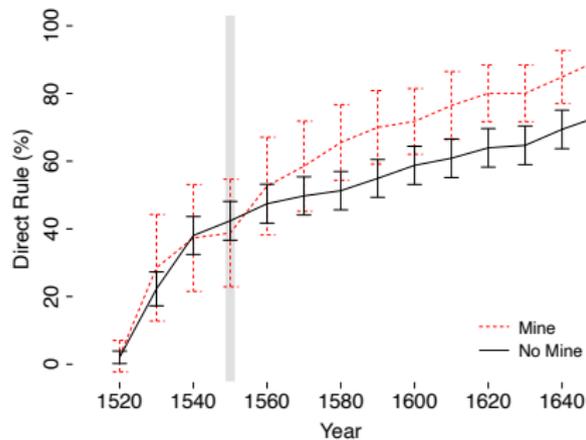
EMPIRICAL STRATEGY

Panel data on early colonial mining and on transition to direct rule

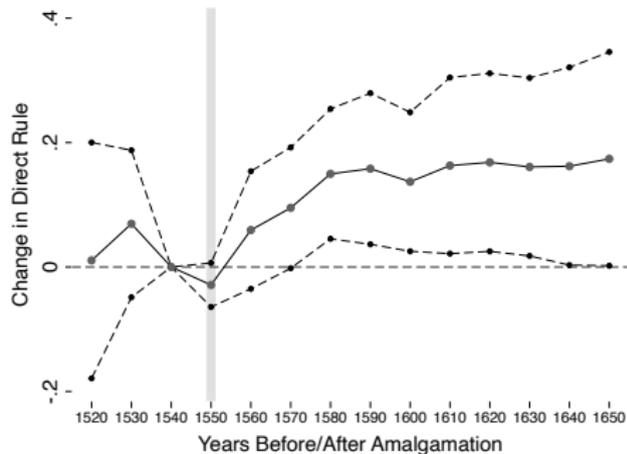
$$DirectRule_{it} = \beta Mine_i \times Amalgamation_t + \Theta_t X_i + \Pi U_{it} + \lambda_t + \gamma_i + \varepsilon_{it},$$

- $DirectRule_{it}$: Fraction of encomiendas brought under direct rule
- $Mine_i$: Silver/gold mine in district
- $Amalgamation_t$: Post-1550, amalgamation discovery/mercury monopoly
- λ_t and γ_i : Decade & district fixed effects
- $\Theta_t X_i$: Time-invariant controls interacted with decade (elevation, surface area, malarial, dist to Mexico City, year of European contact)
- U_{it} Time-varying controls (Mean, minimum, and std. dev. rainfall)

SILVER MINING AND DIRECT RULE ADOPTION



(a) Trends over time



(b) Dynamic panel estimates

DiD: SILVER MINING AND DIRECT RULE

	Direct Rule (% of District)			
	New Spain		New Spain & Nueva Galicia	
	(1)	(2)	(3)	(4)
Any Mine \times Post-Patio Process	0.080** (0.032) {0.035}	0.088** (0.041) {0.045}	0.13*** (0.040) {0.038}	0.12*** (0.037) {0.035}
Climate Controls	No	Yes	No	Yes
Controls \times Year FE	No	Yes	No	Yes
Year of European Contact \times Year FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Within-District Mean of DV	0.51	0.51	0.51	0.52
Within-District SD of DV	0.23	0.22	0.24	0.24
R sq.	0.80	0.82	0.78	0.81
Observations	1680	1624	2016	1960
Number of districts	120	116	144	140

OLS estimations. Unit-of-analysis is the district-year. Std. errors clustered at the district level in parentheses; errors that allow for serial correlation within districts and spatial correlation between districts within 500 km of each other in curly brackets.

MAIN RESULTS: CENTRALIZATION

Introduction of patio process \rightarrow 8–13 p.p. increase in direct rule adoption in mining areas

- \approx one-third to half of within-district s.d. of direct rule adoption
- Robust with/without controls, spatial correlation of errors, only using pre-1560 mines [▶ Results](#)

Was the effect really about the increase in *fiscal legibility*?

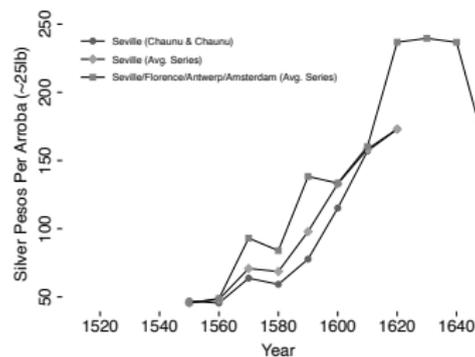
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REVENUE POTENTIAL AS ALTERNATIVE MECHANISM



Cochineal Prices in Europe

Could enhanced profitability explain these results?

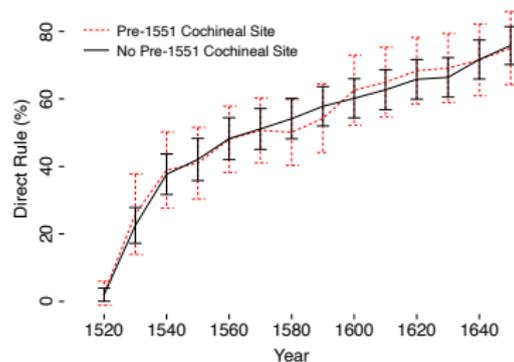
- More potential revenue → centralization?

Examine cochineal price boom

- Other major commodity in colonial Mexico
- 1580–1620: Large, demand-driven price increase

Jump in profitability w/o increase in legibility

REVENUE POTENTIAL AS ALTERNATIVE MECHANISM



Direct rule & price boom

Dramatic rise in profitability but no differential increase in centralization

- Coefficients small, not statistically different from 0

Casts doubt on profitability mechanism

- Jump in potential revenue likely bigger than patio process

No legibility increase → no centralization increase

ADDITIONAL EVIDENCE

Impact on direct rule should be smaller (greater) where cost of transition is higher (lower)

- Where centralization is risky, ruler might prefer to keep indirect rule even when legibility is high
- Smaller effect in districts that resisted Conquest, where collective action should be easier

Impact on direct rule should be larger where there was a low initial level of legibility

- Gain in information provided by patio process especially important
- Smaller in districts near Mexico City, where authorities had pre-colonial tribute history

ENDOGENOUS LEGIBILITY INVESTMENT

Exogenous \uparrow in legibility \rightarrow more investment

- Benefits only under direct rule

Differential placement of royal treasuries

- Better information, monitoring of nearby production

Examine least-cost walking hours to nearest treasury

- Distance, elevation, land cover
- Alternative assumptions, Euclidean distance



Network of royal treasuries

SILVER MINING AND WALKING HOURS TO TREASURY

	Walking Hours to Treasury (log)			
	Regions with Direct/Indirect Rule			
	New Spain		All	
	(1)	(2)	(3)	(4)
Any Mine \times Post-Patio Process	-0.27** (0.12) {0.11}	-0.18 (0.11) {0.097}	-0.073 (0.10) {0.13}	-0.082 (0.089) {0.10}
Climate Controls	No	Yes	No	Yes
Controls \times Year FE	No	Yes	No	Yes
Year of European Contact \times Year FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes
Within-District Mean of DV	8.20	8.16	8.33	8.31
Within-District SD of DV	0.17	0.18	0.31	0.27
R sq.	0.93	0.94	0.87	0.91
Observations	3264	3160	5084	4538
Number of districts	126	122	196	175

OLS estimations. Unit-of-analysis is the district-year. Std. errors clustered at district level in parentheses; errors that allow for serial correlation within districts and spatial correlation between districts within 500 km of each other in curly brackets.

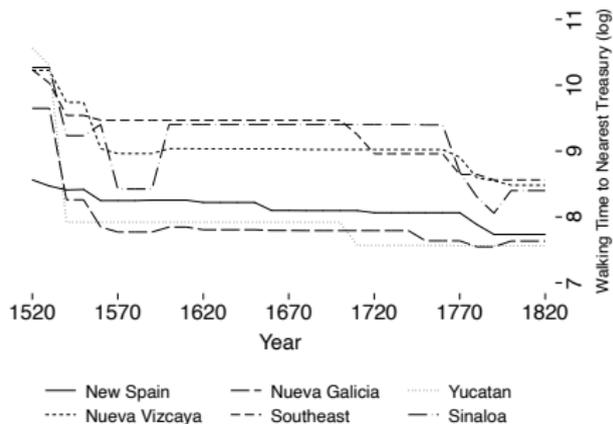
TRENDS IN WALKING TIME TO NEAREST TREASURY

Patterns:

- Shifting temporal investment
- Little investment in frontier regions

Relation to theory:

- Investments \downarrow as imperial European wars increase, patience declines
- Marginal investment in areas with pre-existing legibility & under direct rule



Long-term regional trends

DISCUSSION

Increase in fiscal legibility can encourage centralization of power

- In low-information areas, cost of monitoring/sanctioning intermediaries is high
- As legibility increases, the ruler is better able to discern when intermediary is shirking
- Ruler can tighten control, threaten intermediaries with dismissal, & retain more revenue

Broader implications for state development

- Centralization encourages further investment in fiscal legibility
- Can lead to divergence in political institutions, state control over the long term

DISCUSSION

Evidence from colonial Mexico

- Introduction of patio process increased legibility in mining areas
- Adoption of direct rule differentially increased in mining districts
- Affected areas also see greater state investment in legibility through treasury placement

Contributions

- Framework to analyze the endogenous relationship between legibility and state development
- New quasi-experimental evidence

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