Income Taxation and State Capacities in Chile: measuring institutional development using a historical earthquake data

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Abstract

Building on the fiscal sociology paradigm, this paper argues that the development of the modern fiscal apparatus in Chile was product of a sectoral conflict around in the 1920<U+2019>s between the industrial and agricultural political elites. Particularly, I identify the importance of the income tax, and how it contributed to expand state capacities at the subnational level. Exploiting the quasi-randomness of earthquake shocks, I use a novel historical earthquake dataset and a Bayesian multilevel Poisson model to measure state capacities at the local level between 1900 and 2010. The results suggest that the implementation of the income tax has historically decreased the proportion of local deaths, and that the effect has been stronger in industrial localities.

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I. Multilevel Analyses

I. Appendix

In this section I model the number of dead individuals caused by earthquakes.

The data are fitted using a Bayesian Poisson regression. The main independent variables are the proportion of national agriculture output relative to industrial output and a dummy for whether in year t the law of income tax had been implemented. I expect the yearly death tolls to be lower when the national proportion of agricultural production decreases, when the law of income taxation has been passed, and where the industry predominates at the local level. The model controls for local population, an indicator for local urban/rural, and earthquake magnitude.

Include summary stats here. Explain what's national and what's subnational.

Since the 'treatment,' i.e. the proportion of agricultural output relative to industrial output, and the implementation of the income tax, takes place at the national level but the outcome (death tolls associated to earthquakes) is measured at the local level, I implement a multilevel model.[1]

Particularly, I include year fixed-effects to account for unobservable/unmeasured yearly factors such as the evolution of the political system, demographic, climate and cultural changes, economic shocks (both national and international), and others. Particularly, the multilevel component of Equation 1 allows the slopes of the national proportion of agriculture relative to industry (β_{1_j}) and the earthquake's magnitude (β_{2_j}) to vary by subnational sectoral predominance indexed by j. I consider whether affected localities were predominantly *agricultural*, *industrial* or *mixed*.

The latitude where the earthquake occurred was included to control for the proximity to the Andean mountains. This variable controls for a built-in tectonic predisposition of a higher propensity of earthquakes. Longitude controls for climate and other unobserved conditions that make agricultural development more difficult. In turn, both measurements serve as good proxies for terrain ruggedness and the difficulties the state had to face to centralize political power. More formally, I fit the next equation,

See if I included this lit. already.

$$
\begin{aligned}
\text{Deaths } &\sim \text{Poisson}(\lambda_i) \\
log(\lambda_i) =& \mu + \beta_{1_j}\text{Proportion}_i + \beta_{2_j}\text{Magnitude}_i + \beta_3\text{Tax}_i + \\
& \beta_4\text{Population}_i + \beta_5\text{Urban}_i + \\
& \beta_6\text{Latitude}_i + \beta_7\text{Longitude}_i + \beta_{8_t}\text{Year}_i
\end{aligned} \tag{1}
$$

where,

[1] Gelman and Hill [2006, 237].

$$
\begin{aligned}
&i_{1,\ldots I} \text{ where I} = 91 \\
&j_{1,\ldots J} \text{ where J} = 3 \\
&t_{1,\ldots T} \text{ where T} = 59.
\end{aligned}
\tag{2}
$$

The i subscript denotes the unit of analysis (i.e. earthquake),[2] the j index expresses the type of sub-national economic composition of the affected locality (agricultural, industrial, or mixed), and the t subscripts denotes the year when earthquake i happened. Finally, μ is the intercept. Since earthquakes can happen more than once per year, in my dataset $i > t$.[3] The estimated parameters β_k have uninformative normally distributed priors, while the precisions τ_p of β_{1_j}, β_{2_j} and β_{8_t} have uninformative Gamma priors, of the form,

$$
\begin{aligned}
\beta_{k,\ldots K} &\sim \mathcal{N}(0, 0.01) \text{ where K} = 8 \\
\tau_{p,\ldots P} &\sim \mathcal{G}(0.5, 0.001) \text{ where P} = 3.
\end{aligned}
\tag{3}
$$

[2] Kahn [2005, 278] follows the same strategy.

[3] For the years in which there is just one earthquake, the 'group' variable has only one observation. This does not endangers the robustness of the model. Gelman and Hill [2006, 276] explains that it "is even acceptable to have one observation in many of the groups."

.... **Word count**: 201 ....

References

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