Income Taxation and State Capacities in Chile: Measuring Institutional Development Using Historical Earthquake Data

Héctor Bahamonde, PhD

*Postdoctoral Fellow • Center For Inter-American Policy & Research • Tulane University

e:hbahamonde@tulane.edu

w:www.HectorBahamonde.com

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Abstract

The central argument of this paper is that income taxation fostered, via spillover effects, state-consolidation overtime in Chile. The presence of tax assessors and collectors throughout the territory increased norms of enforcement of state regulations more generally, fostering overall state-capacities over time. In turn, the paper explains that the implementation of the income tax was product of sustained levels of sectoral contestation. Exploiting the exogeneity of earthquake shocks, I leverage a novel hand-collected longitudinal dataset on Chilean earthquake death tolls and a Bayesian multilevel Poisson model to estimate levels of state capacities between 1900 and 2010. My identification strategy contends that the capacity for enforcing and monitoring building codes throughout the territory is a reflection of a state's overall capacities. The results strongly suggest that death-tolls decrease, that is, state capacities increase once the income tax law is implemented. To explore the causal mechanisms at work in more depth, I discuss the Chilean case since the 1920s.

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Levi [1989, 1] has famously explained that "the history of state revenue production is the history of the evolution of the state." However, and as Schneider [2012, 2] explains, even when we have gained considerable knowledge of fiscal expansion in the European cases, the study of the public finances within a context of state consolidation in the developing world is lacking, especially in the presence of "new leading sectors." In fact, while there are a number of theories about state-capacity in Latin America, domestic explanations centered on the role of the economic structural transformation and taxation have been overlooked.[1] Besides this theoretical gap, there is also an empirical deficit. As Soifer [2012, 586] points out, most "scholarship on state capacity [...] lack[s] a satisfying conceptualization and measurement scheme for this concept." Moreover, while most state formation theories are situated during precolonial,[2] early,[3] or late[4] independent Latin America, we lack of a measurement that corresponds *temporally* to the theories we have. In other words, most explanations of state-making are *historical* in nature. Yet, in practice, available measurements capture *contemporary* levels of *stateness*.

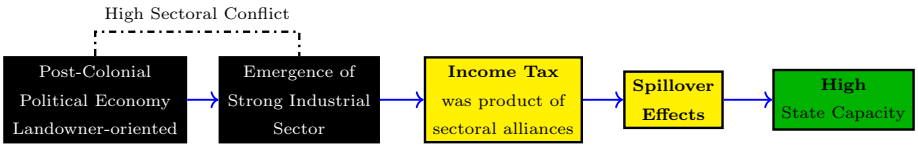

Figure 1: *Causal Mechanism*

By studying the Chilean case, the paper bridges these two shortfalls by arguing, and empirically testing, the positive relationship between income taxation and state-consolidation. The argument outlines how income taxation had positive spillover effects over state institutions, increasing overall levels of state development. The evidence documents how the presence of tax assessors and collectors throughout the territory increased norms of enforcement of state regulations more generally, fostering overall state-capacities over time. Additionally, exploiting the exogeneity of earthquake shocks, I leverage a novel hand-collected dataset on Chilean earthquake death tolls between 1900 and 2010. Earthquakes are time-invariant, and importantly, orthogonal to economic development and regime type. Under reasonable assumptions, if the state's capacity for enforcing and monitoring building codes throughout the territory is a reflection of overall state capacity, then death-toll differentials should be mainly associated with state-capacities. Exploiting this variation via a Bayesian

[1] A few exceptions are Gallo [1991, 7-8], Beramendi et al. [2016] and Saylor [2014, 8] who consider elite conflicts to study state-making and fiscal development in the developing world. Dargent et al. [2017] focus on a "'challenger-based' causal mechanism" of state formation in Peru, however they concentrate their efforts on the role of exogenous economic shocks.

[2] Mahoney [2010].

[3] See Kurtz [2013] and Soifer [2015].

[4] Bahamonde [2017b].

Poisson model with year fixed-effects, I find that death-tolls associated to earthquakes systematically decreased (that is, *state capacities increased*) after the income tax law was implemented. Importantly, these overtime-changes are not correlated with economic growth nor industrialization levels. The empirical section also provides a qualitative case study, and several robustness checks.

Additionally, the article outlines a theory that explains the implementation of the income tax. Given that industrialists were more dependent on capital (relative to landowners), they opposed import taxes, favoring the implementation of the income tax. These fiscal resources paid for public goods that benefited the industrial class in the long-run, such as roads and bridges. Employing a number of survival models, I find that the emergence of the industrial sector *accelerated* the implementation of the income tax. Importantly, the analyses rule out a time-dependent relationship between income taxation and industrialization. In turn, using vector auto-regressive models and Granger-causality tests, the paper also challenges the stereotypical idea that Chilean landowners and industrialists conformed a single entrepreneurial elite with assets scattered throughout several spheres of investment. These tests strongly suggest that both sectors were, in fact, in constant opposition, and that inter-sectoral asset diversification was weak.

Building on the political economy and fiscal sociology literatures, this article then outlines an argument about state-capacity and taxation for the Chilean case. The crux of the argument is that sectoral conflicts triggered state development by promoting income taxation. Particularly, it explains that Latin American elites whose assets were allocated in different sectors of the economy had different preferences over direct taxation, and consequently, state centralization.[5] Consequently, sectoral economic expansion not only shaped the economic landscape; given that both sectors had their corresponding political "arms," the *political* conflict over state centralization was rooted in a broader *economic* conflict. Thus, the paper not only builds on Mamalakis [1969, 1971], who introduced the sectoral conflict approach for the Latin American cases,[6] but also follows Hechter and Brustein [1980, 1085] who explain that "state formation will be most likely to the degree that powerful individual actors form two groups on the basis of divergent economic and political interests." And such, this article is an attempt to provide an alternative explanation of state-development to the bellicist approach famously attributed to Tilly [1992],[7] and extended to the Latin American case by Thies [2005], Thies et al. [2016] and Kurtz [2006].[8] While Kurtz [2009, 2013], Soifer [2015] situate the relevant state-building critical juncture at the end of the colonial period, before the class compromises this paper identifies, the argument posits that the implementation of the income tax

[5] See Acemoglu and Robinson [2009, 289] and Best [1976, 50]. Mamalakis [1971, 109] explains that in Latin America "[p]olitical institutions and agents are distinguished, primarily, on the basis of their sectoral foundations."

[6] See for an extension Ansell and Samuels [2014].

[7] For a recent application, see Dincecco and Onorato [2016].

[8] However, see Centeno [2002].

was an important building block in this process.

The rest of the paper proceeds as follows. pending

I. Sectoral Conflict, State Capacity, and the Case of the Income Tax in Chile

The landed Latin American elites were an economic hegemonic group protected by norms and institutions that originated during colonial times.[9] Moreover, the post-colonial institutional and economical orders were designed to give an unfair advantage to the agricultural sector. Mamalakis [1971, 99] is well-known for describing how an agriculture-government coalition was conformed beginning with the colonial period. Several historians also point out that "[i]n those areas where the government did interfere in the countryside, the effect was to strengthen the position of the landowning class."[10] In fact, the little public infrastructure that existed mostly benefited the agricultural sector.[11] By extension, the landowning class controlled most of the politics too.[12] For instance, Collier and Collier [2002, 106] explain that the "national government was dominated by the central part of the country, with owners of large agricultural holdings playing a predominant role."[13]

However, when the structural transformation took place, i.e. the "secular decline of agriculture and substantial expansion of manufacturing,"[14] this process imposed tight constraints on the way politics was run by the incumbent landowning class. Given the foundational advantage of the landed elites, the secular emergence of the industrial sector translated into lower levels of inter-sectoral inequality, generating political, economic, and military threats to the landed elites.[15] For example, historian Barros [1970, 500] explains that before the civil war, *salitreras* (nitrate towns) in northern Chile were so prominent that they were considered "a state within the state."[16] Industrial bosses

[9] Keller [1931, 13].
[10] Bauer [2008, 118].
[11] Rippy [1971], Marichal [1989], Zeitlin [1984], Bauer [2008].
[12] Wright [1975, 45-46], Zeitlin [1984, 13], Bauer [2008, 45], Baland and Robinson [2008, 1748], Best [1976, 56], Rippy [1971] and Marichal [1989].
[13] Similarly, McBride [1936, 15] explains that "Chile's people live on the soil. Her life is agricultural to the core. *Her government has always been of farm owners. Her Congress is made up chiefly of rich landlords.* Social life is dominated by families whose proudest possession is the ancestral estate." Emphases are mine.
[14] Johnston and Mellor [1961, 567].
[15] As Boix [2015] explains, lower levels of inter-elite economic inequality implied similar degrees of military capabilities. Under these circumstances, war was most likely to exhaust all existent assets without producing positive outcomes for either sector (Richard Salvucci in Uribe-Uran [2001, 48]) leading to heavier pressures to reach agreements instead of engaging in armed conflicts. While initially these two "antagonistic elites" (Keller [1931, 37-38]) confronted each other in two bloody civil wars between a "large landed property [elite against a] productive capital[ist] [elite]" (Zeitlin [1984, 23]), due to low levels of inequality (and similar military capacities), war was not sustainable over time. For instance, while *Balmacedistas* managed to secure the support of the army, *congresistas* (the anti-Balmaceda group) gathered support from the navy. Similarly, in the subsequent years of the civil war, there were a number of *aborted* coups, in 1907, 1912, 1915, and 1919 (in Collier and Collier [2002, 109]), suggesting an equilibrium where no elite was the leading elite.
[16] My translation.

had to approve decisions on whether public employees could be fired, whether public works could be developed, and on whether politicians could give public speeches. *Salitrera* industries also coined their own currency, and had their own particular local laws.

The preferences over fiscal policy of the expanding industrial sector clashed with the ones of the agricultural class. On the one hand, land fixity increased the risk premium of the landed elite's main asset,[17] so they systematically resisted taxation. However, as capital could be reinvested in nontaxable sectors,[18] industrialists' preferences toward taxation were more elastic. Consequently, the emergence of a strong industrial class led to heavier pressures for the implementation of the income tax law.[19] As industrialists depended more on infrastructure implemented at the local level, such as roads, railroads, and bridges, they "[*preferred*] to shoulder a higher tax burden through progressive direct taxation."[20] In fact, in 1924 Chilean industrial elites accepted to be income taxed by agriculturalist incumbents *in exchange* for having more *state services* and being included in state politics. As others have explained, the non-agricultural sector "accepted taxation, *while demanding state services and expecting to influence how tax revenues were spent* [...] *Consultation and cooperation were relatively institutionalised between the two sides*."[21]

The tax was not only important because of the new revenue it collected. In line with the fiscal sociology paradigm,[22] the tax was also important for state consolidation. Musgrave [1992, 99] argues that since taxation (especially on incomes) requires such a high degree of state penetration, public finances offer also a theory of state-building. Indirect taxes are easier to levy, and, hence, this kind of revenue is generally considered "unearned income"[23] or "easy-to-collect source of revenues."[24] Given the relatively lower costs states have to incur to collect them, indirect taxes have a very low impact on state-building.[25] For example, Krasner [1985, 46] explains that "tariffs and export taxes are easier to obtain than direct taxes, which require high levels of bureaucratic skill and voluntary compliance." In fact, when early Latin American states depended heavily on trade taxes, the state apparatus tended to be less developed.[26] Since customs administrations have always been concentrated in a few critical locations, especially ports, tariffs and customs duties—often times—did not require an

[17] Robinson [2006, 512].
[18] Hirschman [1970]. See Ronald Rogowski in Drake and McCubbins [1998, ch. 4]. However, see Bates and Lien [1985, 15].
[19] In line with others, cross-sectoral tensions were more likely to be resolved in favor of implementing the income tax law when income inequality among the elites was low. For instance, Tani [1966, 157] explains that the absence of "wealth groups" makes passing an income tax law easier.
[20] Beramendi et al. [2016, 18].
[21] Carmenza Gallo, in Brautigam et al. [2008, 165]. Emphases are mine.
[22] See for a review Martin and Prasad [2014].
[23] Moore [2004b, 304].
[24] Coatsworth and Williamson [2002, 10].
[25] Moore [2004a, 14].
[26] Campbell [1993, 177].

elaborate fiscal structure.[27]

The very implementation of the income tax fostered state-consolidation via spillovers,[28] or *technical complementarities*, which are situations in which "an increase in the output of [a] commodity [...] lowers the marginal costs of producing [other] commodity."[29] The literature points out that the *introduction* of the income tax has been indeed associated with state expansion. For instance, Kaldor explains that the revenue service is the "point of entry." Once this institution is secured, securing the rest is marginally easier.[30] In turn, Besley et al. [2013] explain that *implementing* the income tax law is "associated with investments in public administrative structures that support tax collection" in a number of countries, including Chile, while Dincecco and Troiano [2015, 3] find "a positive and significant relationship between the introduction of the income tax and (1) per capita total expenditures, (2) per capita education expenditures, and (3) per capita health expenditures." In Chile, the same bureaucracies that were sent to collect and administer taxes, learned to solve land disputes and dispense justice. For instance, it was necessary to send official emissaries to check on accounting books of the refinery in the north, the winery in the central valley, and the *hacienda* in the south. Eventually, these delegations became more complex, increasing the density of state presence in the territory.[31]

evidence of other state programs.

Beyond just merely *adopting* income taxation, however, tax collection was properly *enforced* due to the nature of its implementation. From a historical standpoint, Humud (1969, p. 154) documents that the income tax was widely enforced, generating considerable resources for the Chilean treasury year by year.[32] Analytically, its *effectiveness* was high because both elites agreed on implementing the income tax. Institutionalist economists find that optimal institutional choices result from political settings where all involved actors "had a voice in the choice of institutions,"[33] essentially contributing to an equilibrium of quasi-voluntary compliance.[34]

II. From Earthquake Death Tolls to State Capacities

More than being blessed, the literature is in fact cursed with an over-abundance of poor indicators of state consolidation.[35] Soifer [2012, 589] explains that there exists an "industry of indices measuring

[27] Bertola and Ocampo [2012, 132].
[28] Musgrave [1992, 98] and Moore [2004b, 298] explain that not only observing individual economies, but also transforming them into public property fostered state expansion.
[29] Hirschman [1958, 67].
[30] In Brautigam et al. [2008, 15].
[31] For the European context, Strayer [2005] explains how official state delegations traveled the territory dispensing judicial decisions, thereby fostering state centralization.
[32] Bowman and Wallerstein [1982, 451-452].
[33] Aghion et al. [2004, 566].
[34] Levi [1989].
[35] Hanson and Sigman [2013b, 10] compiled 24 different types of measurements of state-capacities. In turn Mata and Ziaja [2009] constructed a combined measurement of 12 other indicators.

state weakness, state failure, and state fragility [which] has cropped up in recent years." Yet, as Fukuyama [2013, 347] argues, its abundance "points to the poor state of empirical measures of the quality of states." The literature points to two major concerns. First, "most fragility indices barely satisfy scientific standards"[36] and, second, most indices are conflated with analytical and conceptual problems.[37]

One notable example is protection of the rule of law, which is commonly used as proxy for state capacities.[38] As Kurtz and Schrank [2007, 543] explain, this strategy is severely confounded "with policy preferences over the structure of private property rights." On the one hand, this is problematic, since the sources of this data are usually elite interviews. To "the extent that public bureaucracies *are* effective in imposing taxes or regulatory demands [...] they are likely to be judged 'burdensome' and 'growth-inhibiting' by many businesspersons,"[39] thereby introducing systematic measurement error.[40] Likewise, expert surveys suffer from the same problem.[41] On the other hand, the problem is conceptual. As Soifer [2008, 247] puts it, there is a widely spread "problem of misalignment between dimension and indicator." Kurtz and Schrank [2012, 619] recommend "explicitly avoid[ing] an emphasis on outputs that are at the center of political or policy debates, such as property rights." For example, the U.S.S.R. had a strong state, however it did *not* protect property rights. Another iconic example of this misalignment problem is the use of fiscal extraction as a proxy of state capacity. Johnson and Koyama [2017, 3] explain that "[t]ax revenue per capita is a commonly used metric of fiscal capacity," which in turn speaks to levels of state-capacity. For instance, Thies [2015, 172] conceptualizes "fiscal capacity [...] in terms of tax revenue extracted from society."[42] Not only tax shares reflect policy preferences too,[43] but also, as Fukuyama [2013, 353] explains it, there "is a difference between extractive *potential* and *actual* extraction rates."[44] For instance, since American institutions were deliberately designed to limit the exercise of state power, the U.S. taxes very little.[45] However, it is not reasonable to say that the U.S. has a "weak state." Moreover, in late imperial China, "high taxes on peasants [...] were the result of rulers' *lack* of power. Chinese rulers consistently attempted to limit official's excessive extractions from the masses, but were unable to do so."[46] Finally, others have proxied state-capacity with economic

[36] Mata and Ziaja [2009, 35]. They point out particularly to the fact that data are usually poor.
[37] See also Ferreira [2017, 1292].
[38] See for one example Besley and Persson [2009, 1237].
[39] Kurtz and Schrank [2007, 542]. Emphasis in original.
[40] See also Kurtz and Schrank [2012, 618].
[41] Fukuyama [2013, 349].
[42] Other examples are Besley et al. [2013, 224] and Besley and Persson [2014].
[43] Soifer [2013, 9].
[44] Emphases are mine.
[45] Fukuyama [2004, 6].
[46] Kiser and Tong [1992, 301]. Emphasis is mine. Another example has to do with the indicators provided by the World Bank. These series are "[c]learly, the most comprehensive source for cross-national measures of governance"

growth, which is also problematic.[47] As Dargent et al. [2017] explain, state-capacity and economic growth are causally distinct mechanisms. For instance, boom-led economic growth has left net state capacity low in Peru.

This paper identifies a third limitation. Beyond conceptual and analytical problems, most available measurements are unable to capture temporal sources of variation of state capacity. Since most explanations of state-making have a strong historical component, the lack of an indicator able to *travel in time* represents a huge deficit in the literature. Just to name a few examples, Soifer [2012, 585] "builds a new measure of state capacity for [...] *contemporary* Latin America [combining] multiple dimensions (extraction, security, and the administration of basic services)."[48] Kurtz and Schrank [2012, 618-619] designed some list-experiments to study bureaucrat's opinions, Dargent et al. [2017] "analyses the evolution of state capacity in Peru during the *recent* commodity boom,"[49] while Luna and Toro [2014], Luna and Soifer [2017] employ a survey-based design to measure *contemporary* subnational state capacities. While these measurements do overcome the conceptual and analytical problems mentioned above, they do not help us in studying state capacities in a historical setup.

Economic historians and other students of political development offer other alternatives. Some examples are levels of investments in public goods,[50] such as infrastructure, roads,[51] electrification (measured as light intensity per pixel),[52] and railroads.[53] However, many of these measurements are debatable. For instance, Soifer [2012, 593] explains that "railroads were often constructed by private actors."[54] The same problem applies to other types of infrastructure. There are others more appropriate strategies, such as the opening of postal offices,[55] the administration of national censuses,[56] and vaccination.[57] While these measurements do capture historical variations of state capacities, some other problems arise. Censuses, for example, provide a *non-continuous temporal measurement* of state capacities. For instance, censuses are applied in Chile every ten years. Having just a few snapshots of state-capacity should compromise any statistical analysis. In turn, vaccines

(Kurtz and Schrank [2007, 543]). However, "there isn't much by way of street crime or military coup attempts in North Korea," (Fukuyama [2013, 348]) a state that can barely provide basic services to its population.

[47] Fearon and Laitin [2003] and Besley and Persson [2011], and Mahoney [2010, 4, 6-7].

[48] Emphasis is mine.

[49] Emphasis is mine.

[50] Enriquez et al. [2017].

[51] Mann [1984, 2008], Acemoglu [2005], Saylor [2012], Thies [2009], Besley and Persson [2010].

[52] Huntington and Wibbels [2014].

[53] Saylor [2012, 302] and Coatsworth [1974].

[54] Footnote #11.

[55] Acemoglu et al. [2016].

[56] Lee and Zhang [2017], Soifer [2013], Centeno [2002] and Hanson and Sigman [2013a], Hanson [2015]. Another variation of this technique is "age heaping." This technique is borrowed from demographers. It compares the age structure (incorrectly) captured in the census with an assumed correct theoretical age distribution. Low-capacity states should inaccurately round ages or inflate certain intervals, producing error. The error is usually computed using the Whipple's index which serves as a proxy for state capacities.

[57] Soifer [2012].

are usually targeted at primary and high school students. In practice, vaccines are administered by the schools themselves, both public and private. Private schools might be more efficient in doing so, inflating the *average* level of state-capacity.

To solve some of these limitations, the paper proposes considering earthquake death tolls as an alternative to measure state capacities over time. Unlike censuses—*unfortunately*— earthquakes happen in Chile very often. While "[e]arthquakes alone claim thousands of lives a year,"[58] they are not well studied in the discipline.[59] Building on Mann [1984, 113], the proposed measurement intends to capture the state's *infrastructural* power.[60] "Natural hazards can be seen as a function of a specific natural process and human [...] activity."[61] Given that earthquakes happen at random and are exogenous to the affected locality,[62] the only part that is left unexplained is the systematic human component, which is what the proposed measurement captures. Earthquakes are orthogonal to levels of state capacity and economic development.[63] Thus, keeping earthquake magnitudes constant at their means, (population-weighted) death counts should be attributed to the (*in*)capacity of the states to invest in preparedness and earthquake-mitigation institutions.[64] I focus on earthquakes and not on other natural disasters, such as "extreme temperature events, floods, landslides, and windstorms,"[65] because earthquakes cannot be foreseen and, as such, they put to test the states' capacity for having their preventive institutions *already* in place and in good shape.[66] State capacity consist of sustained *proactive* efforts of enforcing institutions in the territory, and, hence, short-term *reactive* actions should *not* be considered state-*making*.

Under reasonable assumptions, the capacity states have in deploying inspectors to enforce quake-sensitive zoning and building codes should be a reflection of the overall levels of state capacity. Since "[e]arthquake-resistant construction depends on responsible governance,"[67] state capacity act as a scope condition, in particular, undermining (or facilitating) the implementation of these norms. For

[58] Anbarci et al. [2005, 1908].

[59] Brancati [2007, 719] explains that "[d]isasters are not as well studied [...] in the field of political science."

[60] He defines infrastructural power as "the capacity of the state [to] actually [...] penetrate civil society, and to implement logistically political decisions throughout the realm."

[61] Raschky [2008, 627].

[62] Brancati [2007, 728] explains that "earthquakes constitute a natural experiment." Gignoux and Menéndez [2016, 27] also point out "that the occurrence of earthquakes can be viewed as random [allowing the analyses of] these events as a set of repeated social experiments." Caruso [2017, 32, unpublished], for instance, "[exploits] the exogenous variation in the location and timing of natural disasters."

[63] Kahn [2005, 271] and Brancati [2007].

[64] To make sure, while "earthquakes may not be preventable, it is possible to prevent the disasters they cause" (Escaleras et al. [2007, 209]). Similarly, Anbarci et al. [2005, 1911] explain that "the potentially devastating effects of major earthquakes are, if not preventable, at least subject to significant mitigation." For a similar approach, see Noji [1996, 130].

[65] Kahn [2005, 280].

[66] In fact, Brancati [2007, 716] explains that "[e]arthquakes may provoke conflict more than any other type of natural disaster *because* they have rapid onsets [and] are not predictable." Emphasis is mine.

[67] Ambraseys and Bilham [2011, 153]. Similarly, Raschky [2008, 628] argue that "the effects of natural hazards [do] not solely depend on a region's topographic or climatic exposure to natural processes [...] but [on] the region's *institutional* vulnerability." Emphasis is mine.

example, Bilham [2013, 169] explains that "although engineering codes may *exist*[,] mechanisms to *implement* these codes are largely unavailable"[68] in low-capacity states. For example, Anbarci et al. [2005, 1910] explain that "while Iran has building codes [...] comparable to those existing in the United States, they tend to be enforced only in the country's larger cities," failing to monitor the countryside, which was where most casualties occurred in the magnitude 6.4 earthquake in Changureh in 2002.[69]

Only high-capacity states overcome their own limitations, not only implementing but also enforcing quake-sensitive regulations. The Chilean government started its efforts to ameliorate the impact of earthquakes after the great quake of 1928 in Talca. A first effort happened in 1929, when *Ley* number 4563 was implemented. The law was among the first attempts to prohibit "construction, reconstruction or any other repairing or transformations [...] without a permit from the authorities." Importantly, the law required that all blueprints had to be signed off by an expert before the construction started. By 1930, *Decreto* number 4882 was adopted, but this time the rule made a number of technical prescriptions,[70] determining what kinds of construction materials ought to be used, among other requirements. Critically, while the central government had retained the control of the supervision of the code since the promulgation of the *ley*, the *decreto* explicitly created the role of the *inspector* to supervise, enforce, and monitor these measures at the local level. Furthermore, *artículo* 414 of the Chilean *Decreto* 4882 granted inspectors "free access to the building" at any time during the construction process. The proposed measurement picks up whether these good intentions written in paper actually achieved lower death tolls.

The proposed measurement has a number of advantages. Unlike non-experimental survey-based or purely policy-based measures, earthquake death tolls are an *objective* measurement of earthquake preparedness,[71] an activity that *any* state *must* perform.[72] However, the measurement has a number of drawbacks. Obviously, the country needs to have earthquakes, possibly limiting the number of potential cases. However, most "earthquakes occur at the various borders of the Pacific plate, the Western border of the Latin American plate, and the boundaries between the African, the Arabic and the Indian plates and the Eurasian plate," allowing potential cross-country comparisons within

[68] Emphases are mine.

[69] Similarly, Bardhan [2016, 865] explains that "unlike in the case of some macroeconomic policies, [...] the effectiveness of the state varies enormously across localities and administrative levels within the same country."

[70] See especially article 151.

[71] That is, "it does not rely on an effort to measure the beliefs of citizens about the nature of the state, the legitimacy of its leaders or the institutional procedures that selected them, or even perceptions of the efficiency of public bureaucracies" (Kurtz and Schrank [2012, 616]).

[72] To be sure, any state susceptible to earthquakes. Kurtz [2013, 58] explains that "the best measures [of state capacities] would be of the sorts of activities that all (or nearly all) states consider to be of primary importance." Similarly, Carlin et al. [2014, 422] explain that "a basket of 'minimal' state functions [typically includes] primary education, public health, rule of law, public finance management, and disaster relief."

most of the developing world.[73] Thus, like other measurements available, this is a context-specific strategy. For instance, Soifer [2012, 593] and Slater [2008, 252] propose a measurement based on whether states are able to either enforce voter registration "where voting is mandatory," or conduct "state registration of marginal populations."

Moving forward, there are countries, like India or the United States, where earthquakes happen in certain regions only. Presumably, mitigation policies in these places would need to be targeted to specific areas, possibly undermining the assumption that these kinds of policies should penetrate the *entire* territory.[74] Another potential concern is that the ability of counting the death-toll might be a function of state capacities itself.[75] However, in most cases, civic organizations, the Catholic Church, and, particularly, the press (national and local) have been the main entities who (willingly or not) have carried out the task of enumerating the deaths. Another potential issue is the measurement of the magnitudes. Before the instrumental period, magnitudes were obtained in an estimative way, and, while there are methods to approximate historically-felt magnitudes to instrumental-like intensities,[76] this strategy unfortunately adds more than one layer of complexity. All in all, this measurement offers a rough approximation of levels of state capacities over time.

III. Empirical Section

I. Spillover Effects of Income Taxation on State Capacity

A novel hand-collected longitudinal dataset was constructed using the *Significant Earthquake Database* compiled by the National Centers for Environmental Information (NOAA) as a starting point.[77] The dataset "contains information on destructive earthquakes from 2150 B.C. to the present," and records the number of deaths,[78] the magnitude, date, latitude, and longitude of every quake, among other variables. Using archival census data from 1907 to 2012,[79] I complemented the NOAA dataset with local population at the municipal level where the quake hit. I use local population to weight the death toll.[80] Using archival census data as well, I considered the main economic activity

[73] Keefer et al. [2011, 1534]. From a population size perspective, this measurement is also convenient. A "quarter of the world's population inhabits [...] the northern edge of the Arabian and Indian Plates that are colliding with the southern margin of the Eurasian Plate" (Bilham and Gaur [2013, 618]).

[74] Dunbar et al. [2003, 164] explains that the Indian state implements targeted policies (that might not necessarily correspond to the administrative areas) based on isoseismal maps that define different zones of seismic hazard.

[75] I thank Paul Poast for this comment.

[76] Szeliga et al. [2010].

[77] [NGDC/WDS].

[78] Importantly, the NOAA distinguishes earthquake deaths from total deaths (which includes tsunami casualties). I use the former.

[79] Particularly, censuses of 1907, 1920, 1930, 1940, 1952, 1960, 1970, 1982, 1992, 2002 and 2012. Some of them were kept at the *Biblioteca Nacional* and others at the *National Statistic Institute* historical library.

[80] While in most occasions (around 90%) I was able to recover the actual local population, in some instances that was not possible. In these cases, I recovered the population of the most concentrated area nearby. Consequently,

of the affected municipality,[81] in addition to whether the municipality was urban or rural.[82] The death tolls and magnitudes proportionated by the NOAA dataset were contrasted case by case with historical press archival information.[83] Magnitudes, in particular, were also compared with the International Seismological Centre.

Figure OA1 plots the over time earthquakes and magnitudes, while Figure 2 plots the geographical distribution and magnitudes of the quakes, as well as the dominant productive sector.[84] Both figures suggest that Chile is a good case to study infrastructural state-capacities using the proposed earthquake framework, since it has considerable variance regarding quake magnitudes, locations and sectoral variation. The northern part of Chile has historically been an industrial region, while the southern part of Chile has traditionally been an agricultural region. Relatedly, both regions vary according to their climate. Furthermore, the distance from Santiago, which is located near latitude 33°, might impose some degree of difficulty for the central government to reach the farthest northern/southern parts of the territory.[85] There is also variance considering longitude. Closeness to the Andean mountains (around longitude 70°) determines the ruggedness of the terrain, presumably making it harder for the state to penetrate these areas.[86] All things considered, earthquakes have affected the territory from coast to mountain,[87] solving potential concerns about geographical sectoral self-selection.

The unit of analysis is the earthquake.[88] As an event, each earthquake has associated to it a death toll, a location (latitude and longitude), a magnitude, a local population, and an urban/rural setting. Specifically, following the statistical convention, I use a Bayesian Poisson regression to test the effect of implementing the income tax law on death-tolls over time.[89] The main quantity of interest is a binary variable (i.e. *Income Tax*) that denotes whether the income tax is implemented

I adopted a more general approach, and used population as a control, not as a variable to construct a dependent variable in proportion-like form.

[81] This variable was constructed by coding press and official sources (mainly censuses) of the main economic sector at the local level. *Agriculture* (n=27), *Industry* (n=51), *Mixed* (n=13). This corresponds to the full sample.

[82] Urban=74, rural=17. If more than 50% of the population lived in an urban setting, I assigned a 1 to that municipality, 0 otherwise. Urban concentrations are most likely to have vertical constructions rather than one-story buildings, increasing the potential number of casualties. Consequently, it is important to control for this source of variation. I thank Daniel Kelemen for this suggestion.

[83] *El Mercurio* and *La Nación* newspapers, both kept at the *Archivo Nacional* of the *Biblioteca Nacional de Chile*.

[84] For illustrative purposes, both plots consider the full sample starting in 1520 and ending in 2015.

[85] Foa and Nemirovskaya [2016, 418].

[86] Moreover, Brancati [2007, 729] explains that "[e]arthquakes often occur in mountainous areas."

[87] Since "most of the damage in major earthquakes occurs within 30 km of the epicenter," (Dunbar et al. [2003, 172]) I don't necessarily exclude earthquakes that didn't happen on land. While the epicentre might have been a few miles away from the shore, the consequences certainly reached the land.

[88] Kahn [2005, 273] also considers that "the unit of analysis is [the] disaster."

[89] Anbarci et al. [2005, 1907] use "a Negative Binomial estimation strategy with both random and fixed estimators" to estimate death-tolls, Kahn [2005, 276] estimates a Zero Inflated Negative Binomial model, Brancati [2007, 729] uses "a negative binomial model with robust standard errors clustered by country," and Escaleras et al. [2007] use "a Negative Binomial specification." Yet, no study tests for over dispersion. I do not find evidence of over dispersion in my dataset, hence I employ a Poisson model.

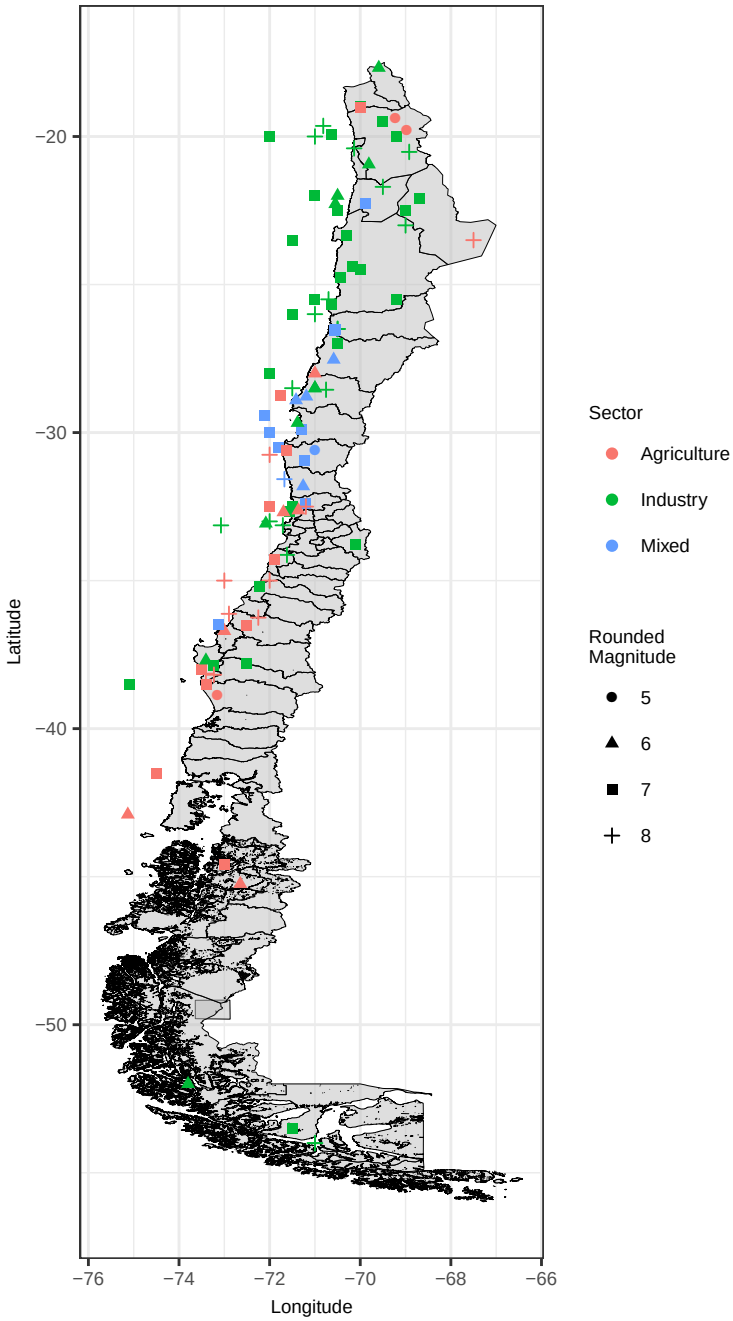

Figure 2: *Geographical Distribution of Earthquakes in Chile, 1903-2015*
Note*: Using a combination of archival information and external sources, the figure shows a total of 101 earthquakes. Each quake was colorized according to the predominant economic sector at the municipal level. In total, there were 29 earthquakes that took place in agricultural localities, 56 in industrial, and 16 in mixed municipalities.*

or not. The model considers year fixed-effects to account for time-varying confounding factors and for unmeasured sources of variation.[90] For instance, fiscal development is also a function of country-specific prior state-capacities. Additionally, technological changes (advances in construction, for example) should diminish death-tolls.[91] Fixed-effects should be able to account for these and other unmeasured yearly factors, such as the evolution of the political system and demographic, climate, and cultural changes, as well as economic shocks. I also included latitude to control for the proximity to the Andean mountains, aiming to control for a built-in tectonic earthquake predisposition. Longitude seeks to control for climate and other unmeasured conditions that make agricultural development more difficult. In turn, both measurements serve as good proxies of terrain ruggedness and the difficulties the state faces in reaching these areas.[92] More formally, I fitted Equation 1.[93]

Fiscal sociologists, mostly focusing on the continental cases, have for a long time claimed that the capacity of taxing individuals' incomes transfers fosters overall state-capacities. The results presented in Table OA1 find support for this claim in a developing country. Particularly, implementing the income tax *decreases* the death-toll by an estimated average of 1. Figure 3 shows the effect over time, and how death-tolls (state capacities) *decrease* (increase) over time. Before the income tax law was implemented, death-tolls were relatively stable, averaging approximately 1 casualties per earthquake. However, once the income tax law was implemented, the death-toll decreased to 1.

[90] Brancati [2007, 729] also includes in his analyses "year-fixed effects to control for trends over time."

[91] I thank Hillel Soifer for this suggestion.

[92] Undoubtedly, there are many more factors that might increase death tolls. Ambraseys and Bilham [2011, 154], for example, explain that the "number of fatalities depends on whether an earthquake happens at night or during the day, in the winter or in the summer, in a mountainous region or in a valley, after strong and protracted fore-shocks and with or without warning." While the model has some of these factors accounted for, complete hourly data is lacking. However, Lomnitz [1970, 1309] explains that "some of the larger Chilean earthquakes which have caused deaths" between the 1900's and the 1960's have been afternoon quakes. See especially Table 1, on p. 1310. Other factors such as "the speed of tectonic movements [and] the degree to which the lower plate bends the upper plate" and the focal depth (Keefer et al. [2011, 1534]) could not be included due to the lack of complete data over time.

[93] All estimated parameters β_k have noninformative normally distributed priors. Precisions, τ_p have noninformative Gamma priors. See Equation V for technical details.

Figure 3: *Death-Tolls Over Time: Before and After the Implementation of the Income Tax*

II. Sectoral Contestation and the Origins of the Income Tax

In an effort to generalize the second portion of the argument, data on eight other Latin American countries were collected (Ecuador, Nicaragua, Venezuela, Peru, Colombia, Guatemala, Argentina and Mexico). Sectoral contestation, and specifically the degree in which industrial elites challenged incumbent landowners, was measured by using industrial and agricultural sectoral growth rates as presented in the MOxLAD data.[94] The dataset spans from 1900 to 2010. According to Astorga et al. [2005, 790], these data provide extended comparable sectoral value-added series in constant purchasing power parity prices.[95] Leveraging some more additional archival data, Table OA2 (in the Appendix section) shows the year when the income tax law was passed. Finally, **??** conveys both agricultural and industrial outputs and the year when the income tax law was passed.

Econometrically, this section is concerned about the *timing* of the implementation of the income tax law in nine Latin American countries, and particularly, about the individual contribution of both the agricultural and industrial sectors to the

Table OA3 shows 3 models.[96] Following Aidt and Jensen [2009], Model 1 computes the lagged

[94] "These data build on the studies and statistical abstracts of the Economic Commission for Latin America, but also rely on Mitchell's International Historical Statistics, International Monetary Fund's International Financial Statistics, the World Bank's World Development Indicators and a variety of national sources." I used the *agriculture value-added* and *manufacturing value-added* variables. The former measures "the output of the sector net of intermediate inputs and includes the cultivation of crops, livestock production, hunting, forestry and fishing." The later "[r]eports the output of the sector net of intermediate inputs." Both of them are expressed in local currency at 1970 constant prices.

[95] Using a similar strategy, Thies [2005] also uses data on taxation and compare those data between cross sections.

[96] Tables were produced using the `texreg` package (Leifeld [2013]). All Cox models were computed using the

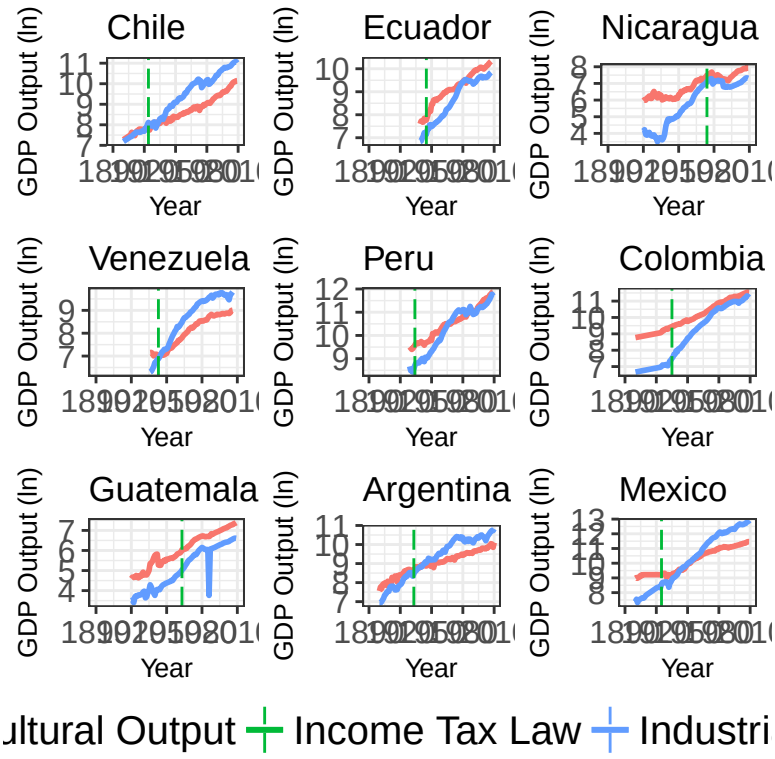

Figure 4: *Industrial and Agricultural Outputs, and The Passage of the Income Tax Law*
Note*: Figure shows historical sectoral outputs, and year of the passage of the income tax law. Following convention, the figure shows logged values.*
Source*: MOxLAD and other souces compiled by the author (see Table OA2).*

conditional hazard ratio of a country which has not yet adopted the income tax, adopts it in a given year, as a function of industrial and agricultural outputs.[97] Countries drop out of the sample when they adopt the income tax. Model 2 shows the estimated coefficients of a generalized estimating equation (GEE). Generalized estimating equations were introduced by Liang and Zeger [1986] to fit clustered, repeated/correlated, and panel data.[98] This method is especially well suited to analyze binary data,[99] something particularly useful given the nature of the dependent variable (e.g. whether a polity has implemented the income tax or not). GEE methods require analysts to parameterize the working correlation matrix. Though Hedeker and Gibbons [2006, 139] explain that "the GEE is robust to misspecification of the correlation structure,"[100] Zorn [2006, 338] explains that whereas the choice of estimator makes little or no difference, the unit on which the data are grouped makes a big difference. Hence, following the advice of Hardin and Hilbe [2013, 166], who point out that when "the observations are clustered (not collected over time) [...] the exchangeable correlation structure" should be used, I assume an "independence" working covariance structure, which also corrects for small-sized panel designs.[101] From a substantive standpoint, GEE models provide an estimated

marginal mean, or the *weighted average* of all cluster-specific effects (or conditional means). Model 3 is a conditional logit (or "fixed effects" model). One important advantage of this strategy is the ability to account for country-specific effects.

As a control variable, population was added into the models.

Since population has been associated with the probability elites expand the franchise,[102] and consequently the tax base, I include total country-year population as a control variable.

III. Robustness Checks and Alternative Explanations

Finally, some areas should be wealthier than others. Increased wealth should allow private investment in earthquake proofing.[103] While data on local income inequality is lacking, I model the effect of earthquake magnitudes on earthquake death-tolls by the type of *comuna*—industrial or agricultural—which aim to serve as a proxy for subnational levels of income inequality.[104]

Additionally, to rule out the possibility that sectors self-select into less earthquake-prone geographical locations, I modeled the effect of magnitudes also considering different slopes (β_{2_j}).[105]

Historians still debate whether agriculturalists and industrialists comprised two *different* elites. Some claim that this dualism is incorrect.[106] They argue that, since landowners also invested in industry,[107] there was a blurry class division between the mining, banking, and agricultural sectors.[108] Perhaps the most cited reference regarding this issue is Veliz [1963, 231-247]. However, building on the Lewis model of dual economic growth, Bahamonde [2017a] explains how in the early

`survival R` package (Therneau [2015]). The GEE logistic regression was computed using the `geepack` package (Hojsgaard et al. [2016]). The simulations were performed using the `simPH R` package (Gandrud [2015]).

[97] I do not combine both variables nor do I construct an index. Since I am interested in the *contribution* of each individual sector in the acceleration of the implementation of the income tax law (keeping constant the other), keeping both variables separately is a better strategy.

[98] Zorn [2006, 322].

[99] Hanley et al. [2003].

[100] Carlin et al. [2001, 402] argue that "[r]elatively minor differences in estimates may arise depending on how the estimating equations are weighted, in particular within the generalized estimating equation (GEE) framework." Westgate and Burchett [2016] and Gardiner et al. [2009, 227] make the same point.

[101] Hardin and Hilbe [2013, 166] explains that if "the number of panels is small, then the independence model may be the best; but [analysts should] calculate the sandwich estimate of variance for use with hypothesis tests and interpretation of coefficient," which is what I report in Table OA3.

[102] Engerman and Sokoloff [2005, 892-893].

[103] I thank Hillel Soifer for this comment.

[104] **??** (top panel) shows that for most years, the industrial sector contributed more to the economy, suggesting that industrial areas were wealthier than agricultural zones.

[105] According to the NOAA, an "increase of one in magnitude represents a tenfold increase in the recorded wave amplitude." Consequently, the effect of this variable should not be linear. Thus, Equation 1 considers the square term of magnitude.

[106] Mamalakis [1976, 125].

[107] Kirsch [1977, 57, 95], citing Bauer [2008], who explains that "[m]iners and merchants bought haciendas but landowners in turn invested in banks, insurance companies, commercial firms and the incipient industrial sector." Coatsworth and Williamson [2002, 23] argue that "[t]he only landowners that mattered in 19th century Latin American politics were those for whom land represented but one asset in a much broader portfolio."

[108] Bauer [2008, 30, 44, 94, 108].

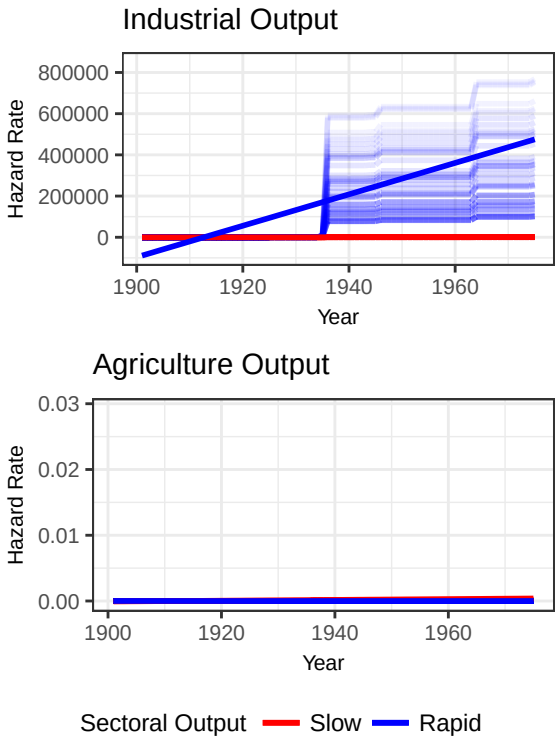

Figure 5: *Hazard Rate of Implementing the Income Tax Law.*
Note*: Using estimations of Model 1 in* **??***, figure shows 5000 simulations with different sectoral growth speeds. Slow is the minimum value, while rapid is the maximum value for each sectoral output. The figure also shows the 95 % confidence intervals.*

20th century Latin America there were a series of structural factors that precluded both industrial and agricultural elites from diversifying their sectoral portfolios; the labor transference from the land to the cities, and the fixity of land, kept the agricultural sector's production-possibility frontier below the industrial sector's frontier. Additionally, there are a number of stylized facts that strongly suggest that there was indeed a structural economic cleavage, which led to the consolidation of two separate sectors. First of all, there were certain practices that mask the existence of a sectoral dualism. For example, it was common that industrialists invested in real estate. However, in many instances they did so *just* to obtain credit. Kirsch [1977, 59] explains that "in a *rural society* land offered one of the best guarantees for loans [since] loans could not be secured by equipment, machinery, or inventory. Only real estate was acceptable collateral."[109] In fact, this practice shows how the credit system was oriented to give unfair advantage to the landed elites.[110] Similarly, Zeitlin [1984, 174] finds "the combined ownership of capital and landed property was a distinctive quality of *certain* [elites] actors,"[111] not something that was generalizable to *the* elites. There were also other instances where miners invested in banking. Yet, Segall [1953] argues that Chilean bankers, after

the crisis of the mining sector around the 1870s, had acquired a number of mineral deposits given as collateral years before. And finally, but for the Argentinean case, Hora [2002, 609] explains that "the image of an entrepreneurial elite with assets *scattered throughout several spheres of investment* does not appear entirely correct."[112]

IV. Final Comments

The crux of the argument is that higher levels of sectoral contestation increased state-capacities over time. Specifically, I explained how the emergence of industrial elites lowered levels of inter-sectoral inequality, pushing agricultural and industrial elites to reach agreements that materialized in investments in state-making institutions (income tax law), fostering higher levels of state-capacities over time. My empirical analyses show that death-tolls decrease (state capacities increase) after the income tax law is implemented, and that the emergence of the industrial sector, and not economic growth, accelerated the implementation of the income tax.

A new measurement based on earthquake death-tolls was introduced. Earthquake damage poses a major threat to commercial, official, and residential buildings, potentially triggering higher levels of looting and social unrest. Consequently, enforcing quake-sensitive building codes also embodies the most basic form of social contract that exists between the state and its subjects. Any kind of political leader should be interested in preventing looting and social unrest. Leaders not only care about their own survival (*electoral or not*) but also about the legitimacy of *the state*. In the event of heavy social unrest, not only is the essential social Hobbesian-like contract broken but the expectations of social peace are also questioned.[113] The physical presence of the state literally *crumbles* when institutions of social coercion and discipline, such as state schools, prisons, and police stations, collapse. For example, when the magnitude 7.0 earthquake hit Hati in 2010, the *Prison Civile de Port-au-Prince* had a population of 4,500 inmates. During the quake, five inmates died. As a prison guard describes it, "everyone escaped. Everyone. Except the dead." This natural disaster exacerbated the already existent chaos, freeing "gang bosses, kidnappers, gunmen," among others,[114] reducing the legitimacy of the state to zero.

Finally, income taxation did even more than just triggering other state capacities. Via a process of assimilation, it also helped in constructing the figure of the *citizen* centered around the concept

[109] Emphases are mine.
[110] Unda [2017, 9] explains that in Mexico, industrial elites complied with the income tax in exchange of having a credit system more adequate for them.
[111] Emphasis is mine.
[112] Emphasis is mine.
[113] Carlin et al. [2014, 419] study how earthquakes damage interpersonal trust. They argue that "state capacity plays a decisive role in determining natural disasters' consequences for social capital."
[114] Reed [2011]. See also Laursen [2010].

of the *taxpayer*. Regardless of an individual's race, religion, culture, or any other kind of status, the state classifies its subjects according to their incomes and obliges them to pay, punishing whoever refuses to do so. From a sociological standpoint, this "generality makes taxation a crucial element in the development of the 'imagined community'[115] of the modern nation-state [...] Taxation enmeshes us in the web of generalized reciprocity that constitutes modern society."[116]

[115] Anderson [2006].
[116] Martin et al. (in Martin et al. [2009, 3]).

V. Online Appendix

$$
\begin{aligned}
\text{Deaths } &\sim \text{Poisson}(\lambda_i) \\
log(\lambda_i) &= \mu + \beta_1 \text{Income Tax}_i + \beta_2 \text{Magnitude}_i^2 + \beta_3 \text{Latitude}_i + \beta_4 \text{Longitude}_i + \\
&\quad \beta_5 \text{Population}_i + \beta_6 \text{Urban}_i + \beta_{7_t} \text{Year}_i
\end{aligned} \tag{1}
$$

$$
\begin{aligned}
i_{1,\ldots I} &\text{ and I} = 91 \\
t_{1,\ldots T} &\text{ and T} = 59;
\end{aligned}
$$

and,

$$
\begin{aligned}
\beta_{k,\ldots K} &\sim \mathcal{N}(0, 0.01) \text{ where K} = 7 \\
\tau_{p,\ldots P} &\sim \mathcal{G}(0.5, 0.001) \text{ where P} = 59.
\end{aligned}
$$

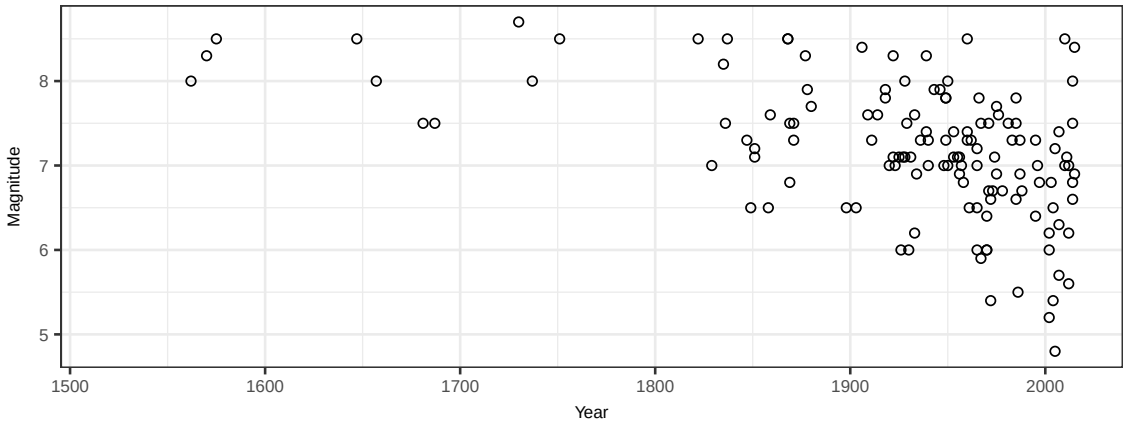

Figure OA1: *Earthquakes in Chile: 1500-2010*

	Mean	SD	Lower	Upper	Pr.
Income Tax	-0.52	0.30	-0.87	-0.24	0.94
Magnitude	0.19	0.02	0.18	0.20	1.00
Latitude	-0.19	0.02	-0.20	-0.17	1.00
Longitude	0.07	0.03	0.04	0.11	1.00
Population	-0.00	0.00	-0.00	0.00	0.39
Urban	-1.14	0.25	-1.35	-0.99	1.00

Note: 20 iterations with a burn-in period of n = 2 iterations discarded.

80% credible intervals (upper/lower bounds). All R-Hat statistics below critical levels.

Standard convergence diagnostics suggest good mixing and convergence.

Year fixed effects were omitted in the table.

A total of 1 chains were run. Detailed diagnostic plots available here.

Table OA1: *Income Tax Adoption Model: Simulated Posterior Predictions (Poisson Regression)*

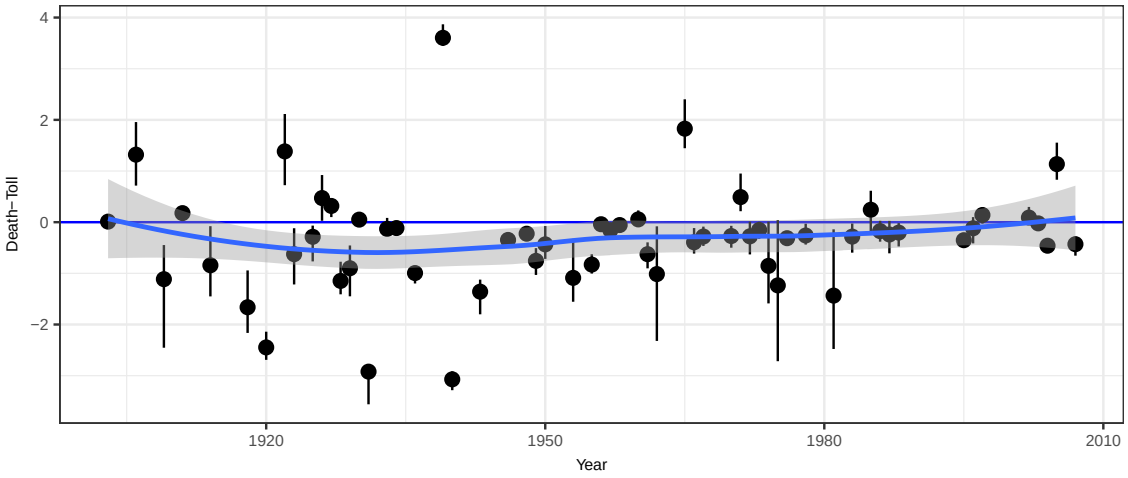

Figure OA2: *Year Fixed Effects*

```
## Error in data.frame(Model = rep("Income Tax Adoption", nrow(datsc)), id = 1:nrow(datsc),
:  arguments imply differing number of rows:  91, 0
## Error in as.data.frame(eq.pred.tax):  objeto 'eq.pred.tax' no encontrado
## Error in ggplot(data = model.checking.plot.df, aes(x = Deaths.observed, :  objeto
'model.checking.plot.df' no encontrado
```

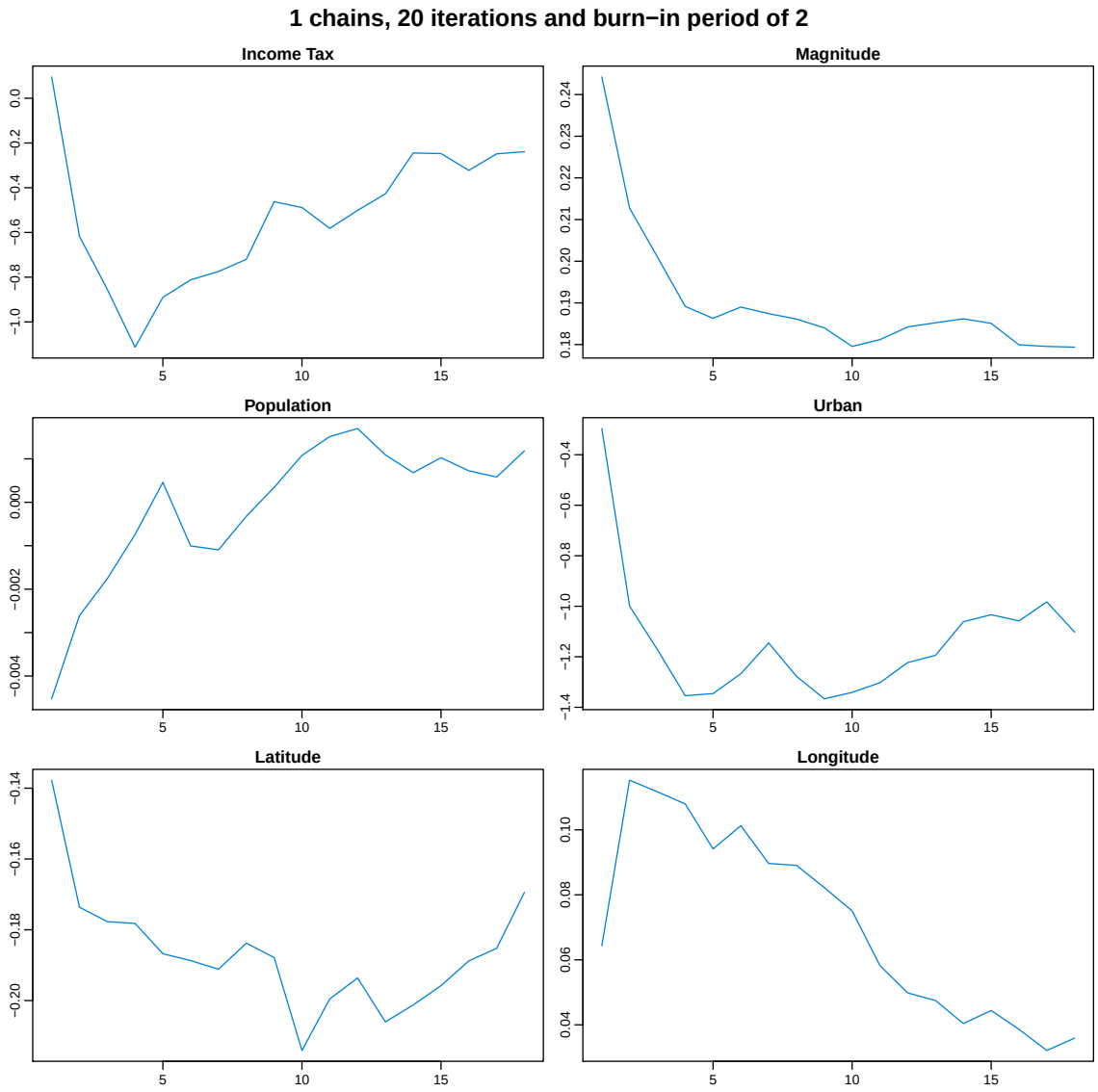

Figure OA3: *Trace Plots: Income Tax Adoption Model*

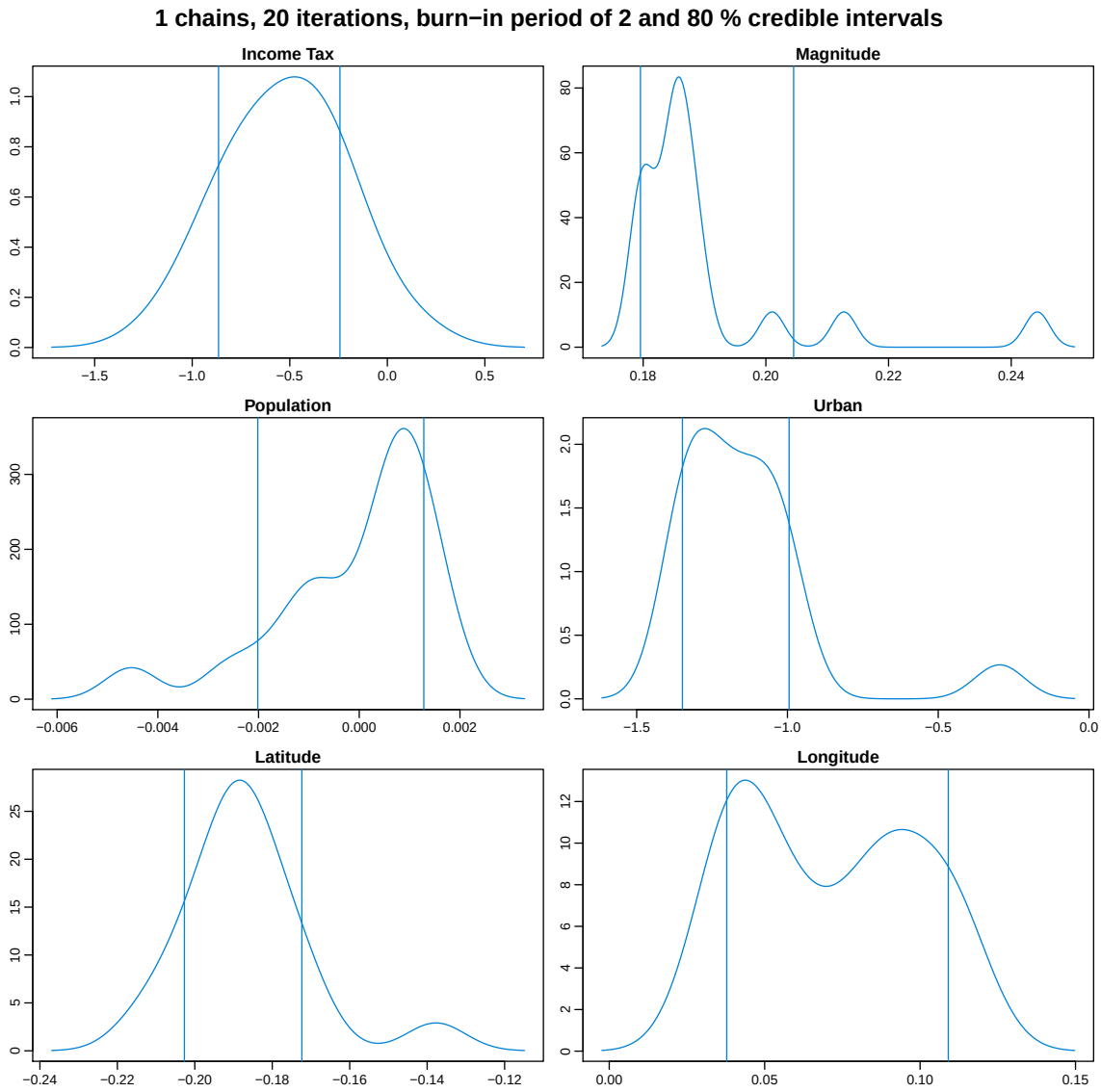

Figure OA4: *Density Plots: Income Tax Adoption Model*

Country	Available Data	Year Income Tax	Law	Source
Chile	1900 - 2009	1924	*Ley* 3996	Mamalakis [1976, 20] and LeyChile.Cl (official)
Peru	1929 - 2009	1934	*Ley* 7904	Gobierno del Perú [1934] (official)
Venezuela	1936 - 2006	1943	*Ley* 20851	*Gaceta Oficial* (official) and Ventura and Armas [2013, 27]
Colombia	1900 - 2009	1935	*Ley* 78	Figueroa [2008, 9]
Argentina	1900 - 2010	1933	*Ley* 11682	Infoleg.Gob.Ar (official)
Mexico	1900 - 2009	1925	*Ley de Impuesto sobre la Renta*	Unda [2017, 8]
Ecuador	1939 - 2007	1945	-	Aguilera and Vera [2013, 135]
Nicaragua	1920 - 2009	1974	*Ley* 662	Legislacion.Asamblea.Gob.Ni (official)
Guatemala	1920 - 2009	1963	*Decreto* 1559	Instituto Centroamericano de Estudios Fiscales [2007, 165]

Table OA2: *Sample, Data Available and Year the Income Tax was Implemented*

	(1) Cox (1 lag)	(2) Logit GEE	(3) Conditional Logit (FE)
Manufacture Output$_{t-1}$	4.923**		
	(1.851)		
Agricultural Output$_{t-1}$	−4.208*		
	(1.638)		
Total Population	0.000**		
	(0.000)		
intercept		−11.832·	
		(6.468)	
Manufacture Output (ln)		1.924***	0.668***
		(0.514)	(0.143)
Agricultural Output (ln)		−1.596**	−0.941***
		(0.603)	(0.281)
Total Population (ln)		1.259	1.030**
		(1.052)	(0.391)
AIC	12.796		4505.538
R^2	0.059		0.341
Max. R^2	0.085		0.997
Num. events	9		610
Num. obs.	241	842	842
Missings	0		0
PH test	0.388		
Num. clust.		9	

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$, $^{cdot}p < 0.1$. Robust standard errors in all models

Table OA3: *Sectoral Origins of Income Taxation: Income Tax Law and Industrial Development*

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