

Research Portfolio

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November 1, 2017

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

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October 31, 2017

Abstract

The central argument of this paper is that higher levels of sectoral competition increased state-capacities over time. The paper explains how the emergence of industrial elites posed credible threats to the landowning elites, pushing both groups to reach political agreements. I identify one such agreement, the income tax law. Borrowing from the fiscal sociology paradigm, I explain how this institution was important for state-making. 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 of these empirical analyses are twofold. Death-tolls decrease, that is, state capacities increase: (1) when levels of sectoral contestation increase, and (2) once the income tax law is implemented. To explore the causal mechanisms at work in more depth, I discuss the Chilean case.

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*I thank Robert Kaufman, Hillel Soifer, Mark Dincecco, James Mahon, Daniel Kelemen, Douglas Blair, Paul Poast for all the useful comments. I also thank the School of Arts and Sciences at Rutgers for granting me funds to collect part of the data used in this project. All errors are my own.

Latin Americanists have several theories to explain the causes and consequences of state capacities. However, most explanations do not consider within-country variations in levels of state capacity.¹ Since state authorities in less developed countries face higher difficulties achieving political control,² this is very unfortunate. Moreover, *domestic* explanations of state-capacities centered on the role of economic-sectoral conflicts, the economic structural transformation and taxation, have been overlooked.³ For instance, Schneider [2012, 2] explains that 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.” Since wars in Latin America have been rare,⁴ it is difficult to extend models developed to understanding the medieval European case based on external threats.⁵ Critically, there exists in the literature a huge concept-measurement deficit. While most state formation theories (just to name a few) are situated during precolonial,⁶ early,⁷ or late⁸ 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*. In this paper I try to bridge this gap by providing an additional explanation of state consolidation in Latin America centered on domestic sectoral economic conflicts and fiscal expansion. Additionally, I provide a corresponding indicator able to capture levels of state consolidation *over time* using a novel dataset and approach. The paper then seeks to contribute to the state consolidation literature in general, both from theoretical and methodological perspectives.

The central argument of this paper is that higher levels of sectoral contestation, characterized by the emergence of a strong industrial sector, promoted state consolidation. In particular, the paper explains how higher levels of sectoral contestation promoted the implementation of the income tax, an institution that—according to the fiscal sociology approach—produced positive externalities for state consolidation. Exploiting the exogeneity of earthquake shocks, I leverage a novel hand-collected dataset on Chilean earthquake death tolls between 1900 and 2010. In conjunction with Bayesian

¹For instance, Acemoglu et al. [2015, 2368] explain that there is only “a small literature on within-country variation in state capacity.” See for an exception Foa and Nemirovskaya [2016] and Soifer [2008].

²Migdal [1988].

³A 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.

⁴Centeno [2002].

⁵Some examples are Tilly [1992] and Dincecco and Onorato [2016]. See however Thies [2005], Thies et al. [2016] and Kurtz [2006].

⁶Mahoney [2010].

⁷See Kurtz [2013] and Soifer [2015].

⁸Bahamonde [2017b].

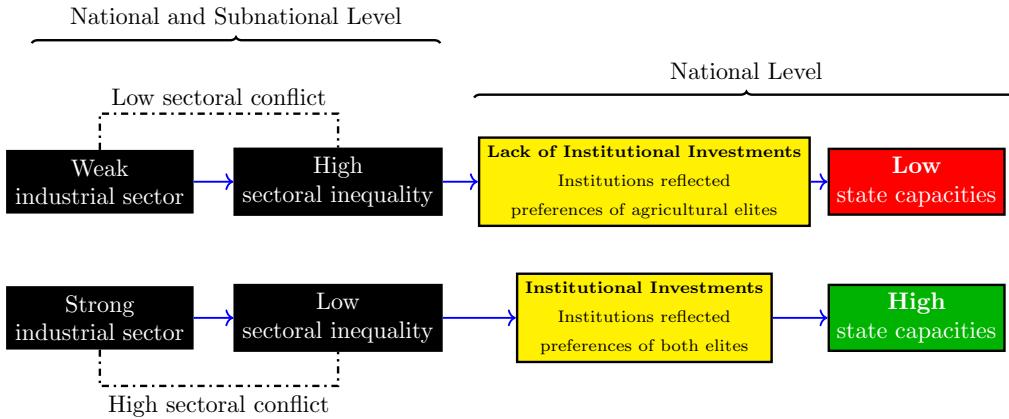


Figure 1: Causal Mechanism

multilevel Poisson models with year fixed-effects, I am able to estimate levels of state consolidation in Chile over time. I find that death-tolls decreased (*state capacities increased*) when (1) levels of national/subnational sectoral contestation were high, and (2) after the income tax law was implemented.

Under reasonable assumptions, the state's capacity for enforcing and monitoring building codes throughout the territory is a *reflection* of Chile's *overall* state capacities. Earthquakes are time-invariant and, importantly, orthogonal to economic development and regime type. Consequently, death-toll differentials should be mainly associated with state-capacities. The proposed measurement goes in line with other attempts to capture state capacities over time. While most strategies have focused on the capacity to enforce private contracts,⁹ unfortunately, these measurements correlate strongly with property-rights protection, distorting the resemblance between concept and measurement.

The theory also incorporates important subnational dynamics. The ability of the central level to enforce these (and other) institutions depends on whether subnational elites are willing to cooperate with the central level. The paper contends that industrial elites challenged agricultural elites, moving forward investments in state-making institutions—the income tax law.¹⁰ The tax not only increased national revenues, but also helped to form bureaucratic structures at the subnational level. As the Chilean case illustrates, industrial elites were willing to impose a national income tax on themselves in exchange for public goods delivered at the subnational level, and incorporation into the national project. Compliance depended on sustained national–subnational coordination, boosting state centralization.

⁹See Besley and Persson [2010, 1] for an example.

¹⁰Besley et al. [2013, 208] also consider implementing the income tax a strong sign of fiscal capacities, including Chile.

The rest of the paper proceeds as follows. In [section I](#) I explain the argument, paying special attention to how the implementation of the income tax expanded state-capacities. Then, in [section II](#) I illustrate the causal mechanisms at work, presenting some historical context about the Chilean case. In [section III](#) I introduce the proposed measurement and explain how it maps onto state capacities. Then, in [section IV](#), I present a number of econometric tests. In [section V](#) I provide final comments. In [section VI](#) (online appendix) I show some convergence diagnostics.

I. SECTORAL CONFLICT, COOPERATION, AND THE CASE OF THE INCOME TAX

The crux of the argument is that sectoral conflicts triggered state development. Analytically, the paper considers that the sectoral conflict approach also offers a theory of state consolidation.¹¹ In particular, elites whose assets are allocated in different sectors of the economy have different preferences over state centralization and direct taxation. Consequently, sectoral economic expansion not only (re)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.¹² This line of argumentation goes in line with others, in 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.”¹³

The capacity of enforcing and monitoring building codes depends on both *national* and *subnational* sources of cooperation, and hence, state incorporation. [O'Donnell \[1993, 1359\]](#) famously distinguished different levels of state penetration *in the same country*. The subnational approach goes in line with [Snyder \[2001, 103\]](#), [Ziblatt \[2008, 286\]](#) and, particularly, [Soifer \[2008\]](#). Following these important contributions, I implement an identification strategy that not only accounts for temporal but also for geographical—i.e., subnational—sources of sectoral contestation and state capacities. The paper proposes that higher levels of subnational sectoral contestation translated into more credible threats coming from the provinces. Should these subnational sources of contestation *not* be translated into sectoral agreements, the country risked being torn apart or, alternatively, seeing the emergence of local *caudillos* or other regional ‘bosses.’ For example, the historian [Barros \[1970, 500\]](#) explains that before the civil war, *salitreras* (nitrate towns) in northern Chile were locally so important that they were considered “a state within the state.”¹⁴ Local bosses had to approve decisions on

¹¹For a similar view, see [Gallo \[1991, 7-8\]](#), [Beramendi et al. \[2016\]](#) and [Saylor \[2014, 8\]](#). Critically, [Schneider \[2012, 2\]](#) explains that even when we have gained considerable knowledge of fiscal expansion in the European cases, the study of developing countries is lacking especially in the presence of “new leading sectors.”

¹²The sectoral conflict approach for the Latin American cases was seminally introduced by [Mamalakis \[1969, 1971\]](#). See for an extension [Ansell and Samuels \[2014\]](#).

¹³[Hechter and Brustein \[1980, 1085\]](#). Unlike [Besley et al. \[2013, 206\]](#), I find that conflict (‘political frictions’) is not ‘exogenous,’ but rather endogenous to the implementation of the tax itself.

¹⁴My translation.

whether public employees could be fired, whether public works could be developed, and on whether politicians could give public speeches. Moreover, they coined their own currency and had their own particular local laws. The paper sketches a theory that explains how these national–subnational tensions fostered institutional investments that promoted state capacities over time.

Elite incorporation was possible, contingent on outsiders' capacity for challenging the institutional order that permitted hegemonic groups to rule without opposition. The landed Latin American elites were an economic hegemonic group protected by norms and institutions that originated during colonial times. By extension, the landowning class controlled most of the politics too.¹⁵ However, when the *structural transformation* (that is, the “secular decline of agriculture and substantial expansion of manufacturing”)¹⁶ took place, this process imposed tight constraints on the way politics was run by the incumbent landowning class.¹⁷ Given the initial 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.¹⁸ The higher the threats, the more likely the inter-sectoral compromises (yellow box in [Figure 1](#)). One particular compromise is identified—the implementation of the income tax—and special attention is paid to how this institution expanded state-capacities overtime.

Since state centralization affects landowners and industrialists in different ways, both sectors have different preferences towards taxation and state centralization.¹⁹ On the one hand, land fixity increases the risk premium of the landed elite's main asset,²⁰ so they systematically resist taxation. In turn, as capital can be reinvested in nontaxable sectors,²¹ industrialists' preferences toward taxation are more elastic. These cross-sectoral tensions are most likely to be resolved in favor of inter-sectoral cooperation—particularly, implementing the income tax law—when income inequality among the elites is low.²² In Latin America, the post-colonial institutional and economical orders were designed to give an unfair advantage to the agricultural sector.²³ However, the emergence of a strong industrial class led to heavier pressures for higher levels of state centralization and investment in public goods at the local level. I find elsewhere that the emergence of the industrial sector

¹⁵See for the Chilean case [Zeitlin \[1984, 13\]](#), [Bauer \[2008, 45\]](#), [Baland and Robinson \[2008, 1748\]](#) and [Best \[1976, 56\]](#), [Rippy \[1971\]](#) and [Marichal \[1989\]](#).

¹⁶[Johnston and Mellor \[1961, 567\]](#).

¹⁷[Bahamonde \[2017b\]](#).

¹⁸[Boix \[2015\]](#). For example, elites could use a faction of the existing army or hire private militias.

¹⁹See [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.”

²⁰[Robinson \[2006, 512\]](#).

²¹[Hirschman \[1970\]](#). See Ronald Rogowski in [Drake and McCubbins \[1998, ch. 4\]](#). However, see [Bates and Lien \[1985, 15\]](#).

²²[Tani \[1966, 157\]](#) explains that the absence of “wealth groups” makes passing an income tax law easier.

²³[Bahamonde \[2017a\]](#).

accelerated the implementation of the income tax in a number of Latin American states.²⁴ In fact, it was not only sustained industrial expansion that depended on the implementation of the income tax. Beramendi et al. [2016, 18] explain that, 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.” But also, lower levels of inter-elite economic inequality implied similar degrees of military capabilities.²⁵ Under these circumstances, war was most likely to exhaust all existent assets without producing positive outcomes for either sector,²⁶ leading to heavier pressures to reach agreements instead of engaging in armed conflicts.

However, the tax was not only important because of the new revenue it collected. While Humud (1969, p. 154) explains that the income tax generated considerable resources for the Chilean treasury,²⁷ following the fiscal sociology paradigm,²⁸ 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 the key for a theory of state-building. Indirect taxes are easier to levy, and, hence, this kind of revenue is generally considered “unearned income”²⁹ or “easy-to-collect source of revenues.”³⁰ Given the relatively lower costs states have to incur to collect them, indirect taxes have a very low impact on state-building.³¹ 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.³² Since customs administrations have always been concentrated in a few critical locations, especially ports, tariffs and customs duties—often times—did not require an elaborate fiscal structure.³³

The very implementation of the income tax produced a secular accumulation of know-how, particularly of better technologies able to monitor individual incomes. Unlike “regular” institutions, income taxation enabled the state’s coercive sovereignty to infiltrate the individuals themselves. Not only observing individual economies, but transforming them into public property is what fostered state expansion.³⁴ This argument goes in line with Besley et al. [2013], who explain that

²⁴Bahamonde [2017b].

²⁵Boix [2015].

²⁶Richard Salvucci in Uribe-Uran [2001, 48].

²⁷Bowman and Wallerstein [1982, 451-452].

²⁸See for a review Martin and Prasad [2014].

²⁹Moore [2004b, 304].

³⁰Coatsworth and Williamson [2002, 10].

³¹Moore [2004a, 14].

³²Campbell [1993, 177].

³³Bertola and Ocampo [2012, 132].

³⁴Musgrave [1992, 98] and Moore [2004b, 298]. While Kurtz [2009, 2013], Soifer [2015] situate the relevant state-building critical juncture at the end of the colonial period, before the class compromises I identify in this paper, I argue that the implementation of the income tax was an important building block in this process.

implementing the income tax law is “associated with investments in public administrative structures that support tax collection” in a number of countries, including Chile. I contend that the knowledge and expertise the state accumulated were transferred to other state institutions via spillovers, augmenting the overall levels of *stateness*. This causal mechanism is supported by a number of scholarly works. Economist Nicholas Kaldor explains that the revenue service is the “point of entry.” Once this institution is secured, securing the rest is easier.³⁵ This suggests economies of scale too. For instance, the same bureaucracies that were sent to collect and administer taxes, learned to solve land disputes and dispense justice. More generally, the development literature terms these spillover effects *technical complementarities*, which is “a situation where an increase in the output of [a] commodity [...] lowers the marginal costs of producing [other] commodity.”³⁶ In fact, the literature finds that the *introduction* of the income tax was indeed associated with state expansion. For instance, [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 summation, as [Levi \[1989, 1\]](#) explains, “the history of state revenue production is the history of the evolution of the state.” Regarding the Chilean case, 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. For the European context, [Strayer \[2005\]](#) explains how official state delegations traveled the territory dispensing judicial decisions, thereby fostering state centralization. [Dincecco \[2015\]](#) explains that states became effective organisms upon centralizing a system of direct taxation and implementing some kind of checks-and-balances system. As I explain in [section II](#), the Chilean case met these two conditions. Analytically, the *effectiveness* of income taxation on fiscal *capacities* increased due to the nature of the implementation of the income tax. [Aghion et al. \[2004, 566\]](#) explain how optimal institutional choices result from political settings where all involved actors “had a voice in the choice of institutions,” essentially contributing to an equilibrium of quasi-voluntary compliance.³⁷ In line with this literature, I find in [section II](#) that *both* elites agreed on imposing the tax on themselves.

Finally, income taxation did 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 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

³⁵In [Brautigam et al. \[2008, 15\]](#).

³⁶[Hirschman \[1958, 67\]](#).

³⁷[Levi \[1989\]](#).

the development of the ‘imagined community’³⁸ of the modern nation-state [...] Taxation enmeshes us in the web of generalized reciprocity that constitutes modern society.”³⁹

II. HISTORICAL BACKGROUND

Historians still debate whether agriculturalists and industrialists comprised two *different* elites. Some claim that this dualism is incorrect.⁴⁰ They argue that, since landowners also invested in industry,⁴¹ there was a blurry class division between the mining, banking, and agricultural sectors.⁴² 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 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.”⁴³ In fact, this practice shows how the credit system was oriented to give unfair advantage to the landed elites. Similarly, [Zeitlin \[1984, 174\]](#) finds “the combined ownership of capital and landed property was a distinctive quality of *certain* [elites] actors,”⁴⁴ 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.”⁴⁵

³⁸[Anderson \[2006\]](#).

³⁹Martin et al. (in [Martin et al. \[2009, 3\]](#)).

⁴⁰[Mamalakis \[1976, 125\]](#).

⁴¹[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.”

⁴²[Bauer \[2008, 30, 44, 94, 108\]](#).

⁴³Emphases are mine.

⁴⁴Emphasis is mine.

⁴⁵Emphasis is mine.

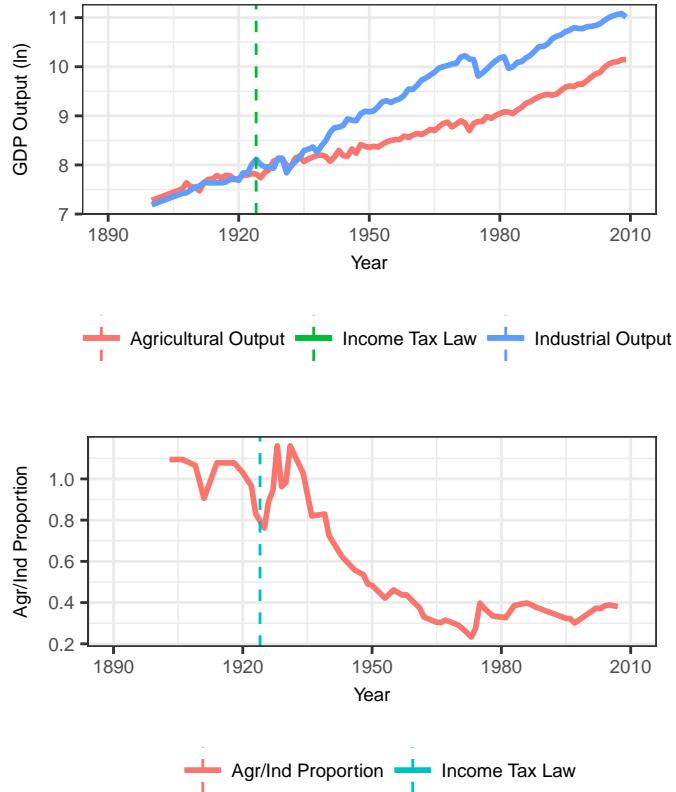


Figure 2: Industrial and Agricultural Outputs, and The Passage of the Income Tax Law in Chile

In all Latin American economies during and after the colonial period, agriculture was the most important sector.⁴⁶ Thus, by extension, agricultural political elites were the most powerful group.⁴⁷ 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.”⁴⁸ However, an important asymmetry existed. While both the agricultural and industrial sectors were growing at the same pace (see Figure 2, top panel), the latter were kept from participating in politics under fair conditions. As Mamalakis [1971, 111] describes it, in Latin America, economic equality led to political equality.⁴⁹ Initially, this asymmetry led these two “antagonistic elites”⁵⁰ to two bloody civil wars. Zeitlin [1984, 23] argues that the civil wars challenged a “large landed property [elite against a] productive capital[ist] [elite].” 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 1919,⁵¹ suggesting an equilibrium where no elite was the leading elite.

In 1924, 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.”⁵² As explained above, income taxation did more than just increasing the treasury’s budget. Importantly, these sectoral compromises increased the complexity of the state, expanding its dominion beyond Santiago. Moreover, it allowed previously-excluded (industrial) elites to influence public spending. *Did sectoral contestation increase state capacities? Did implementing the income tax increase state capacities over time?*

III. 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.⁵³ Soifer [2012, 589] explains that there exists an “industry of indices measuring 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”⁵⁴ and, second, most indices are conflated with analytical and conceptual problems.⁵⁵ One notable example is protection of the rule of law, which is commonly used as proxy for state capacities.⁵⁶ 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,”⁵⁷ thereby introducing systematic

⁴⁶Keller [1931, 13].

⁴⁷Wright [1975, 45-46]. In his sectoral clashes theory, Mamalakis [1971, 99] describes how the agriculture-government coalition conformed the first stage of development, beginning with the colonial period.

⁴⁸Similarly, 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.

⁴⁹For instance, Bahamonde [2017b] explains that President Balmaceda’s agenda on “industrial” infrastructure (mainly roads and railroads) mostly benefited agricultural areas, and that his attitude towards the banking sector (closely linked to the mining sector) was mostly confiscatory. See especially Zeitlin [1984].

⁵⁰Keller [1931, 37-38].

⁵¹Collier and Collier [2002, 109].

⁵²Carmenza Gallo, in Brautigam et al. [2008, 165]. Emphases are mine.

⁵³Hanson and Sigman [2013, 10] compiled 24 different types of measurements of state-capacities. In turn Mata and Ziaja [2009] constructed a combined measurement of 12 other indicators.

⁵⁴Mata and Ziaja [2009, 35]. They point out particularly to the fact that data are usually poor.

⁵⁵I agree with Soifer [2012, 586] in that most “scholarship on state capacity [...] lack[s] a satisfying conceptualization and measurement scheme for this concept.” See also Ferreira [2017, 1292].

⁵⁶See for one example Besley and Persson [2009, 1237].

⁵⁷Kurtz and Schrank [2007, 542]. Emphasis in original.

measurement error.⁵⁸ Likewise, expert surveys suffer from the same problem.⁵⁹ 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. One iconic example is the use of fiscal extraction as a proxy of state capacity.⁶⁰ Not only tax shares reflect policy preferences too,⁶¹ but also, as Fukuyama [2013, 353] explains it, there “is a difference between extractive *potential* and *actual* extraction rates.”⁶² For instance, since American institutions were deliberately designed to limit the exercise of state power, the U.S. taxes very little.⁶³ However, it is not reasonable to say that the U.S. has a “weak state.” 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.”⁶⁴ They consider absence of violence, among other factors. However, “there isn’t much by way of street crime or military coup attempts in North Korea,”⁶⁵ a state that can barely provide basic services to its population. Focusing on tax rates is not a solution either.⁶⁶ For example, 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.”⁶⁷

This paper identifies a third limitation. Beyond conceptual and analytical problems, most available measurements are unable to capture temporal sources of variation of state capacities. 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).”⁶⁸ Kurtz and Schrank [2012, 618-619] propose an experimental design based on list-experiments to study (in an unbiased way) bureaucrat’s opinions, Dargent et al. [2017] “analyzes the evolution of

⁵⁸See also Kurtz and Schrank [2012, 618].

⁵⁹Fukuyama [2013, 349].

⁶⁰Thies [2015, 172] conceptualizes “fiscal capacity [...] in terms of tax revenue extracted from society,” which is key to avoid state failure. This has been a measurement avenue typically pursued by Timothy Besley and his coauthors. See for example Besley et al. [2013, 224].

⁶¹Soifer [2013, 9].

⁶²Emphases are mine.

⁶³Fukuyama [2004, 6].

⁶⁴Kurtz and Schrank [2007, 543].

⁶⁵Fukuyama [2013, 348].

⁶⁶Yet, Johnson and Koyama [2017, 3] explain that ‘[t]ax revenue per capita is a commonly used metric of fiscal capacity,’ which in turn might work as a proxy of state capacities. For example, Besley and Persson [2014] adopt this strategy.

⁶⁷Kiser and Tong [1992, 301].

⁶⁸Emphasis is mine.

state capacity in Peru during the *recent* commodity boom,⁶⁹ while [Luna and Toro \[2014\]](#), [Luna and Soifer \[2017\]](#) employ a survey-based design to measure *contemporary* subnational state capacities. While these measurements 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,⁷⁰ such as infrastructure, roads,⁷¹ electrification (measured as light intensity per pixel),⁷² and railroads.⁷³ However, many of these measurements are debatable. For instance, [Soifer \[2012, 593\]](#) explains that “railroads were often constructed by private actors.”⁷⁴ The same problem applies to other types of infrastructure. There are others more appropriate strategies, such as the opening of postal offices,⁷⁵ the administration of national censuses,⁷⁶ and vaccination.⁷⁷ 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 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,”⁷⁸ they are not well studied in the discipline.⁷⁹ Building on [Mann \[1984, 113\]](#), the proposed measurement intends to capture the state’s ‘infrastructural’ power.⁸⁰ “Natural hazards can be seen as a function of a specific natural process and human [...] activity.”⁸¹ Given that earthquakes happen at random and are exogenous to the affected locality,⁸² the only part that is left unexplained is the systematic human

⁶⁹Emphasis is mine.

⁷⁰[Enriquez et al. \[2017\]](#).

⁷¹[Mann \[1984, 2008\]](#), [Acemoglu \[2005\]](#), [Saylor \[2012\]](#), [Thies \[2009\]](#), [Besley and Persson \[2010\]](#).

⁷²[Huntington and Wibbels \[2014\]](#).

⁷³[Saylor \[2012, 302\]](#) and [Coatsworth \[1974\]](#).

⁷⁴Footnote #11.

⁷⁵[Acemoglu et al. \[2016\]](#).

⁷⁶[Lee and Zhang \[2017\]](#), [Soifer \[2013\]](#), ? and [Centeno \[2002\]](#). 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.

⁷⁷[Soifer \[2012\]](#).

⁷⁸[Anbarci et al. \[2005, 1908\]](#).

⁷⁹[Brancati \[2007, 719\]](#) explains that “[d]isasters are not as well studied [...] in the field of political science.”

⁸⁰He defines infrastructural power as “the capacity of the state [to] actually [...] penetrate civil society, and to implement logically political decisions throughout the realm.”

⁸¹[Raschky \[2008, 627\]](#).

⁸²[Brancati \[2007, 728\]](#) explains that “earthquakes constitute a natural experiment.” [Gignoux and Menéndez \[2016\]](#),

component, which is what the proposed measurement captures. Earthquakes are orthogonal to levels of state capacity and economic development.⁸³ 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.⁸⁴ I focus on earthquakes and not on other natural disasters, such as “extreme temperature events, floods, landslides, and windstorms,”⁸⁵ 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.⁸⁶ State capacities 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,”⁸⁷ state capacities act as a scope condition, in particular, undermining (or facilitating) the implementation of these norms. For example, [Bilham \[2013, 169\]](#) explains that “although engineering codes may *exist*[,] mechanisms to *implement* these codes are largely unavailable”⁸⁸ 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 2002.⁸⁹ Importantly, the proposed measurement bridges this gap by incorporating and modeling the capacity for enforcing these codes at the subnational level.

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,

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.”

⁸³[Kahn \[2005, 271\]](#) and [Brancati \[2007\]](#).

⁸⁴To 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 \[1996, 130\]](#).

⁸⁵[Kahn \[2005, 280\]](#).

⁸⁶In 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.

⁸⁷[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.

⁸⁸Emphases are mine.

⁸⁹Similarly, [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.”

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,⁹⁰ 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.

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.⁹¹ 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,⁹² reducing the legitimacy of the state to zero.

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,⁹³ an activity that *any state must* perform.⁹⁴ Importantly, Soifer [2008, 235-236] divides the state infrastructural power into three layers, ‘national capabilities,’⁹⁵ the ‘weight of the

⁹⁰See especially article 151.

⁹¹Carlin 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.”

⁹²Reed [2011]. See also Laursen [2010].

⁹³That 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]).

⁹⁴To be sure, any state susceptible to earthquakes. Kurtz [2013, 58] for example 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.”

⁹⁵This layer ‘sees state infrastructural power as a characteristic of the central state’.

state,⁹⁶ and a ‘subnational’ component, which tracks “the ability of the state to exercise control within its territory.” The proposed measurement strategy maps well onto all three components. Importantly, this paper adds a relatively unexplored layer, which is the relationship between fiscal expansion and the structural transformation, but from a subnational standpoint. As Evenhuis [2017, 2] explains, at “the subnational level, the interaction between institutional change and economic development is still very much underexplored.”

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 most of the developing world.⁹⁷ Moreover, 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.⁹⁸ Another potential concern is that the ability of counting the death-toll might be a function of state capacities itself.⁹⁹ 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,¹⁰⁰ 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.

IV. MULTILEVEL ANALYSES

I constructed a novel hand-collected longitudinal dataset using the *Significant Earthquake Database* compiled by the National Centers for Environmental Information (NOAA) as a starting point.¹⁰¹ The dataset “contains information on destructive earthquakes from 2150 B.C. to the present,” and

⁹⁶This relates to ‘how the exercise of state power shapes the society it controls.’

⁹⁷Keefer 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]). Other measurements are also context-specific. For example, Soifer [2012, 593] proposes a measurement of administrative capacities focusing on how states are able to enforce voter registration “where voting is mandatory.”

⁹⁸Dunbar 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.

⁹⁹I thank Paul Poast for this comment.

¹⁰⁰Szeliga et al. [2010].

¹⁰¹[NGDC/WDS].

records the number of deaths,¹⁰² the magnitude, date, latitude, and longitude of every quake, among other variables. Using archival census data from 1907 to 2012,¹⁰³ 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.¹⁰⁴ Using archival census data as well, I considered the main economic activity of the affected municipality,¹⁰⁵ in addition to whether the municipality was urban or rural.¹⁰⁶ The death tolls and magnitudes proportionated by the NOAA dataset were contrasted case by case with historical press archival information.¹⁰⁷ Magnitudes, in particular, were also compared with the International Seismological Centre. All these are subnational-level variables. Next, I included national-level indicators that aim to serve as proxies for levels of sectoral conflict. Following Bahamonde [2017b,a], I measured the degree to which the industrial elites challenged incumbent landowners by calculating the proportion of agricultural growth relative to industrial growth as presented in the MOxLAD data (see Figure 2, bottom panel).¹⁰⁸ According to Astorga et al. [2005, 790], these data provide extended comparable sectoral value-added series in constant purchasing power parity prices. Even when pre-1900 earthquakes are recorded in both the NOAA data and my own dataset (Figure 3), the economic data provided by MOxLAD limits the scope of this paper to the period from 1903 to 2007 (Figure 2).

Figure 3 plots the earthquakes, the years, and the magnitudes, while Figure 4 plots the geographical distribution and magnitudes of the quakes.¹⁰⁹ 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 and locations. 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

¹⁰²Importantly, the NOAA distinguishes earthquake deaths from total deaths (which includes tsunami casualties). I use the former.

¹⁰³Particularly, 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.

¹⁰⁴While in most occasions 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, 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.

¹⁰⁵Agriculture (n=27), Industry (n=51), Mixed (n=13).

¹⁰⁶Urban=74, rural=17. If more than 50% of the population lives 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.

¹⁰⁷*El Mercurio* and *La Nación* newspapers, both kept at the *Archivo de la Biblioteca Nacional de Chile*.

¹⁰⁸These 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.

¹⁰⁹For illustrative purposes, both plots consider the full sample starting in 1520 and ending in 2015.

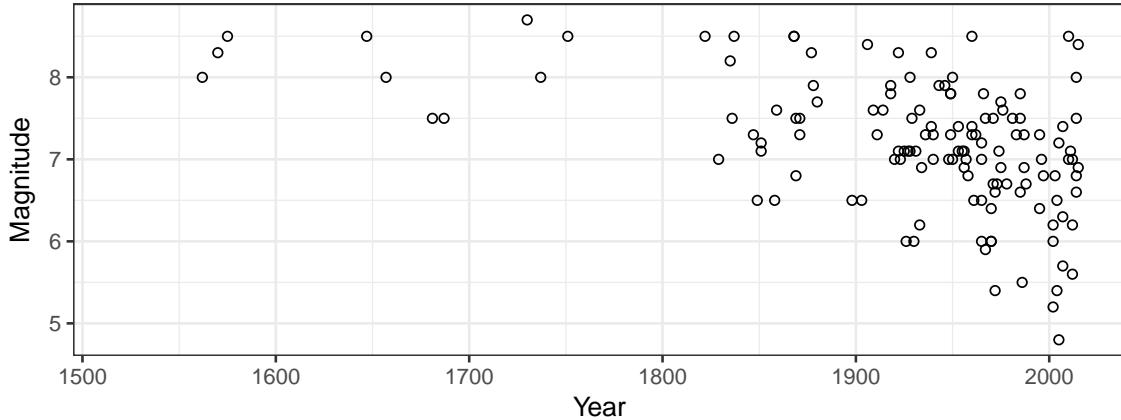


Figure 3: *Earthquakes in Chile: 1500-2010*

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.¹¹⁰ 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.¹¹¹ All things considered, earthquakes have affected the territory from coast to mountain,¹¹² solving potential concerns about geographical sectoral self-selection.

The unit of analysis is the earthquake.¹¹³ As an event, each earthquake has associated to it a death toll, a subnational location (latitude and longitude), a magnitude, the main economic activity of the locality where the quake hit, a local population, and an urban/rural setting. All these factors are subnational. At the national level, I consider sectoral outputs (as a proportion), population, and year. Specifically, following the statistical convention, I use a Bayesian Poisson regression to test the effect of both national and subnational sources of sectoral contestation on the count of deaths due to earthquakes over time.¹¹⁴ In a second model, I test the effect of implementing the income tax law on death-tolls over time. In the first model the main variable of interest is the national proportion of agriculture output relative to national industrial output with different slopes for agricultural, industrial, or mixed localities. In the second model, the main quantity of interest

¹¹⁰Foa and Nemirovskaya [2016, 418].

¹¹¹Moreover, Brancati [2007, 729] explains that “[e]arthquakes often occur in mountainous areas.”

¹¹²Since “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 epicenter might have been a few miles away from the shore, the consequences certainly reached the land.

¹¹³Kahn [2005, 273] also considers that “the unit of analysis is [the] disaster.”

¹¹⁴Anbarci 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.

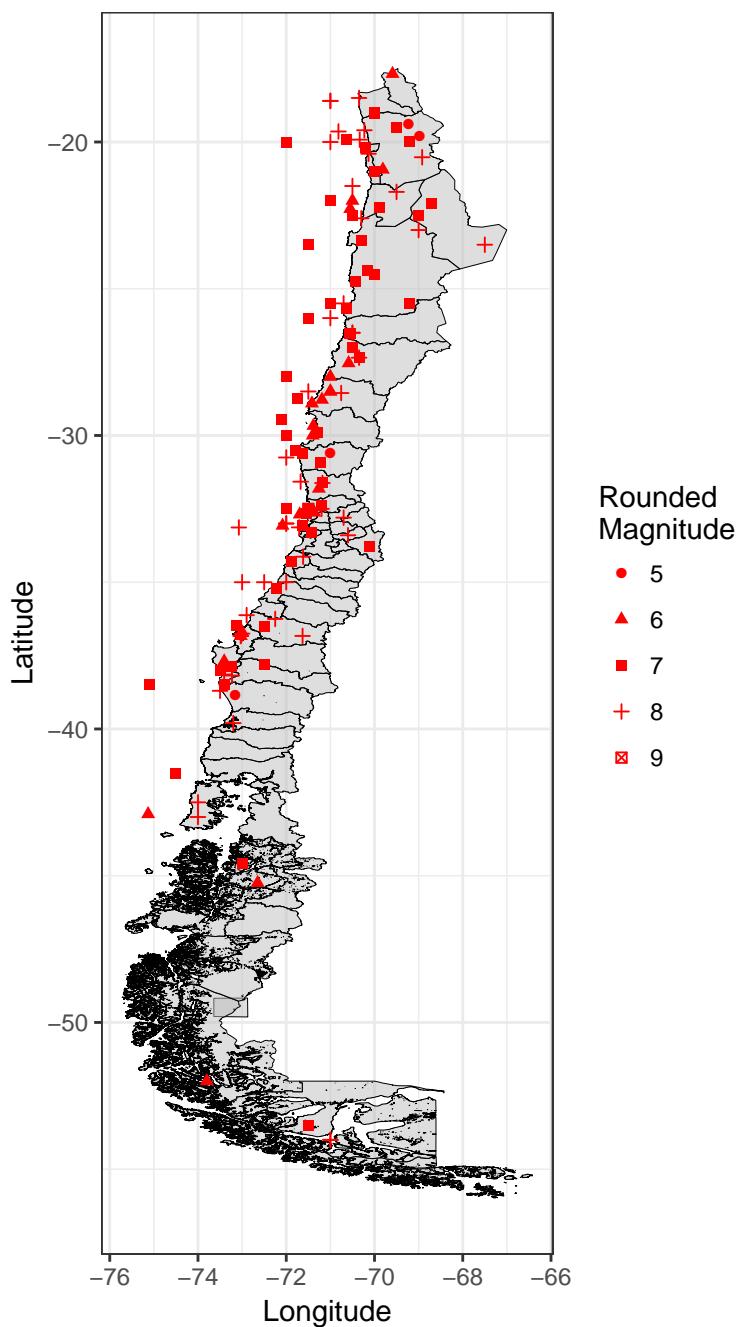


Figure 4: Geographical Distribution of Earthquakes in Chile 1500-2015

is a binary variable that denotes whether the income tax is implemented or not. Both models consider year fixed-effects to account for time-varying confounding factors and for unmeasured sources of variation.¹¹⁵ 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.¹¹⁶ 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.¹¹⁷ Finally, some areas should be wealthier than others. Increased wealth should allow private investment in earthquake proofing.¹¹⁸ While data on subnational levels of 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.¹¹⁹ More formally, I fit the following equation,

$$\text{Deaths} \sim \text{Poisson}(\lambda_i)$$

$$\log(\lambda_i) = \mu + \beta_{1_j} \text{Proportion}_i + \beta_{2_j} \text{Magnitude}_i^2 + \beta_3 \text{Latitude}_i + \beta_4 \text{Longitude}_i + \beta_5 \text{Population}_i + \beta_6 \text{Urban}_i + \beta_7 \text{Year}_i \quad (1)$$

where,

$$i_{1,\dots,I} \text{ and } I = 91$$

$$j_{1,\dots,J} \text{ and } J = 3$$

$$t_{1,\dots,T} \text{ and } T = 59;$$

¹¹⁵Brancati [2007, 729] also includes in his analyses “year-fixed effects to control for trends over time.”

¹¹⁶I thank Hillel Soifer for this suggestion.

¹¹⁷Undoubtedly, 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 in my model some of these factors are accounted for, I do not have complete hourly data. 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.

¹¹⁸I thank Hillel Soifer for this comment.

¹¹⁹Figure 2 (top panel) shows that for most years, the industrial sector contributed more to the economy, suggesting that industrial areas were wealthier than agricultural zones.

the i subscript denotes the unit of analysis (i.e. earthquake),¹²⁰ the j index expresses the type of subnational economic composition of the affected municipality—agricultural, industrial, mixed—and the t subscripts denotes the year when earthquake i happened. Since earthquakes can happen more than once per year, $I > T$.¹²¹ Finally, μ is the intercept.

I implement a multilevel setup to model the effect of national–subnational sources of sectoral contestation on state capacities over time. Substantively, sectoral contestation is high in circumstances where the leading sector at the national level is *not* the same as that which leads the subnational level, suggesting an overall situation of sectoral indeterminacy. For instance, sectoral contestation is low when the agricultural sector leads both the national and subnational level. Econometrically, the multilevel component of [Equation 1](#) allows the slope of the national proportion of agriculture relative to industry ($\beta_{1,j}$) to vary by the j th dominant subnational economic sector. Due to space constraints, I exclude mixed subnational units from my theoretical analyses. 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 ($\beta_{2,j}$).¹²² The results strongly suggest that there is not a self-selection mechanism in the data generating process.¹²³ Finally, the estimated parameters β_k have noninformative normally distributed priors,¹²⁴ while the precisions, τ_p , of $\beta_{1,j}$, $\beta_{2,j}$, and $\beta_{7,t}$ have noninformative Gamma priors.

More formally, I considered the following:

$$\beta_{k,\dots,K} \sim \mathcal{N}(0, 0.01) \text{ where } K = 8$$

$$\tau_{p,\dots,P} \sim \mathcal{G}(0.5, 0.001) \text{ where } P = 3.$$

Do higher levels of sectoral contestation translate into state development? [Table 1](#) shows the posterior predictive distributions of the multi-level Bayesian Poisson regression, in particular, the predicted death counts conditional on observed covariates. The main quantity of interest is $\beta_{1,j}$. The results strongly suggest that the average earthquake causes 13 *more* deaths when the average subnational locality is agricultural under circumstances where the main national

¹²⁰Kahn [2005, 278] follows the same strategy.

¹²¹For the years in which there is just one earthquake, the ‘group’ variable has only one observation. This does not endanger the robustness of the model. Gelman and Hill [2006, 276] explain that it “is even acceptable to have one observation in many of the groups.”

¹²²According 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, both in [Equation 1](#) and [Equation 2](#) I consider the square term of magnitude.

¹²³Nearly-zero posteriors indicate that the three types of subnational localities are affected in the same way, and that casualties are independent of the subnational predominant sector.

¹²⁴“Noninformative prior distributions are intended to allow Bayesian inference for parameters about which not much is known beyond the data included in the analysis at hand” (Gelman [2006, 520]).

economic sector is *also* agricultural. I contend that agricultural economic hegemony left the political order uncontested, reinforcing the advantaged position landowners had since colonial times. However, the same average earthquake causes 16 *less* casualties when the average subnational locality is industrial under circumstances where the main national economic sector is agricultural. In these contexts of inter-sectoral challenge, industrial political elites at the subnational level had more leverage to push for the implementation of the income tax, fostering state development in the long-run. To ease interpretation of these results, [Figure 5](#) shows that, as the proportion of the agricultural sector increases, the death toll decreases by a 4-19 range when the average affected locality is industrial, but it increases by a 3-15 range when the average affected locality is *also* agricultural.

	Mean	SD	Lower	Upper	Pr.
Agr/Ind [Agr]	12.68	7.21	3.73	22.65	0.98
Agr/Ind [Ind]	-16.26	5.30	-23.17	-9.62	1.00
Agr/Ind [Mixed]	-30.73	21.74	-63.78	-4.89	0.95
Magnitude [Agr]	0.04	0.02	0.01	0.06	0.95
Magnitude [Ind]	0.24	0.07	0.16	0.32	1.00
Magnitude [Mixed]	0.37	0.14	0.17	0.55	1.00
Latitude	-0.01	0.03	-0.05	0.02	0.69
Longitude	-0.16	0.14	-0.34	0.03	0.85
Population	-0.01	0.00	-0.02	-0.01	1.00
Urban	-1.54	2.01	-4.22	1.00	0.76

Note: 200000 iterations with a burn-in period of n = 5000 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 4 chains were run. Detailed diagnostic plots available [here](#).

Table 1: *Sectoral Competition Model: Simulated Posterior Predictions (Poisson Regression)*

In sum, the overall results strongly suggest that the Chilean state was better able to enforce building codes when the main national economic sector did not rule the average subnational locality. I attribute these increments in subnational state-capacities to the incorporation of industrial elites into the same national project. Historical evidence suggests that the implementation of the income tax contributed towards the incorporation of industrial elites. Importantly for state-making, the tax reflected the preferences of both elites, fostering the implementation of stronger local bureaucracies and better monitoring technologies. Following the fiscal sociology paradigm, there were complementarities between income taxation and expanding/improving other state capacities. In sum, these results find empirical support for the *average* positive relationship between higher levels of sectoral contestation and higher levels of state-capacities. However, they do not tell us how these sectoral dynamics impacted state-capacities *over time*, which is what I do next.

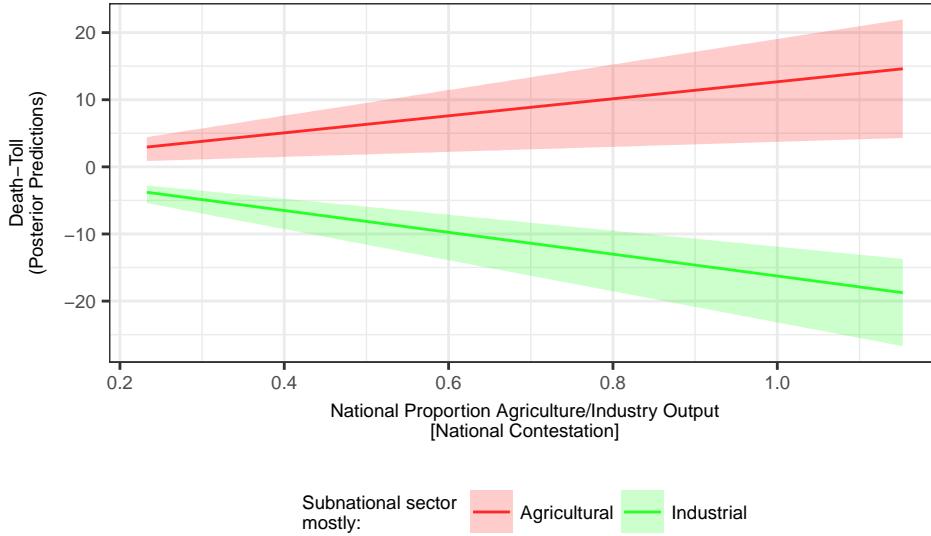


Figure 5: Death-Toll by National and Subnational Sources of Sectoral Contestation

Did taxation improve state capacities overtime? Following the same setup, I fit a simpler one-dimensional Poisson model. The only complexity kept were the yearly fixed-effects. The main difference is the inclusion of an indicator variable that denotes whether the income tax is implemented by year t , and whose estimated parameter (β_1) is the main quantity of interest.

More formally, I fitted the next equation:

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

Table 2 also shows posterior predictive distributions. The results show that implementing the income tax *decreases* the death-toll by an estimated average of 3. **Figure 6** 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 28 casualties per earthquake. However, once the income tax law was implemented, the death-toll decreased from 28 to 22, approximately.

	Mean	SD	Lower	Upper	Pr.
Income Tax	-3.01	3.55	-7.55	1.41	0.81
Magnitude	0.06	0.01	0.04	0.07	1.00
Latitude	0.06	0.01	0.04	0.08	1.00
Longitude	-0.49	0.07	-0.58	-0.39	1.00
Population	-0.02	0.00	-0.02	-0.02	1.00
Urban	-5.22	0.73	-6.19	-4.35	1.00

Note: 200000 iterations with a burn-in period of n = 5000 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 4 chains were run. Detailed diagnostic plots available [here](#).

Table 2: Income Tax Adoption Model: Simulated Posterior Predictions (Poisson Regression)

Fiscal sociologists have, for a long time, claimed that the capacity of taxing individuals' incomes transfers to other state institutions, improving overall state-capacities. Here, I find support for this claim. Historical evidence suggests that the treasury did increase the Chilean fiscal coffers after the implementation of the income tax law, suggesting a denser (and better) state presence at the local level. My analyses suggest that the act of *sending* bureaucrats to collect the income tax had positive externalities on other state activities. Here I identify one such activity, the enforcement of national quake-sensitive norms. The data analyses show (statistically) that, *ceteris paribus*, state capacities increase over time after the implementation of the income tax law.

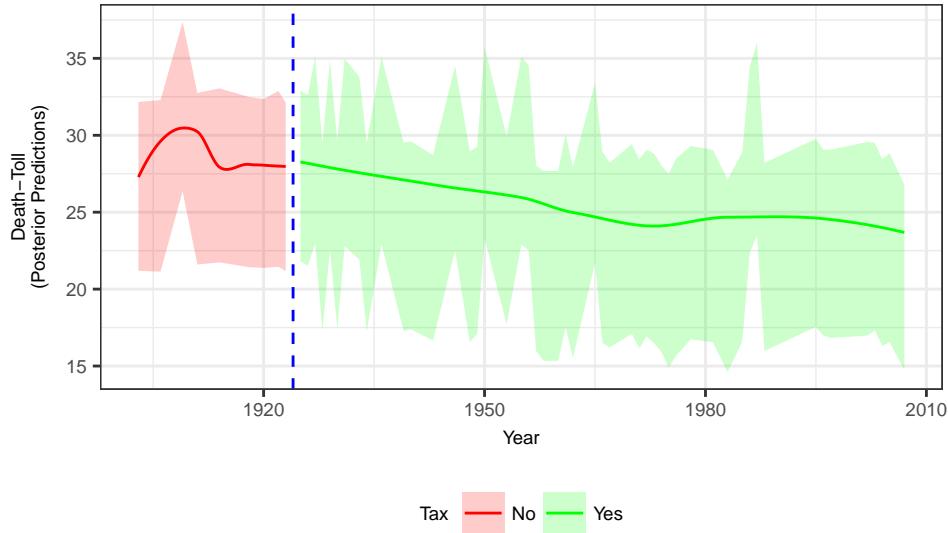


Figure 6: Death-Tolls Over Time: Before and After the Implementation of the Income Tax

V. 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 the following. First, death-tolls decrease (state capacities increase) when levels of national/subnational sectoral contestation increase. Second, death-tolls decrease (state capacities increase) after the income tax law is implemented. This last finding supports the idea that income taxation produces positive effects via spillovers on overall state capacities (fiscal sociology paradigm).

The causal mechanism focuses on how higher levels of sectoral contestation translated into more credible threats, advancing sectoral alliances at the national level. I identified one such compromise, the implementation of the income tax, and how this crucial institution for state-making included the preferences of both elites. Importantly, I explain how the industrial sector was excluded from participating in politics before these big compromises, and how industrial expansion required the implementation of the income tax law (to pay for local public goods). Analytically, these conditions were met once the emergence of the industrial elites posed sufficiently credible threats to the incumbent landowning elites. The paper also introduced a novel framework that leveraged the exogeneity of earthquakes. Under reasonable assumptions, this approach is well-suited to capturing how the Chilean state has been able to enforce a number of regulations that sought to shape norms for the construction and infrastructure sectors.

VI. ONLINE APPENDIX

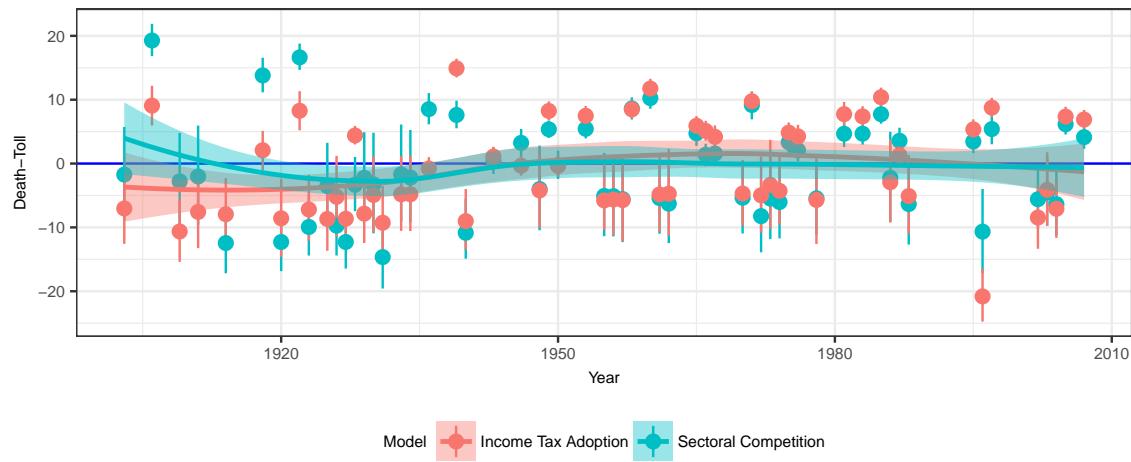
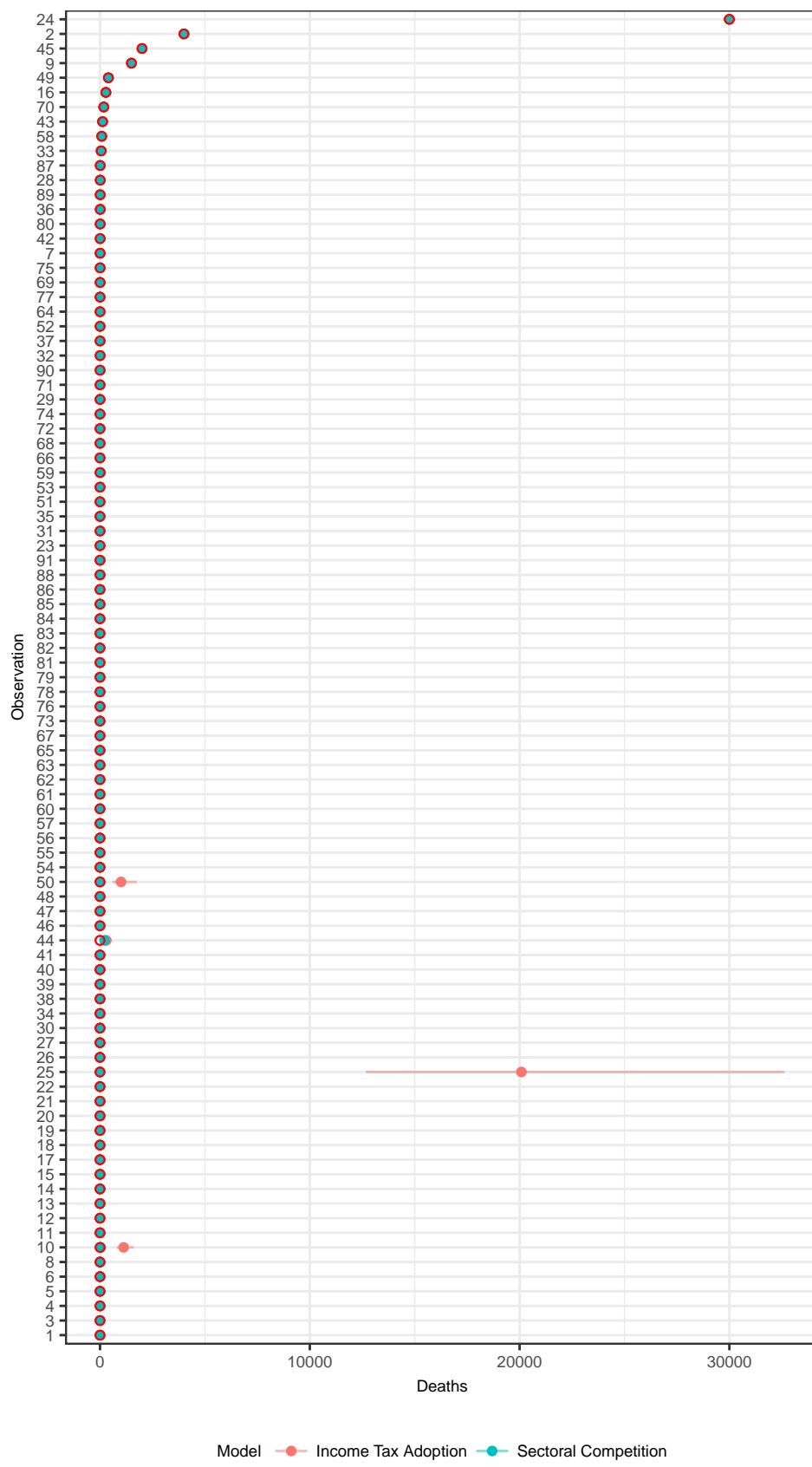


Figure OA1: *Year Fixed Effects*



Model —●— Income Tax Adoption —●— Sectoral Competition

Figure OA2: Assessing Model Fit

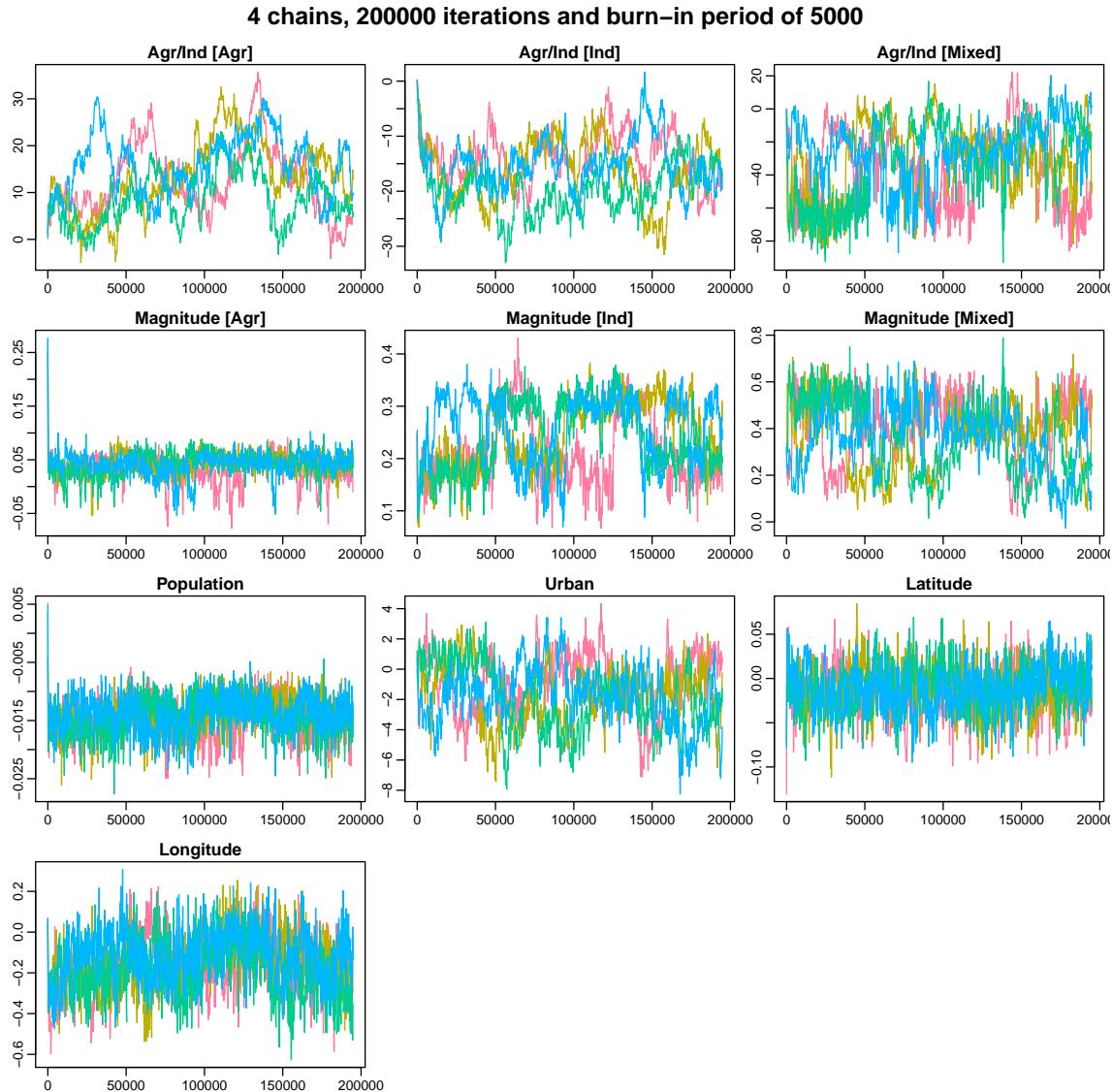


Figure OA3: Trace Plots: Sectoral Conflicts Model

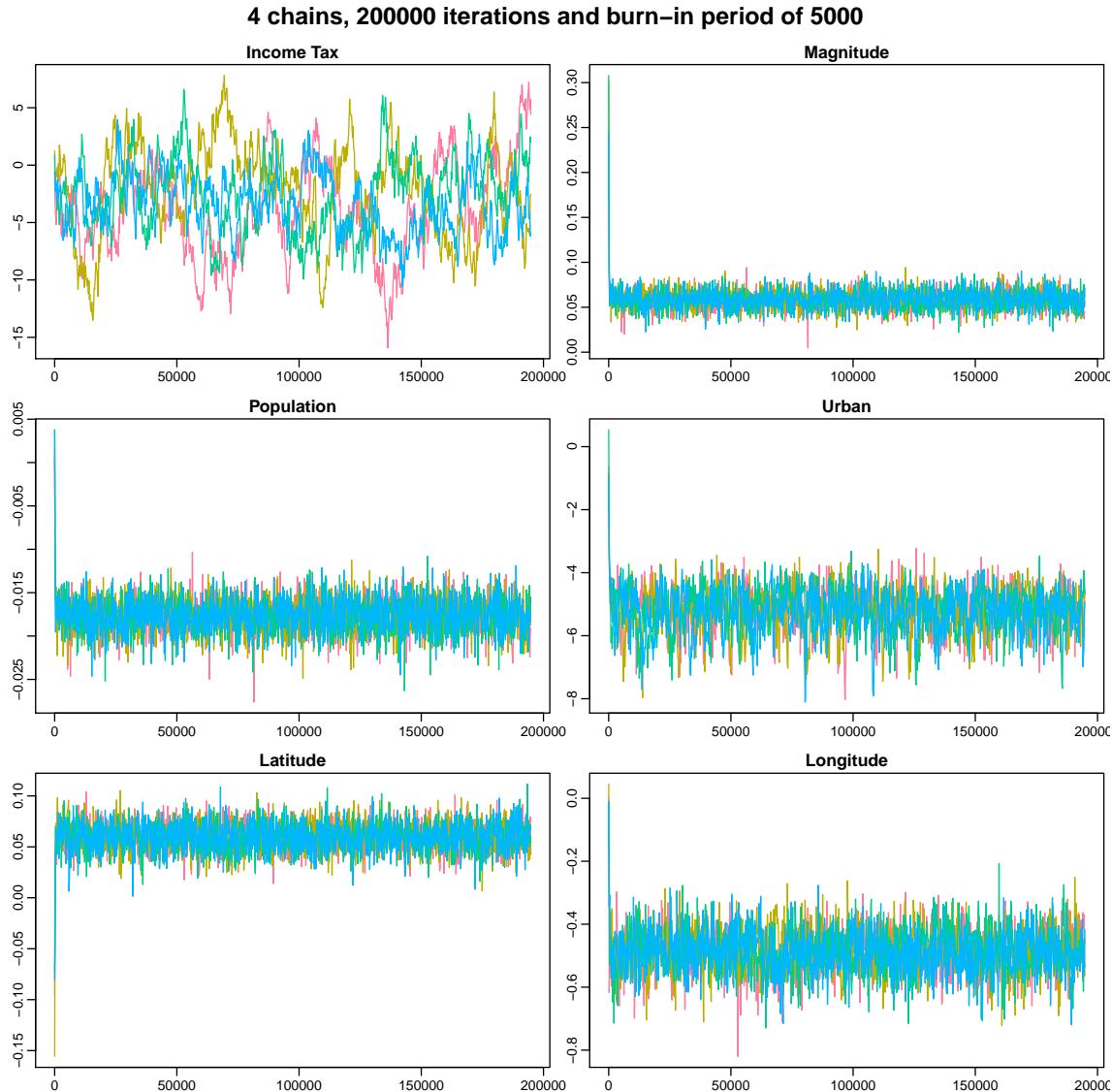


Figure OA4: Trace Plots: Income Tax Adoption Model

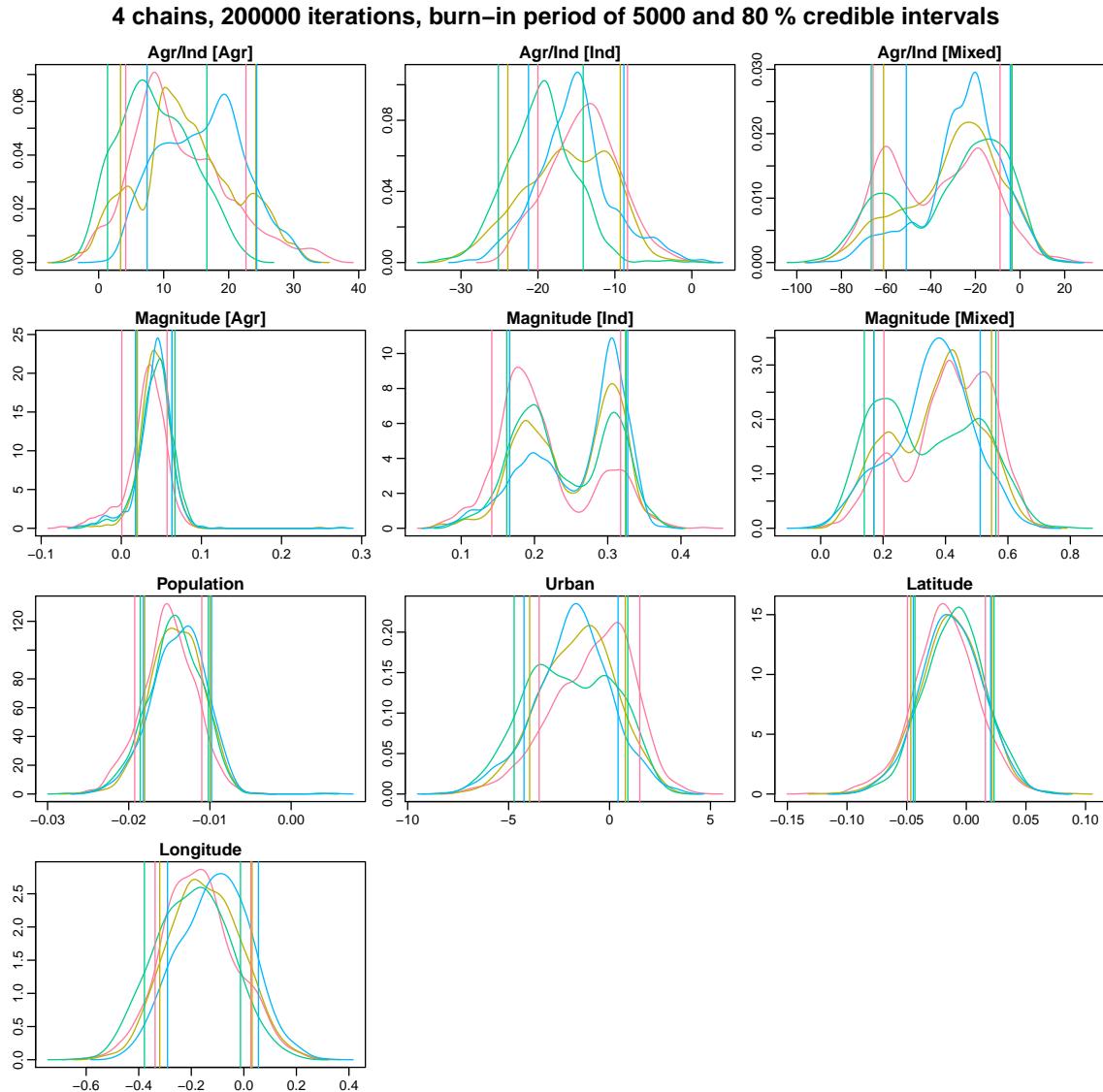


Figure OA5: Density Plots: Sectoral Conflicts Model

4 chains, 200000 iterations, burn-in period of 5000 and 80 % credible intervals

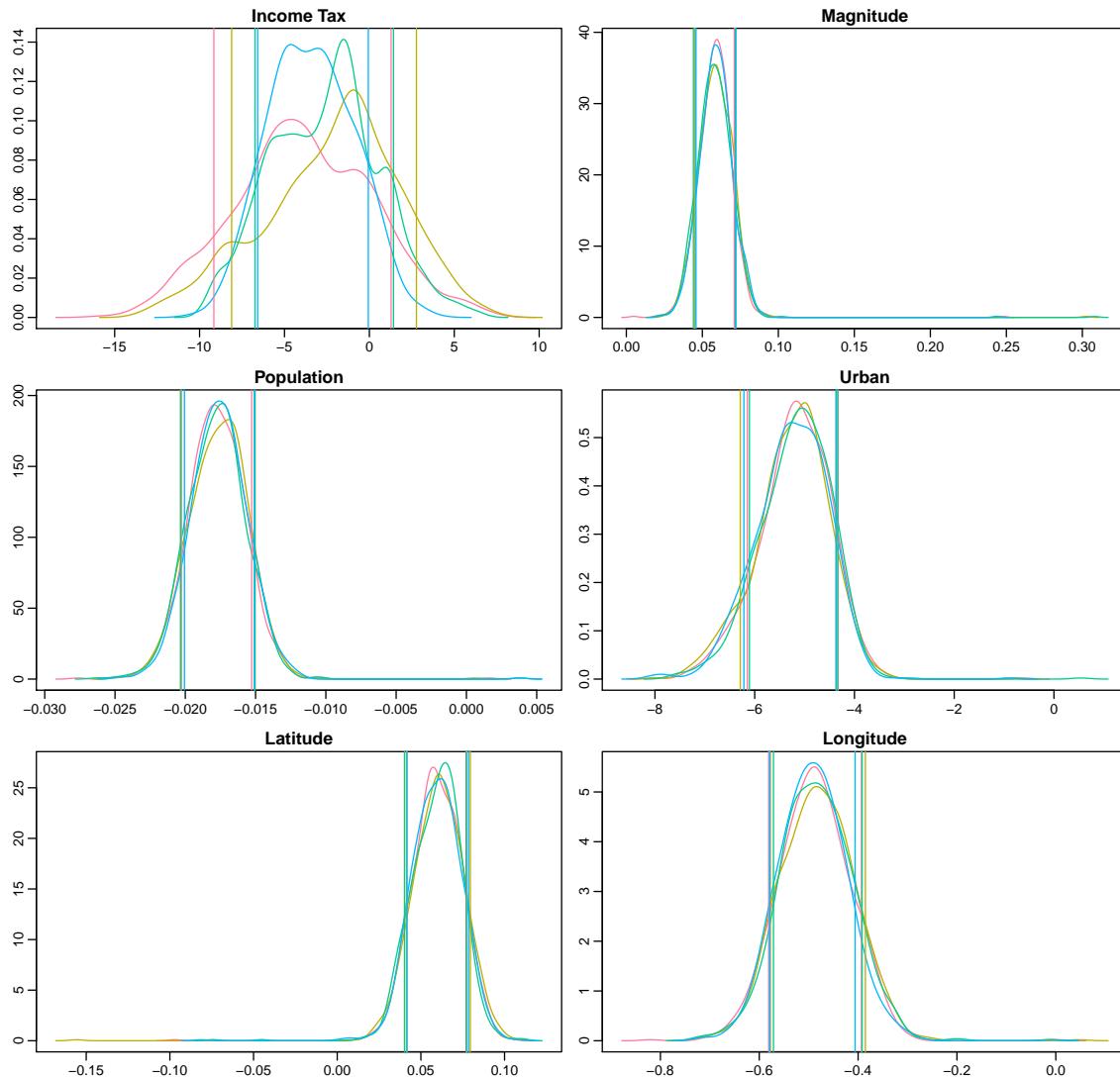


Figure OA6: Density Plots: Income Tax Adoption Model

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Sectoral Origins of Income Taxation: Industrial Development in Latin America and The Case of Chile (1900-2010)

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November 1, 2017

Abstract

Building on the fiscal sociology and sectoral approaches, this paper outlines the conditions under which the timing of the implementation of the income tax was most likely to happen. The argument stresses the role of sectoral contestation, and how the tax was an important critical juncture for state-building in Latin America. My quantitative analyses cover almost a hundred years of sectoral outputs. I also examine the Chilean case to illustrate the causal mechanisms at work. I find that higher levels of sectoral contestation—characterized by the rising of the industrial class—posed credible threats to incumbent landowners elites, in turn accelerating inter-sectoral alliances. I focus on one such agreement, the income tax.

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*I thank Robert Kaufman, Daniel Kelemen, Matthias vom Hau, Dídac Queralt, James Mahon, Florian Hollenbach, Douglas Blair, Christopher Zorn, Paul Poast, William Young, Mart Trasberg, Jose Pablo Silva, and the participants of the 50th LASA Congress for all the useful comments. I also thank the School of Arts and Sciences at Rutgers for a pre-doctoral research grant and the Department of Political Science at Rutgers University for conference travel funds. All errors are my own.

I. INTRODUCTION

*The only important coercion which is
crucial to development is taxation*

Arthur Lewis, 1965

*The budget is the skeleton of the state
stripped of all misleading ideologies*

Schumpeter, 1991

There seems to be a strong agreement on that fiscal capacities are a prerequisite for state-building. Unfortunately, there have not been many attempts to explain when fiscal capacities in the developing world emerged.¹ Except for a few exceptions, most efforts have been devoted to understanding the relationship between the politics of taxation and state development only in a limited number of European cases. In a recently edited volume, [Monson and Scheidel \[2015, 3\]](#) explain that the “New Fiscal History has furnished a valuable set of concepts and questions but so far its scope has been limited to post-classical Europe.”² In fact, the bulk of the research done on Latin America has mostly focused on recent tax reforms.³ However, the origins, and moreover, the timing of fiscal expansion in Latin America, remains relatively unclear. Additionally, since wars in Latin America have been rare,⁴ it is difficult to extend models developed to understanding the medieval European case based on external threats,⁵ such as the one explained in [Tilly \[1992\].](#)⁶ Importantly, domestic explanations, such as the role of sectoral conflicts within a context of economic structural transformation, taxation and state-building, has been overlooked.⁷ [Schneider \[2012, 2\]](#) explains that even when we have gained considerable knowledge of fiscal expansion in the European cases, the study of developing countries is lacking especially in the presence of ‘new leading sectors.’ Building on the fiscal sociology

¹[Di John \[2006, 5\].](#)

²Some important exceptions are [Yun-Casalilla et al. \[2015\]](#) and [Monson and Scheidel \[2015\]](#) who study a number of premodern Latin American states.

³Flores-Macías, in [Flores-Macías \[2017\]](#). For instance, [Fairfield \[2013\]](#) studies different strategies policymakers pursue to tax elites starting in 1990, [Mahon et al. \[2014, 3\]](#), [Mahon \[2004\]](#) and [Focanti et al. \[2013\]](#) study the causes of tax reform in Latin America starting in the 1960s, 1980s, and 1990, respectively. Similarly, [Ross \[2004\]](#) studies the relationship between taxation and representation between 1971 and 1997, whereas [Sokoloff and Zolt \[2007\]](#) study the evolution of tax institutions comparing the U.S. with Latin America. See also [Sanchez \[2011\]](#) and [Bergman \[2003\]](#).

⁴[Centeno \[2002\].](#)

⁵However, for the Latin American context, see [Thies \[2005\]](#).

⁶In fact, [Flores-Macias and Sanchez-Talanquer \[2016\]](#) find micro-level evidence which suggests that higher levels of public insecurity decrease the willingness to pay taxes in Mexico.

⁷Flores-Macías, in [Flores-Macías \[2017\]](#). However, 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. [Wheeler \[2011\]](#) studies how inter-elite cooperation and agreements positively impacted state-making in Europe.

approach,⁸ I develop an argument centered on the development of the modern fiscal apparatus in Latin America, explaining that it was product of sectoral conflicts and compromises, between the industrial and agricultural political elites. The paper presents several panel-data analyses covering almost 100 years of sectoral outputs for a number of Latin American countries, and the Chilean case to illustrate the causal mechanisms at work. Particularly, I find that the emergence of the industrial sector *accelerated* the implementation of the income tax, while the expansion of the agricultural sector *retarded*, or even *precluded* fiscal development. These findings go in line with Beramendi et al. [2016], particularly, in that as long as agriculture is the leading economic sector, the fiscal apparatus is less likely to emerge.⁹

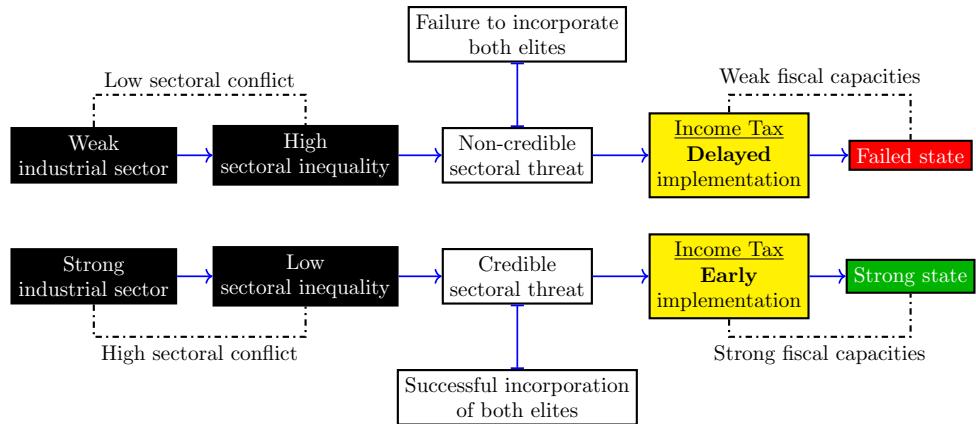


Figure 1: Causal Mechanism

I argue that the early implementation of the income tax in Latin America was product of an inter-sectoral conflict that took place around in the early 1900's between the agricultural and industrial sectors. Initially, Latin American political institutions and social norms—largely inherited from the colonial period—were designed to serve the interests of the landowning elites.¹⁰ However, the economic structural transformation characterized by “a secular decline of agriculture and substantial expansion of manufacturing,”¹¹ imposed tight constraints on the way politics was run by the incumbent agricultural political elites. Given the initial advantage of the landed elites, the emergence of the industrial sector meant the reduction of inter-sectoral inequality and the rise of bargaining power of the challenger elites, e.g. the industrial class.¹² In this sense, I follow Thies

⁸For a review, see Martin and Prasad [2014].

⁹See for similar results Pessino and Fenochietto [2010, 78]. Finally, Peter Evans points out that industrial elites should find it harder to “construct a project of industrialization [in the presence of the] continuing social power of the elites.” (in Haggard and Kaufman [1992, 176]).

¹⁰Mamalakis [1971, 90,109].

¹¹Johnston and Mellor [1961, 567].

¹²Mamalakis [1971, 112] explains that in “Latin America, agriculture-linked parties lost power between 1900-1960, while those parties linked with mining, industrial, and service sectors gained power.”

[2015, 169], who explains that “rulers will have an upper hand whenever they monopolize the coercive, political *and* economic resources of a society.”¹³ This monopolistic equilibrium was disturbed with the culturing of a new and strong political elite backed by favorable material conditions. These lower levels of inter-sectoral inequality posed credible political, economic and military threats to agricultural incumbents, increasing the opportunity costs of conflict, generating pressures for inter-elite compromises. In Mamalakis [1971, 111]’s words, in Latin America, economic equality led to political equality. Analytically, the emergence of the industrial sector not only altered the structure of the economy, but also the inter-sectoral balance of *political* power, triggering a series of inter-sectoral compromises. Here I identify one such compromise, the implementation of the income tax law. In this paper, I leverage a number of Cox regressions using comparative data on a number of Latin American countries to suggest that a rapid expanding industrial sector, accelerated the implementation of the income tax. The Chilean case shows that the industrial elites accepted to be income taxed by agriculturalist incumbents, in exchange of opening access to state politics, and the delivery of public goods at the local level.

When countries implement the income tax is an analytically important quantity of interest. For instance, Chile imposed the income tax law very early, in 1924, and the Chilean *Servicio de Impuestos Internos* is among the finest tax institutions in Latin America. Unlike Chile, Guatemala imposed the income tax law very late in 1963. By 1967, the national income tax office employed only 194 people, with only 9 of them with a college degree.¹⁴ In fact, Cabrera and Schneider not only find that “Guatemala collects among the lowest tax levels in Latin America,” but also that “the revenues it does collect are gathered inefficiently.”¹⁵ From a theoretical perspective, I explain this variation focusing on how implementing the income tax early, was an important critical juncture for state consolidation. As explained later, fiscal sociologists contend that an important feature of income taxation are its positive externalities for state-capacities. I focus on how differences in levels of sectoral contestation delayed or accelerated the timing of the implementation of the tax.

Some scholars situate the relevant state-building critical juncture either before the colonial period,¹⁶ or at the end of it.¹⁷ While the literature situates these critical moments before the class compromises I identify in this paper, the paper identifies the income tax as an important *additional building block* in that process. Hence, here the focus is on state *consolidation*, rather than pure state *formation*. Particularly, I explain how early implementers were able to crystallize a series of reforms

¹³Emphasis is mine.

¹⁴Di John [2006, 5].

¹⁵In Mahon et al. [2014, 128].

¹⁶Mahoney [2010].

¹⁷Kurtz [2009, 2013] explains that the first critical juncture corresponded to the post independence political economy, stressing whether local rural elites recruited their workers through servile means. In turn, Soifer [2015, 6] argues that the critical tipping point was whether “local administrators were outsiders in the communities in which they served.”

and inter-elite compromises that fostered state consolidation in the long run. Late implementers, however, due to their lower levels of sectoral contestation, reproduced the legacy of post-colonial institutions. In these cases, the conflict was too low to trigger a critical juncture, reinforcing the institutional order inherited during colonial times. Even when the tax was (lately) implemented, the process of implementing it did not reflect the domestic sectoral dynamics, but other forces. Importantly, late implementers introduced the income tax *after* the nation's formative period, missing a key historical opportunity for state consolidation, and great divergence. For instance, the income tax in Chile was implemented under circumstances of political contestation, replacing the old institutional order, producing not only long-term economic growth,¹⁸ but also state-capacities overtime.¹⁹ However, while Guatemala did eventually implement the tax, the process did not reflect the foundational sectoral cleavage, truncating the development of state institutions in the long run. In fact, the law responded to exogenous forces. Particularly, the law was implemented by the US-backed dictator Colonel Enrique Peralta Azurdia, not necessarily reflecting the inter-sectoral domestic dynamics. In these kinds of scenarios, landowners were never challenged and there were less pressures to centralize the state, making further institutional investments less likely. This argument, centered on the timing of income taxation—as an important critical juncture for state consolidation—is a novel argument.²⁰ The paper is situated with other relevant research, such as Beramendi et al. [2016, 7], who argue that “so long as agricultural elites are the dominant political power-holders in society, then fiscal capacity should remain relatively small, because such elites will prefer *not* to invest in greater fiscal capacity.”²¹ Consequently, the tax was not (only) important because of the new revenue it collected, but because its implementation required a series of inter-elite compromises, triggering a series of other institutional investments, such as the implementation of checks-and-balances (to monitor tax spending) and the development of skilled bureaucracies.

II. SECTORAL CONFLICTS AND THE ROLE OF TAXATION ON STATE FORMATION

The paper follows a Schumpeterian view, particularly, seeing “taxation in terms of group conflicts [and] class interests.”²² And in turn, it examines the well-established link between direct taxation and state-making. The crux of the argument is that sectoral conflicts triggered fiscal expansion, fostering in turn state development. This line of argumentation goes in line with Musgrave [1992,

¹⁸Bahamonde [2017a].

¹⁹Bahamonde [2017b].

²⁰Gabriel Ondetti explains in Flores-Macias [2017] that to “[his] knowledge, there is no study that explicitly applies [the] notion [of path dependence] to explain variance in contemporary tax burdens.”

²¹Emphasis in original. See also for a similar approach Ansell and Samuels [2014] and Collier and Collier [2002].

²²Monson and Scheidel [2015, 14]. For an excellent overview of both classic and new fiscal sociology refer to Martin et al. [2009, Ch. 1].

99] who explains that since taxation (especially on incomes) requires such a high degree of state penetration, public finances offer *the* key for a theory of state development.

Indirect taxes not necessarily develop a strong fiscal apparatus.²³ According to Best [1976, 53], “indirect taxes are but substitutes for direct taxes,”²⁴ and hence they are typically administered by weak states.²⁵ Since indirect taxes are easier to levy,²⁶ this kind of revenue is generally considered “unearned income”²⁷ or “easy-to-collect source of revenues.”²⁸ Given the relatively lower costs states have to incur to collect them, indirect taxes—particularly tariffs—have a very low impact on state-building. In fact, when early Latin American states depended heavily on international trade taxes, the state apparatus tended to be less developed.²⁹ Since customs administrations in the region have always been concentrated in a few critical locations, especially ports, tariffs and customs duties did not require an elaborate fiscal structure.³⁰ Instead, direct taxes—and particularly, income taxes—are more likely to produce long-lasting positive externalities on state-building. Since income taxation involves a compulsory transfer from private hands to the government sector for public purposes,³¹ it is harder to collect,³² requiring stronger domestic alliances to sustain these kinds of policies. From a historical standpoint, its introduction “was one of the major events in fiscal history that contributed to the *growth in government* observed during the past 150 years.”³³ Consequently, since taxing incomes involves transforming private income into public property,³⁴ this form of taxation demands the endogenous development of both stronger state institutions and efficient monitoring and enforcement technologies.³⁵

Hechter and Brustein [1980, 1085] 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.”³⁶ I contend that since state centralization affects landowners and industrialists in different ways, both sectors have different preferences towards taxation and state centralization.³⁷ On the one

²³However, see Brewer [1990, 56]. The English state made extensive use of its navy to prevent smuggling and enforce the excise, an indirect tax. The excise employed an important number of state agents and helped to develop skilled state bureaucracies and an efficient fiscal system.

²⁴However, under certain circumstances, indirect taxes are more efficient. Kiser [1994, 291] explains that when the levels of tax variability are high, direct taxation can actually have negative effects, especially when overtaxation is a possibility.

²⁵This view is also supported by Moore [2004a, 14].

²⁶Krasner [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.” See also Flores-Macías in Flores-Macías [2017].

²⁷Moore [2004b, 304].

²⁸Coatsworth and Williamson [2002, 10].

²⁹Campbell [1993, 177].

³⁰Bertola and Ocampo [2012, 132].

³¹Cfr. Raja Chellia, “Trends in Taxation in Developing Countries,” in Migdal [1988, 282].

³²Kurtz [2013, 62].

³³Aidt and Jensen [2009, 171]. Emphasis is mine.

³⁴Musgrave [1992, 98].

³⁵Lieberman [2002, 99].

³⁶Emphasis is mine.

³⁷See Acemoglu and Robinson [2009, 289] and Best [1976, 50].

hand, land fixity increases the risk premium of the landed elite's main asset,³⁸ so they systematically resist taxation. In turn, as capital can be reinvested in nontaxable sectors,³⁹ industrialists' preferences toward taxation are more elastic. These cross-sectoral tensions are most likely to resolve in favor of inter-sectoral cooperation—particularly, implementing the income tax law—when income inequality among the elites is low.⁴⁰ In Latin America, the post-colonial institutional and economical order was designed to give an unfair advantage to the agricultural sector.⁴¹ However, the emergence of a strong industrial class put heavier pressures for higher levels of state centralization and investment in public goods at the local level.⁴² In fact, not only sustained industrial expansion depended on the implementation of the income tax. Beramendi et al. [2016, 18] explain that 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.” But also, lower levels of inter-elite economic inequality implied similar degrees of military capabilities.⁴³ Under these circumstances, war was most likely to exhaust all existent assets without producing positive outcomes for either sector,⁴⁴ putting heavier pressures to reach agreements instead of engaging in armed conflicts. Here I focus on one such agreement, the implementation of the income tax law.

Income taxation was not only important because of the new revenue it collected, however. While Humud (1969, p. 154) explains that the tax generated considerable resources for the Chilean treasury,⁴⁵ it was also important for state consolidation. Not only observing individual economies, but transforming them into public property, fostered state expansion.⁴⁶ This argument goes in line with Besley et al. [2013] who explain that *implementing* the income tax law has been “associated with investments in public administrative structures that support tax collection” in a number of countries, including Chile. Similarly, 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.”⁴⁷ I contend that the acquired institutional knowledge associated with income taxation was transferred to other state institutions via spillovers, augmenting the overall levels of *stateness*.⁴⁸ Levi [1989, 1] explains for

³⁸ Robinson [2006, 512]. However, see Freeman and Quinn [2012].

³⁹ Hirschman [1970]. See Ronald Rogowski in Drake and McCubbins [1998, ch. 4]. However, see Bates and Lien [1985, 15].

⁴⁰ Tani [1966, 157] explains that the absence of “wealth groups” makes passing an income tax law easier.

⁴¹ Bahamonde [2017a].

⁴² Bahamonde [2017b].

⁴³ Boix [2015].

⁴⁴ Richard Salvucci in Uribe-Uran [2001, 48].

⁴⁵ Bowman and Wallerstein [1982, 451-452].

⁴⁶ Moore [2004b, 298].

⁴⁷ Emphasis is mine.

⁴⁸ While emphasizing a different channel, Baskaran and Bigsten [2013] find that fiscal capacities improved levels of governance in 31 sub-Saharan African countries between 1990 and 2005. See also Altunbas and Thornton [2011].

the continental cases that “the history of state revenue production is the history of the evolution of the state.” In the same line, economist Nicholas Kaldor pointed out that the revenue service is the “point of entry.” Once this institution is secured, securing the rest is easier.⁴⁹ In the case of Chile, particularly, 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. Similarly, but for the European cases, Strayer [2005] explains how official state delegations traveled the territory dispensing judicial decisions, fostering state centralization. In turn, Dincecco [2015] explains that states became effective organisms upon centralizing a system of direct taxation and implementing some kind of checks-and-balances system. As explained in section III, the Chilean case met these two conditions. Analytically, the *effectiveness* of income taxation on fiscal capacities increased due to the nature of the implementation of the income tax. Aghion et al. [2004, 566] explain how optimal institutional choices result from political settings where all involved actors “had a voice in the choice of institutions,” essentially contributing to an equilibrium of quasi-voluntary compliance.⁵⁰ In fact, Flores-Macias [2014] finds that Colombian elites were willing to impose higher taxation levels, upon the establishment of an elite-government alliance, fostering closer monitoring levels, particularly regarding public spending. In line with this literature, I find in section III that higher levels of sectoral contestation fostered the incorporation of both elites into the same national project (white boxes in Figure 1). This sectoral alliance, specially regarding the implementation of the income tax, fostered higher levels of tax compliance, and state-building.

III. UNPACKING THE MECHANISMS: CHILE 1850-1950

Historians still debate whether agriculturalists and industrialists comprised two *different* elites. Some claim that this dualism is incorrect.⁵¹ They argue that since landowners also invested in industry,⁵² there was a blurry class division between the mining, banking and agricultural sectors.⁵³ I contend that there are a series of stylized facts that suggest that there was indeed a structural cleavage between the two sectors. Here I explain how there were certain practices that mask the sectoral dualism. For example, it was common that industrialists invested in real estate. However, in

⁴⁹In Brautigam et al. [2008, 15].

⁵⁰Levi [1989].

⁵¹See for example Mamalakis [1976, 125].

⁵²Kirsch [1977, 57, 95] who cites Bauer [2008]. See also 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.” In the same vein, Bauer [2008, 180] argues that “[m]iners and merchants bought haciendas but landowners in turn invested in banks, insurance companies, commercial firms and the incipient industrial sector.”

⁵³Bauer [2008, 30, 44, 94, 108].

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.”⁵⁴ In fact, this practice shows how the credit system was oriented to give unfair advantage to the landed elites.⁵⁵ Similarly, Zeitlin [1984, 174] finds that while there were some instances where there were mixed investments, “the combined ownership of capital and landed property was a distinctive quality of *certain* [elites] actors.”⁵⁶ There were also other instances where miners invested in banking. However, Segall [1953] argues that Chilean bankers, after the crisis of the mining sector around the 1870s, acquired a number of mineral deposits given as collateral years before, again suggesting that the lack of economic dualism is rather apparent. Similarly, 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.”⁵⁷ I contend that the nature of the main factors of production of agriculturalists and industrialists (land v. capital), in addition to their preferences regarding fiscal policy, produced a strong sectoral cleavage. In fact, borrowing from the Lewis model of economic growth, I explain elsewhere that the agricultural sector’s role in the economy is to supply labor to the industrial sector, limiting agriculture’s expansion relative to industry’s growth,⁵⁸ evidencing the lack of incentives for crossed investments.

In all Latin American economies during and right after the colonial period, agriculture was the most important sector.⁵⁹ And by extension, the economic interests of the agricultural elite were the only economic interests represented in politics.⁶⁰ For example, Collier and Collier [2002, 106] argue that initially the “national government was dominated by the central part of the country, with owners of large agricultural holdings playing a predominant role.”⁶¹ Moreover, political institutions and social norms inherited from the colonial period were designed to allocate economic inputs (and hence *growth*) in a way that benefited the landowning class only.⁶² Even though the industrial sector was growing, industrial political elites were kept from participating in politics with the same

⁵⁴Emphases are mine.

⁵⁵Unda [2017, 9] explains that in Mexico the lack of credit had previously been one of the industrial sector’s main obstacles. In fact, industrial elites started to comply with the income tax in exchange of having credit policies more adequate to the industrial sector. Similarly, Mamalakis [1969, 11] develops a theory of sectoral clashes. The leading sector becomes dominant thanks to the interplay between the government, the dominant sector, and the central bank.

⁵⁶Emphasis is mine.

⁵⁷Emphasis is mine.

⁵⁸Bahamonde [2017a].

⁵⁹Keller [1931, 13].

⁶⁰Wright [1975, 45-46]. Mamalakis [1969, 19] refers to this period as the *traditional pattern of government-export sector coalition*.

⁶¹Similarly, 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.

⁶²Bahamonde [2017a].

privileges and conditions the landowning political elites had. Consequently, the opportunity costs of implementing policies designed to enhance the agricultural sector were low. Zeitlin [1984, 13] argues that “landowners controlled both the vote and the labor power of the agrarian tenants (*inquilinos*) and dependent peasants (*minifundistas*), and this was the *sine qua non* of their continuing political hegemony.” In Congress, and the presidency itself, landowners were the single most important group,⁶³ leaving the modern sector heavily under-represented.⁶⁴ Consequently, fiscal pressures in favor of agricultural taxes were minimal compared with mining taxes,⁶⁵ leaving the agricultural sector systematically—and substantially—undertaxed relative to other sectors.⁶⁶ Historians explain that “[i]n those areas where the government did interfere in the countryside, the effect was to strengthen the position of the landowning class.”⁶⁷ For example, the little public infrastructure that existed benefited the agricultural sector.⁶⁸

Both economic sectors were similarly developed but only agriculturalists had access to fair political representation. This asymmetry led these two “antagonistic elites”⁶⁹ to confront in the civil wars of 1851-1859 and 1891 between a “large landed property [elite against a] productive capital [elite].”⁷⁰ President Balmaceda’s overthrowing explains the sectoral nature of these conflicts. On the one hand, he was mainly supported by the landed elites, but later overthrown in 1891 by a mainly industrial/mining coalition.⁷¹ While his agenda on “industrial” infrastructure (mainly roads and railroads) benefited mostly agricultural areas,⁷² his attitude towards the banking sector (closely linked to the mining sector)⁷³ was “all but confiscatory.”⁷⁴ On the other hand, however, he failed to secure a coalition with his own sector. Zeitlin [1984, 127] explains that the “decline of wheat exports [...] came precisely when a vast new market for agriculture was growing in the nitrate territory.” As the agricultural sector supplied the industrial areas with foodstuff, it simultaneously increased the sectoral dependence of the agricultural elites on the industrial sector, forcing the

⁶³Bauer [2008, 45].

⁶⁴As Baland and Robinson [2008, 1748] argue, “[c]ongressional representation was heavily weighted in favor of rural districts.”

⁶⁵Mining was one of the first manifestations of industrial activity. For example, while an agricultural income tax was imposed, it was weak and abolished after the civil war of 1891.

⁶⁶Best [1976, 56]. Bauer [2008, 81] provides a very plausible explanation for why the agricultural sector was “structurally” protected against taxation. As he explains, “[t]he availability of an easily accountable source of public revenue—bags of nitrate or bars of copper—meant that any need for the Chilean government to intrude into the affairs of landowners was reduced [...] the state kept its political hands off the countryside until the overwhelming urban demands for more food and political support in the 1960s.” Zeitlin [1984, 38] also points out that “public revenues came almost exclusively from taxes on mining and its exports.”

⁶⁷Bauer [2008, 118].

⁶⁸Rippy [1971], Marichal [1989], Zeitlin [1984], Bauer [2008].

⁶⁹Keller [1931, 37-38].

⁷⁰Zeitlin [1984, 23].

⁷¹Zeitlin [1984, 186].

⁷²Zeitlin [1984, 124].

⁷³Zeitlin [1984, 118].

⁷⁴Zeitlin [1984, 175].

“landed proprietors [to] become dependent to a considerable extent on the continuing prosperity of the major nitrate capitalists.”⁷⁵ While it would be inaccurate to say that Balmaceda was *completely* supported by agriculturalists and *completely* opposed by industrialists, this example illustrates how a failed inter-sectoral alliance, and a biased strategy regarding the provision of public goods against industrialists, led these two groups to a series of military conflicts.

Additionally, lower levels of inter-elite inequality gave both elites access to similar military resources. While *Balmacedistas* managed to secure the support of the army, *congresistas* (the anti-Balmaceda group) managed to gather support of the navy. Ultimately, the conflict left a permanent scar in the Chilean society. While the civil war lasted only nine months, it took 10,000 lives (out of a total population of 3 million people), and cost more than \$ 100 million,⁷⁶ a significant amount for a small country. This legacy materialized in an inefficient, but politically stable political system for several years. In part, the immobilism was due to the fact that the political reforms that gave way to the “parliamentary” period, came out from inter-elite alliances.⁷⁷ However, the intention to avoid more violence (at least among the elites) tended to persist. For instance, while all “ministers, counselors of state, members of the constituent congress [,] municipal officials, provincial governors and intendants, members of the judiciary and even the lowest functionaries and ordinary employees of Balmaceda’s government were investigated [or] brought to trial,”⁷⁸ there were a number of amnesties issued. Similarly, there were a number of *aborted* coups in 1907, 1912, 1915 and 1919.⁷⁹ I identify a third additional factor. War was more likely to exhaust all existent assets without producing positive outcomes for either sector, putting pressures for a sectoral compromise.⁸⁰ Three institutional components were considered: an income tax, industrial protectionism, and equal access to the state. Here I focus on the first component.⁸¹ The faster the industrial growth, the higher the pressures to impose a tax to capture increasing industrial incomes. This is in line with **Besley and Persson** [2011, 59] who argue that “investing in fiscal capacity becomes more attractive [...] when wages or incomes [...] are higher.”⁸² **Beramendi et al.** [2016] also find that investments in fiscal capacities are conditional on the expansion of the industrial sector.

⁷⁵Zeitlin [1984, 129].

⁷⁶Zeitlin [1984, 86].

⁷⁷Collier and Collier [2002, 108].

⁷⁸Zeitlin [1984, 87].

⁷⁹Collier and Collier [2002, 109].

⁸⁰Similarly, **Geddes** [1991] argues that competition between two rival parties of about the same size creates clearer incentives to invest in political institutions.

⁸¹The SOFOFA pursued a very strong protectionist agenda. **Sokoloff and Zolt** [2007, 122] explain that the expansion of “manufacturing production [...] helped to nurture the development of a powerful constituency for higher tariffs.” In fact, **Lederman** [2005, 53] finds that in Chile the timing of protectionist and income taxation cycles matches, suggesting the plausibility of the sectoral bargains that took place around in the 1920’s between the two elites. See for a similar view **Haber** [2005, 18].

⁸²Similarly, see **Campbell and Allen** [1994, 647] who explain that “economic development should be directly related to individual and corporate income tax rates.”

The income tax law was passed in Chile in the middle of big political instability. In 1920, President Alessandri obtained a very close victory against Luis Barros Borgoño,⁸³ who was supported by “the dominant political and landed aristocracy.”⁸⁴ Governability was seriously compromised as the election let the senate in control of the landowning class, who roundly opposed tax reforms.⁸⁵ Particularly, the opposition had “serious differences [...] over [Alessandri’s] legislative program, especially in connection with the proposed income tax.”⁸⁶ In 1924, the income tax law was passed. As others explain, the non-agricultural “accepted taxation, *while demanding state services and expecting to influence how tax revenues were spent.*”⁸⁷ The law taxed 2% on professional income above 2,400 pesos, 3.5% on net profits in industry and commerce above the same sum, 5% on income from mining, and 9% per cent on incomes from real estate.⁸⁸ Humud (1969, p. 154) explains that the income tax generated considerable resources, and that the tax in “1930 [it] would become second only to import duties in size.”⁸⁹

The Chilean case suggests a number of hypotheses. First, there existed a structural economic cleavage between the industrial and agricultural sectors. Second, agricultural political elites implemented policies that played in their own favor, without necessarily considering industrial preferences. Third, the rising of the industrial class challenged the *status quo* promoted by the landowning group. Fourth, given their similar degree of economic and military resources, both elites compromised the income tax which was beneficial for both the industrial and agricultural classes. Next section is an attempt to generalize this argument in a quantitative manner. Particularly, it tests the third and fourth hypotheses combined, that is, the rising of a strong industrial sector—characterized by higher levels of sectoral conflicts—accelerated the implementation of the income tax law. In reverse, uncontested polities did not have the endogenous incentives to invest in fiscal institutions, which are key for state development.

IV. ECONOMETRIC ANALYSES

Following the economic development typology suggested in Mahoney [2010, 5], nine polities were selected. Three “higher level” countries (Argentina, Chile and Venezuela), three “intermediate level” countries (Mexico, Colombia and Perú), and three “lower level” countries (Ecuador, Nicaragua and Guatemala). I proxy sectoral conflicts, and specifically the degree in which the industrial elites

⁸³Collier [1999, 111].

⁸⁴Haring [1931, 2].

⁸⁵Haring [1931, 5].

⁸⁶Haring [1931, 3].

⁸⁷Carmenza Gallo, in Brautigam et al. [2008, 165]. Emphases are mine. She refers specifically to the mining elites.

⁸⁸James [1924, 552].

⁸⁹Bowman and Wallerstein [1982, 451-452].

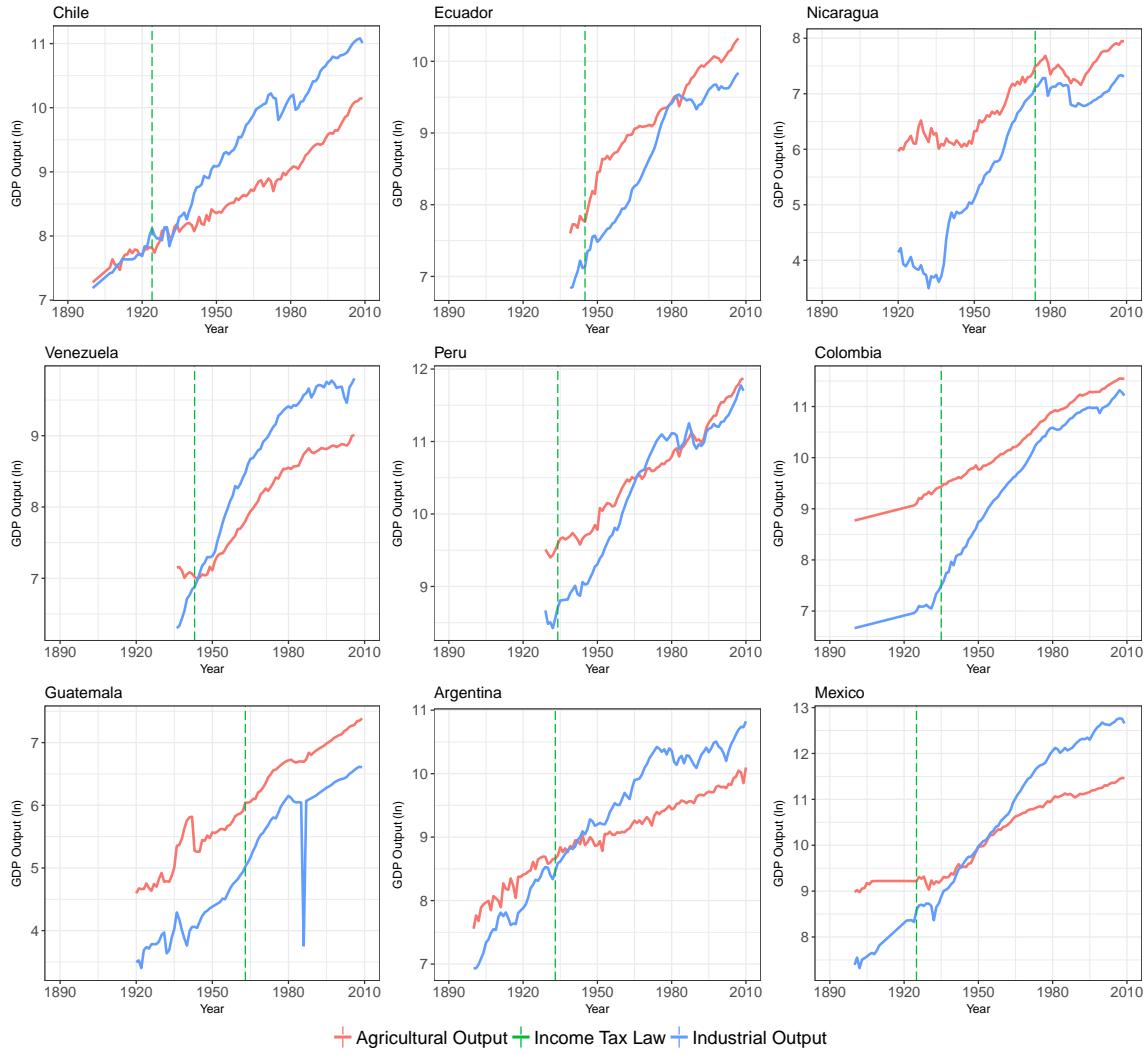


Figure 2: Industrial and Agricultural Outputs, and The Passage of the Income Tax Law

challenged incumbent landowners, by using industrial and agricultural sectoral growth rates as presented in the MOxLAD data.⁹⁰ The dataset spans from 1900 to (potentially) 2010.⁹¹ According to Astorga et al. [2005, 790], these data provide extended comparable sectoral value-added series in constant purchasing power parity prices.⁹² Using secondary information, Table 1 states *when* the income tax was implemented, which was the specific law, and its corresponding source(s). Figure 2 shows both sectoral outputs (independent variables) and the year when the income tax law was passed (dependent variable). Since population has been associated with the probability elites expand the franchise,⁹³ and consequently the tax base, I include total country-year population as a control

variable.

When countries implement the tax, that is, how early or late they do so, is a substantively important quantity of interest. From an historical institutionalist perspective, early implementers were able to crystallize a series of inter-elite compromises during the formative years of the state. In these cases, the state was built *in light* of taxation. Late implementers, however, did not trigger these inter-elite compromises, reproducing the legacies of post-colonial institutions, and compromising the expansion of the state.

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

Table 1: Sample, Data Available and Year the Income Tax was Implemented

Before estimate the models, it is important to rule out the possibility that income taxation and sectoral development, are not linked through a spurious, time-dependent relationship. In other words, the occurrence of the outcome of interest (income taxation), should not be directly related to time itself, but to the rise of the industrial elite. Within the framework of survival analyses, Figure 3 shows the failure rate of the sample average country of implementing the income tax, if

⁹⁰^aThese 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.

⁹¹As I explain later, I test this argument within the duration model approach. Since countries are censored once they implement the income tax law, they leave the sample (potentially) before 2010.

⁹²Using a similar strategy, Thies [2005] also uses data on taxation and compare those data between cross sections.

⁹³Engerman and Sokoloff [2005, 892-893].

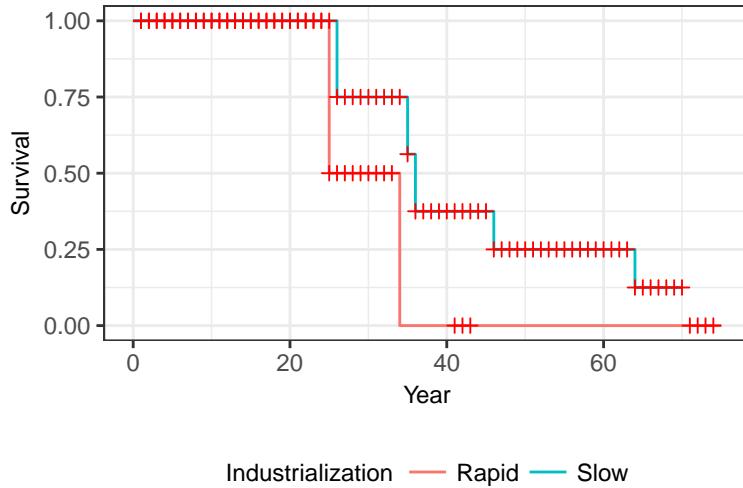


Figure 3: Kaplan-Meier Curves: Size of the Industrial Sector and the Accelerated Rate of the Imposition of Income Tax Law

industrial development had increased/decreased by half (rapid/slow).⁹⁴ This preliminary analysis clearly shows that the implementation of the income tax law is largely accelerated when the size of the industrial sector increases, and that this relationship does not depend directly on time.

Table 2 shows 5 models.⁹⁵ Following Aidt and Jensen [2009], Model 1 computes the lagged 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.⁹⁶ Countries drop out of the sample when they adopt the income tax. Model 2 is also a Cox regression, but with lagged logged variables. By including time-transformed variables, in the form of a lagged dependent variable (to account for partial adjustment of behavior)⁹⁷ or “the use of the natural log transformation [to capture] different forms (or “shapes”) of the baseline hazard,”⁹⁸ Models 1 and 2 are especially well-equipped to account for possible time dependency. Model 3 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.⁹⁹ This method is especially well suited to analyze

⁹⁴“Failure” in this case means “implementing” the income tax law.

⁹⁵All tables were produced using the `texreg` package (Leifeld [2013]). All Cox models were computed using the `survival` R package (Therneau [2015]). The GEE logistic regression was computed using the `geepack` package (Hojsgaard et al. [2016]). This paper was written in L^AT_EX using the dynamic report R package `knitr` (Xie [2016]), for fully replicable research. The simulations were performed using the `simPH` R package (Gandrud [2015]).

⁹⁶I 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.

⁹⁷Wawro [2002].

⁹⁸Box-Steffensmeier and Jones [2004, 75].

⁹⁹Zorn [2006, 322].

binary data.¹⁰⁰ 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,”¹⁰¹ 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.¹⁰² From a substantive standpoint, GEE models provide an estimated marginal mean, or the *weighted average* of all cluster-specific effects (or conditional means). Model 4 is a conditional logit (or “fixed effects” model). One important advantage of this strategy is the ability to account for country-specific effects. For example, fiscal development could be a function of country-specific prior state-building capacities.¹⁰³ A number of scholars rightly argue that post-colonial state capacities are in part a function of pre-colonial state-capacities.¹⁰⁴ Fixed-effects should be able to account for these, and other unobserved or hard-to-measure covariates, which if left unaccounted for, would introduce omitted variable biases.¹⁰⁵ Model 5 accounts for possible spatial-temporal dependence.¹⁰⁶ Given that most countries in the sample are contiguous neighbors, it is reasonable to expect a “domino” effect.¹⁰⁷ Theoretically, being the first country in implementing the income tax, might not require the same level of domestic “effort” than being the last one. Early-implementers might not have prior experience, being harder for them to pass the law. To account for this possible spatial-temporal dependence, a cumulative count of countries which have implemented the law at time t was included.¹⁰⁸

All models suggest that the rise of a strong industrial sector largely accelerated the implementation of the income tax law. Moreover, a strong agricultural sector not only has zero impact on fiscal development, but a negative one (models 1, 3 and 4). Both pooled results in model 3 and model 4 give the same results. I do not find that there was spatial-temporal dependence (model 5).

Using the estimations from Model 1 in Table 2, I follow Gandlerud [2015] and King et al. [2000], and

¹⁰⁰Hanley et al. [2003].

¹⁰¹Carlin 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.

¹⁰²Hardin 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 2.

¹⁰³I thank Matthias von Hau for this suggestion.

¹⁰⁴Wimmer [2015, 10], Mahoney [2010] and Lange et al. [2006, 1426].

¹⁰⁵Angrist and Pischke [2008].

¹⁰⁶I thank both Christopher Zorn and David Darmofal for this suggestion.

¹⁰⁷For a more detailed spatial take on fiscal expansion, see Thies et al. [2016].

¹⁰⁸I clustered the standard errors at the counting variable level. Clustering by the counting variable allows me to cluster by early or late implementers.

	(1) Cox (1 lag)	(2) Cox (1 lag, ln)	(3) Logit GEE	(4) Conditional Logit (FE)	(5) Spatial Dependence
Manufacture Output _{t-1}	4.923** (1.851)				
Agricultural Output _{t-1}	-4.208* (1.638)				
Total Population	0.000** (0.000)				
Manufacture Output _{t-1} (ln)		7.685* (3.333)			
Agricultural Output _{t-1} (ln)		-6.971* (3.227)			
Total Population (ln)		5.059* (2.228)	1.259 (1.052)	1.030** (0.391)	4.676* (2.682)
Manufacture Output (ln)			1.924*** (0.514)	0.688*** (0.143)	7.148* (4.815)
Agricultural Output (ln)			-1.596* (0.603)	-0.941*** (0.281)	-6.465* (4.636)
AIC	12.796	10.894	4505.538	11.056	
R ²	0.059	0.068	0.341	0.065	
Max. F ²	0.085	0.088	0.397	0.085	
Num. events	9	9	610	9	
Num. obs.	241	232	842	241	
Missing	0	0	0	0	
PH test	0.388	0.877	9	0.667	
Num. clust.					

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

Table 2: Sectoral Origins of Income Taxation: Income Tax Law and Industrial Development

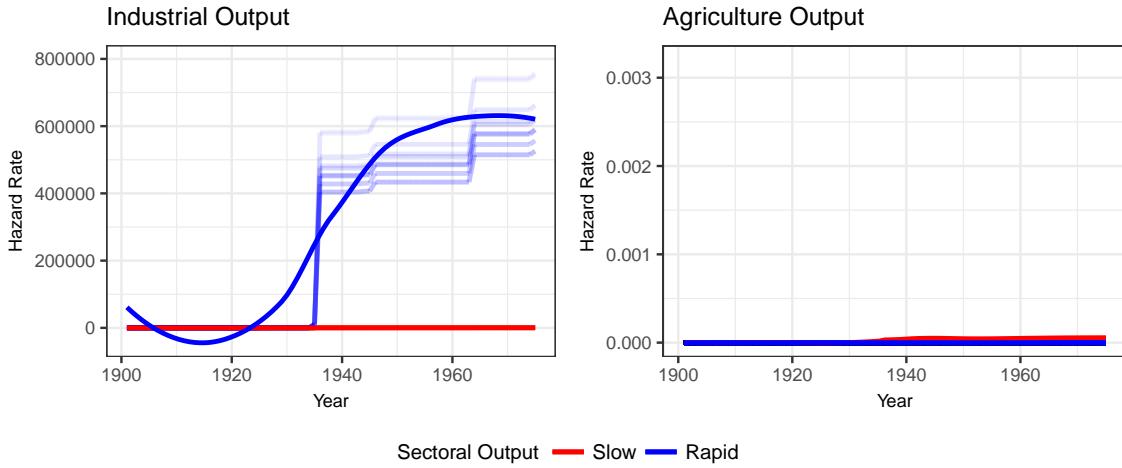


Figure 4: Hazard Rates of Implementing the Income Tax Law

in Figure 4, simulate 5000 times the Hazard Rate of implementing the income tax law conditional on industrial and agricultural growth rates.¹⁰⁹ While the outcome of interest does *not* depend *directly* on time,¹¹⁰ sectoral outputs do grow in time.¹¹¹ Consequently, it will be necessary to account for this tendency by allowing estimations to vary with time as well.¹¹² Since the Hazard Rate “is the probability that a case will fail at time t ,”¹¹³ I take advantage of this quantity of interest which allows some dependency on both time *and* the covariates.¹¹⁴ Figure 4 strongly suggest that the faster the agricultural sector develops, the less likely the implementation of the income tax. This relationship does *not* change at later stages of development, suggesting that polities with a strong agricultural elite are not associated with fiscal development. However, rapid industrial development is associated with the acceleration of the implementation of the income tax law. In sum, *the stronger the industrial sector, the faster the tax is implemented.*

In sum, the quantitative analyses of a sample of Latin American countries, suggest that higher levels of sectoral competition, characterized by the emergence of the industrial sector, are associated with earlier times of implementation of the income tax law. In turn, the Chilean example illustrates the causal mechanisms at work. The case particularly explains why industrial elites put heavier pressures in favor of direct taxation, while the fiscal sociology approach provides an analytical framework to explaining why and how direct taxation fostered state centralization. Both types

¹⁰⁹Box-Steffensmeier and Jones [2004, 15] explain that the Hazard Rate is the most common quantity of interest analysts focus on. Figure 4 shows 90% confidence intervals.

¹¹⁰Please refer to Figure 3.

¹¹¹Please refer to Figure 2.

¹¹²The economics literature refers to these kinds of time series “integrated” or I(1) processes.

¹¹³Licht [2011, 231].

¹¹⁴Box-Steffensmeier and Jones [2004, 15].

of analyses combined provide a theory of state formation centered around the idea of the role of sectoral contestation and state formation.

V. DISCUSSION: SLOW INDUSTRIAL GROWTH AND LACK OF CONTESTATION

Historically, agriculturalists were a hegemonic group protected by practices inherited from institutions originated in colonial times. These norms survived due to institutional inertia, perpetuating their advantaged position. However, the emergence of a strong industrial elite altered the inter-sectoral balance of political power, making unsustainable the political monopoly run by the landed elites. Given the initial advantage of the landed elites, the emergence of the industrial sector reduced the levels of inter-sectoral inequality, in turn generating political, economic and military threats to agricultural incumbents. Moreover, low inequality also increased the opportunity costs of conflict, putting pressures for inter-elite compromises.

The data analyses suggested that faster industrial growth accelerated the hazard of implementing the income tax. I interpreted the Chilean case through the lenses of the fiscal sociology paradigm. Leveraging historical evidence, I find that industrial elites accepted to be income taxed by agriculturalist incumbents in exchange of having access to state politics. Importantly, all these elite compromises took place during the formative years of the Chilean state, and during a period of structural indetermination, where no elite had a clear economic/military/political advantage, fostering the incorporation of all major economic elites into the same national project. When the income tax was implemented under politically contested circumstances, this institution expanded the overall state capacities by crystallizing a series of reforms, dismantling the old institutional order inherited since colonial times. Given the initial advantage of the landed elites, the emergence of a strong industrial sector increased levels of sectoral contestation. Countries with low levels of state-capacities did eventually implement the tax. However, later implementation had to do more with exogenous forces, leaving unaltered the backwards institutional order inherited since colonial times.

Both the argument, and the empirical findings, are situated within the broader literature on political and economic development, particularly within the fiscal sociology paradigm, emphasizing how fiscal development fosters state-making. Concretely, this paradigm proportionates a theory of state-building as it links the mechanics between the state-led effort of taxing incomes, and the expansion of other state services. Future research should explore more avenues of fiscal expansion, emphasizing domestic channels of political development, particularly considering different types of bargaining dynamics between the agricultural and industrial elites. To the best of my knowledge,

Beramendi et al. [2016] and this paper, are among the few of such accounts.¹¹⁵

¹¹⁵In p. 19, they argue that their “paper is among the first to systematically establish that fiscal development may take place even in the absence of interstate military competition and warfare.”

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Aiming Right at You: Group v. Individual Clientelistic Targeting in Brazil

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July 4, 2017

Abstract

Do parties target individuals or groups? This is a question fundamental to understanding clientelism, yet the literature does not offer an answer. This paper argues that depending on certain conditions, brokers target individuals when they are identifiable and groups when brokers need to rely on the spillover effects of clientelism. Both identifiability and spillovers depend on individual poverty, group poverty and political competition. Though the theory I outline focuses on targeting, the paper also argues that structural factors, such as the density of the poor, should be considered in the vote-buying literature. Structural factors are one of the few observables upon which brokers can base their decision regarding where to invest in clientelism. Using survey data from Brazil, the paper exploits variations in personal incomes within contexts of differing levels of poverty. I find that political parties engage in segmented or ad-hoc strategies, targeting individuals when identifiability is high, and groups when there are economies of scale. Importantly, non-poor individuals can also be offered clientelism.

Please consider downloading the last version of the paper [here](#).

*I'm thankful to Robert Kaufman, Daniel Kelemen, Richard Lau, Paul Poast, Geoffrey Wallace, Douglas Jones, Ezequiel González Ocantos, Juan Pablo Luna, Jorge Bravo, Eric Davis, Adam Cohen, Edwin Camp, Luciana Oliveira Ramos, Giancarlo Visconti, William Young and Johannes Karreth. I thank participants of the Latin American Studies Association 2014 Conference, The Southern Political Science Association 2015 meeting, the Western Political Science Association 2015 meeting and the 2014 Graduate Conference at the Political Science Dept., Rutgers U. This work was partially funded by the Center for Latin American Studies at Rutgers University. I am thankful to the School of Arts and Sciences and the Department of Political Science for their travel grants.

There is no agreement on when, how and why parties choose to aim clientelistic practices at individuals or groups. The distributive politics and vote-buying literatures have traditionally pursued one of two approaches. On the one hand, the former has mostly focused on group targeting, usually districts or provinces.¹ In this literature, incumbent parties deliver public-sector jobs or construction projects contingent on the support of *groups* of people. On the other hand, the latter has typically focused on *individuals* and their characteristics, such as their socio-economic or electoral profiles. However, it is not clear when clientelistic brokers use one or the other strategy, and why. Moreover, the decision to investigate group-based and/or individual-based targeting seems to be attributable to distinct research designs and agendas, rather than theory. For example, ethnographers most generally focus on individuals, while others have traditionally focused on groups.² What is most concerning, however, is that it is relatively assumed or implied that individual and group clientelistic targeting strategies are interchangeable, when they are clearly not. Groups and individuals have different reasons and mechanisms to defect or cooperate and vote for the incumbent. They also face different costs and coordination dilemmas. In this paper I systematize the process of deciding who to target by arguing it is a function of three mechanisms: individuals' discount factors explained by income levels, the incentives of clientelistic brokers to rely on spillover effects caused by the nesting structure of individuals (i.e. whether individuals are nested in poor or non-poor contexts), and brokers' incentives to engage in clientelism explained by higher electoral pressures and political competition. Given the nested structure of the argument and the empirics, I am able to disentangle the effects of "being poor" and "living in a poor area" on clientelistic targeting. I share Carlin and Moseley [2015, 14]'s diagnosis, in that "[e]xisting research looks almost *exclusively* at individuals' socio-economic and, specially, electoral profile [and] [y]et our knowledge of who parties target remains incomplete."³ The paper seeks to contribute to the vote-buying literature by incorporating structural factors and individual factors of clientelism in the same theory. Another important implication of the argument is that I am able to explain why clientelistic parties target their resources to both poor *and* non-poor individuals, an empirical regularity that to the best of my knowledge has been unexplored so far (see Figure 1).

Perhaps the area in which there is the most agreement among scholars is on the relationship between poverty and vote-buying.⁴ For example, Brusco et al. [2004], Stokes et al. [2013] and

¹See Dixit and Londregan [1996], Khemani [2015] and Calvo and Murillo [2004].

²See for example Scott [1972], Auyero [2000], Szwarcberg [2013] and Weitz-Shapiro [2012] and Gonzalez-Ocantos et al. [2012]. I thank Ezequiel González Ocantos for this suggestion.

³Emphasis is mine.

⁴See Calvo and Murillo [2004], Weitz-Shapiro [2012], Kitschelt [2000] and Kitschelt and Altamirano in Carlin et al. [2015, ch. 10]. Following Brusco et al. [2004, 67], I define vote-buying as "the proffering to voters of cash or (more commonly) minor consumption goods by political parties, in office or in opposition, in exchange for the recipient's vote." In the rest of this note, I use clientelism and vote-buying interchangeably.

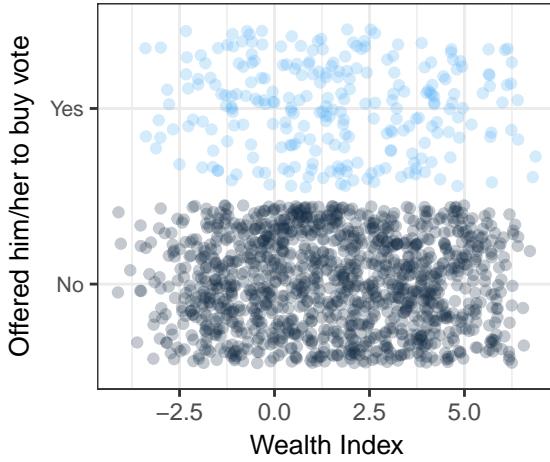


Figure 1: Individual Wealth and Vote-Buying in Brazil

Nazareno et al. [2008] explain that since the poor derive more utility from immediate transfers than the risky returns associated with future policy packages, clientelistic political parties *only* target the poor. In fact, Weitz-Shapiro [2014, 12] explains that “[a]lmost universally, scholars of clientelism treat and analyze [this] practice as an exchange between politicians and their poor clients.”⁵ However, this canonical predictor has recently been challenged. Szwarcberg [2013] “challenges the assumption [that brokers] with access to material benefits will always distribute goods to low-income voters in exchange for electoral support,” while Gonzalez-Ocantos et al. [2012] and Holland and Palmer-Rubin [2015] found that income (measured at the individual level) had little or no effect on vote-buying. In fact, the Brazilian case, in Figure 1, also shows that non-poor individuals do receive clientelistic offerings. *Why would brokers target non-poor individuals?* And relatedly, *Why is contemporary scholarly work reporting null findings for poverty, traditionally the most important predictor of vote-buying?* I present an argument where individual income *on its own* is not relevant. What matters is how *noticeable* individuals are. For example, wealthier individuals living in poorer contexts are very identifiable. In low-information environments, brokers use these observables to reduce their costs.

One often-considered contextual factor in the literature is the size of the community where clientelism takes place. Large-sized communities impose principal-agent problems. If an individual’s vote is bought, he or she may be tempted to accept the benefit and then vote for his or her preferred candidate anyway, and this incentive increases linearly with the size of the community where the individual is nested. Several scholars have then argued that brokers prefer smaller groups because

⁵Emphasis is mine.

individuals nested in small communities should defect less.⁶ One problem, however, is that it is not clear how political parties gain enough electoral returns from such an expensive strategy. Vote-buying is an already expensive strategy,⁷ making one-to-one vote-buying even more so.⁸ Therefore, the theoretical challenge is that this method seems to be extremely expensive given the relatively small number of votes brokers can secure. Moreover, the cost of this strategy increases linearly with the size of the targeted population. The brokers' production-possibility frontier cannot be shifted upwards either, i.e. monitoring capacities are bounded. Simply put, at some point party machines run out of brokers. It is hard to conceive that brokers will stop being clientelistic when the size of the population is large, specially when political competition is high. In my argument, when brokers need to secure large amounts of electoral support, specially when political competition is high, they turn to group targeting strategies relying on the spillover effects of clientelism. In these contexts, clientelism mobilizes electoral support from *actual* and *potential* beneficiaries, a mechanism that I explain later on in the paper.

Civic associations might help solve some of the challenges large-sized groups present to brokers. As low-information environments prevent brokers from really observing individual electoral behavior,⁹ they usually resort to alternative methods that allow them to make safer inferences. For example, Schaffer and Baker [2015] explain that clientelism is "socially multiplied" as party machines target individuals "who are opinion-leading epicenters" in informal situations or "partisan networks,"¹⁰ in what has been called "organization buying."¹¹ And if parties buy "turnout,"¹² then they will most probably target associations too, as "citizens immersed in clientelistic networks [...] have a higher probability of voting than the rest."¹³ The positive relationship between group-membership and clientelism is intuitive. However, what has not been explored yet is whether clientelism is explained by association membership itself, or by the fact that poor individuals usually address their problems as an organized community since otherwise it would be too costly to solve them outside of the group. If this is the case, group *membership* should be spuriously related to clientelism. While I find that

⁶See for an overview Stokes [2005, 323], Brusco et al. [2004], Kitschelt and Wilkinson [2006, 10] and Magaloni [2008, 67]. Rueda [2016] finds support for this hypothesis in Colombia. Similarly, see Bratton [2008] for Nigeria and Gingerich and Medina [2013, 456] for Brazil.

⁷Zarazaga [2014, 35].

⁸For example, Stokes [2005] argues that brokers develop skills that allow them to infer whether individual clients in small-sized communities voted for their party by *looking at them in the eyes*. For the Brazilian case, similar ethnographic evidence is suggested in Gay [1993, 1998].

⁹Zarazaga [2014, 35].

¹⁰Calvo and Murillo [2013].

¹¹Stokes et al. [2013, 250-251]. Holland and Palmer-Rubin [2015, 16] explain that when "parties lack their own brokerage networks [they seek] to capitalize on organizational networks instead." Similarly, Rueda [2015, 13] argues that parties tend to target very specific civic associations of "seniors and associations of single mothers, organizing trips to recreational centers outside the city where all their expenses are covered." *Paradoxically*, the stronger the civic society, i.e. the more organized it is, the more clientelism.

¹²Nichter [2008].

¹³Carreras and Castaneda-Angarita [2014, 7].

group membership does have a positive effect on clientelism, I find that the density of the poor in a given area has even more explanatory power.

In an important paper, Weitz-Shapiro [2012] finds that in several Argentine municipalities, higher levels of political competition mixed and low socioeconomic indicators led to more clientelism. In her paper losses are conceptualized in terms of “moral costs.”¹⁴ Evidence for these types of costs have been presented in the literature very recently. For example, Carlin and Moseley [2015] argue that citizens endowed with more democratic values feel more “moral repugnance” to clientelism, Vicente [2014] explains that vote-buying practices have an “immoral/illegal connotation,” and Gonzalez-Ocantos et al. [2012] find that individuals wanting to avoid social stigma usually do not give truthful answers when asked directly about clientelism. However, it is not clear if individuals who benefit from vote-buying really *understand* these kinds of ‘costs.’ In fact, Gonzalez-Ocantos et al. [2014] find that while the concrete benefits obtained through vote-buying are generally well understood, “the abstract societal costs of such exchanges are often distant from the every-day world in which clientelistic relationships are formed.” Individuals then might not really understand that clientelism is bad for democracy, or something to be ashamed of. Also, individuals with democratic values are also the ones with higher incomes, precisely the ones that are not supposed to receive clientelistic offerings. Finally, given that clientelism usually satisfies immediate material needs, clientelism might very well counterweight any other cost, moral or otherwise. In other words, clientelism might be worth the ‘shame’ or ‘repugnance.’ I argue that political competition rises the incentives to capture more votes in a way that is affordable for brokers. When political competition is high, clientelism will be higher in contexts where poor individuals live in poor economic contests, suggesting that brokers rely on the economies of scale and spillover effects clientelism provides.

WHEN DO PARTIES TARGET INDIVIDUALS AND WHEN GROUPS?

I argue that brokers will have incentives to engage in individual targeting when targets are easier to *identify*. Identifiability not only helps brokers to keep targeted individuals electorally accountable, but also to reduce the net costs of clientelism. Whereas individual targeting is the safest bet a broker can make, it is also the most expensive one as it requires brokers to have sustained close relationships with clients. In the framework I propose the capacity brokers have to identify potential clients does not necessarily come from third-party sources (associations), but from a few observables brokers have at their disposition. In this paper I focus on how *noticeable* individuals are in their respective

¹⁴Weitz-Shapiro [2012] argues that non-poor individuals are more likely to condemn clientelism “due to self-interest or because of *moral concern[s]*” (emphasis is mine). That being said, ‘self-interest’ refers to the idea that what is being distributed through clientelism is *discounted* from the pool of resources theoretically available to be spent on policy packages. And that *is* an economic cost.

contexts. Should brokers engage in individual targeting, they would rather visit highly noticeable *poor* households in largely *non-poor* neighborhoods. As these households stand out in these contexts, it is easy for brokers to notice whether they need construction materials, whether there are wakes to which they could contribute flowers or birthday parties to which they could bring cakes. Poor households need not be close to each other, they just need to be *visible* enough for brokers to detect their needs. Income alone does not play an independent role. What is important is how individual incomes interact with their respective poverty context, making individuals more or less identifiable. Individuals will be more noticeable when non-poor individuals are nested in poor areas (quadrant 1) and when poor individuals are nested in non-poor areas (quadrant 4) in [Table 1](#).

	Non-Poor Individuals	Poor Individuals
High Competition	Poor Areas, identifiable, individual targeting	Poor Areas, spillover effects, group targeting, cheap vote-buying
Low Competition	Non-Poor Areas, group targeting, expensive vote-buying, lack of checks and balances, embezzlement	Non-Poor Areas, identifiable, individual targeting

Table 1: *Strategy Set: Group v. Individual Targeting*

When poor individuals are nested in poor areas, or vice-versa, individual targeting is no longer efficient. Since individuals are masked by their environments, identifiability is hard to achieve, increasing the cost of this strategy. In these circumstances, depicted in quadrants 2 and 3 in [Table 1](#), group targeting is more efficient as it relies on the *spillover* effects provided by larger concentrations of individuals. Group targeting works because it also mobilizes electoral support from *potential* clients, that is, those who have not received benefits yet. [Auyero \[2000, 65\]](#) describes the case of *Alfonsina* in Argentina. *Alfonsina* was part of the brokers' inner circle and received a job as a cleaning lady in a public school. As the broker explained to her before getting the job, *Alfonsina* had to be *patient* because as a member of 'the circle,' she was in the pool of potential beneficiaries; it was only a "matter of time" until she could get the job. Building on this intuition, my argument presents two ideal types: *actual* and *potential* beneficiaries. The former receive particularistic benefits "today" and vote for the broker's candidate "tomorrow," while the latter do not receive benefits today (in the expectation of receiving them in the future) but *still* vote for the broker's candidate. Actual beneficiaries want to remain actual beneficiaries; thus, they keep supporting the broker's candidate. Potential beneficiaries want to become actual beneficiaries, but are uncertain when that might happen; as a result, they keep supporting the broker's candidate. This mechanism requires the broker's ability to not allow the transaction costs of switching strategies to be lower

than what it costs clients to wait to be benefited. In other words, brokers need to take care of their reputation and deliver benefits. Zarazaga [2014, 14] finds that *brokers and voters' interests are aligned. Since the flow of resources to voters is dependent on their brokers' electoral success, if the broker loses the election and is replaced, clients do not know what/if the new broker will get them benefits. A new broker may access to fewer resources or choose to distribute them to other people, and brokers often remind voters about this.* Hence, no matter what the type is, both of them keep voting for the broker's party. Given that the poor are risk-averse, potential beneficiaries are better-off waiting (and voting for the broker's party) than defecting. In the same vein but in a slightly different subject, Magaloni [2008, 20] explains that in non-democratic contexts voters have incentives to keep voting for the incumbent government, *even when they oppose it.*¹⁵ Hence, the cost of switching brokers (or defecting) is very high since it also involves building from scratch relationships of confidence with the new broker. Also reputation costs keep clients disciplined, and brokers exploit these self-enforced compliance dynamics. Vote-buying is also targeted to non-poor groups individuals nested in poor groups, as in quadrant 3. Though vote-buying has decreasing returns to scale in non-poor individuals,¹⁶ low levels of political contestation give local politicians more “room to move,” allowing them to divert local resources into more expensive means of targeting (embezzlement). This situation is sustained by the very low levels of political opposition.

CASE SELECTION, RESEARCH DESIGN AND DATA ANALYSES

This paper tests the effects of individual income, the effects of being nested in *communities* with different poverty structures (a variable which I call **density of the poor**), and the effect of being exposed to different levels of political competition, on receiving clientelism. Brazil is a good case because its poverty structure is such that it is possible to find low-income individuals nested in non-poor areas (and vice versa). This case is also interesting from an institutional perspective. The Brazilian electoral system *incentivizes* clientelism. Several factors such as multimember districts with open lists and the institution of the *candidato nato*,¹⁷ “clearly [makes] Brazil one of the most personalistic systems of democratic governance.”¹⁸ In fact, Gingerich [2014, 290] finds that vote-buying drastically changed electoral results, concluding that “[v]ote brokerage can still pay electoral dividends in contemporary Brazil.”

¹⁵The Mexican PRI lasted as long as it did not because of electoral fraud but because voters supported the “known devil.” As Magaloni explains, hegemonic parties survive when they are able to sustain long-term economic growth and a constant supply of clientelistic transfers.

¹⁶Buying votes from non-poor individuals gets more expensive as income increases.

¹⁷[R]ule that removed parties' control over the nominations process and let an electoral legislator decide to run on any party ticket.” See Carlin et al. [2015, Chapter?].

¹⁸Carlin et al. [2015, Chapter?].

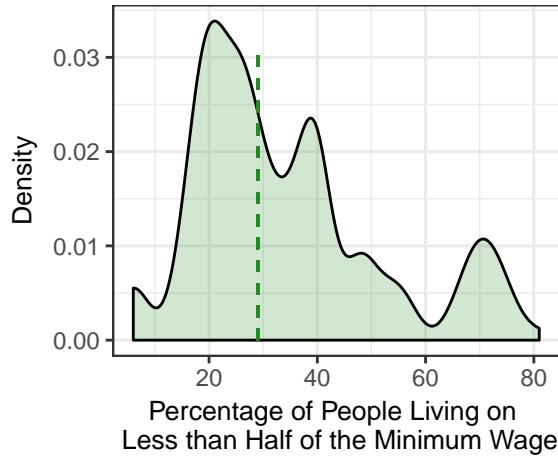


Figure 2: *Distribution of the Density of the Poor*

To test this hypothesis, I use survey data from 2010 from the Latin American Public Opinion Project [LAPOP].¹⁹ Though the LAPOP survey provides a question for income, people who are somewhat better off than their neighbors but live in poor areas may not “feel” poor. If this is the case, this could confound the results. Additionally, when answering the questioner, individuals might not want to reveal their true incomes (either because it is too low or too high). Following the advice of Córdoba [2008] and Córdoba and Seligson [2009, 2010], a relative wealth index (RWI) was constructed.²⁰ Using principal component analyses, the index measures wealth based on actual assets weighted by how common these assets are. Different indexes were constructed for urban and rural contexts. Figure 1 plots the distribution of the combined index separated by clientelism. To measure the density of the poor, I followed a strategy similar to that of Weitz-Shapiro [2012], measuring the degree of poverty at the municipal level. Using information from the 2010 Brazilian census,²¹ a variable was constructed that measures the percentage of individuals who live on less than half of the minimum wage in a given municipality (**density of the poor**). Given that the municipality of residence for each individual in the LAPOP survey is recorded, I was able to merge the census percentage with the LAPOP dataset. The **density of the poor** serves as a good proxy to capture the size of the poor group. It is important to stress that the unit of analysis is the individual, and that this variable captures the economic context in which each individual lives. And just like other scholars in the past have tested the effect of being nested in rural areas,²² this paper focuses on another class of contextual variable. Although the **density of the poor** group was originally a semi-continuous variable,²³ it had to be dichotomized at the median (29%) to be able to construct a matched sample, which I justify and explain below. Figure 2 shows the continuous distribution dichotomized at the median (dashed line). Finally, to measure political competition, the

paper follows Weitz-Shapiro [2012]. Using official electoral data from the 2008 municipal elections,²⁴ a variable was constructed that measures the percentage of seats that are not controlled by the mayor's party in a given municipal council.

There is a built-in lack of relationship between “being poor” and “living in a poor municipality,” confirming that Brazil is in fact a good case to test this theory. [Figure A1](#) in the Appendix shows that the unmatched/raw dataset had already embedded low levels of correlation between these two variables (0.44).²⁵ Using matching methods, I am able to further break this relationship. Matching is a two-stage process. In the first stage the analysts preprocesses the data, seeking to break any systematic relationship between, in this case, the **density of the poor** and the wealth index (RWI).²⁶ Matching does so by deleting observations for which matches cannot be found.²⁷ The idea is to obtain a good covariate balance as in [Figure OA2](#) (in the Online Appendix), to then estimate any appropriated statistical model.²⁸ From a statistical standpoint, preprocessed datasets are less model-dependent²⁹ and prevent analysts from making extreme counterfactuals.³⁰ [Table A2](#) and [Table A1](#) in the Appendix provide summary statistics for both the matched and raw datasets.³¹ The preprocessed data used in the matching approach has 54 municipalities while the raw data used in the generalized propensity score (GPS) approach (which I explain below) has 54 too. [Figure 3](#) lists the municipalities and shows which ones are considered “high” or “low” in terms of the **density of the poor** after the dichotomization process. The figure also shows that there exists considerable variance in income/RWI in both high and low poverty density conditions (bubbles).³²

It could be argued that dichotomizing the **density of the poor** variable at the median is an arbitrary decision. While there have been theoretical advances regarding general treatment effects

¹⁹I thank the Latin American Public Opinion Project (LAPOP) and its major supporters (the United States Agency for International Development, the United Nations Development Program, the Inter-American Development Bank, and Vanderbilt University) for making the data available.” The sample consists of five strata representing the five main geographical regions of Brazil. Each stratum was further sub-stratified by urban and rural areas.

²⁰See also Santos and Villatoro [2016].

²¹Official data comes from the Bureau of Statistics of Brazil IBGE.

²²See for example Brusco et al. [2004] and Stokes [2005]. Both of them use the log of population, which is a proxy for urban/rural.

²³I.e., a percentage.

²⁴Data from the *Tribunal Superior Eleitoral*.

²⁵The figure shows that for both the matched and raw datasets, “being poor” and “living in a poor municipality” are not confounded, as it is possible to find poor individuals living in non-poor areas, and viceversa.

²⁶King et al. [2011]

²⁷The final procedure matched 761 individuals living in the low-density poverty condition with 676 individuals living in the high-density poverty condition.

²⁸The idea is that the propensity of being exposed to the “high” *density of the poor* condition (the ‘propensity score’) has a similar distribution in both ‘treated’ and ‘control’ groups. It is important to say that, despite the language, I do not claim any causal relationship in this paper.

²⁹See Ho et al. [2007].

³⁰King and Zeng [2005]. The matching routine used was the **full** matching routine (see Hansen [2004] and Rosenbaum [2010]), via the **MatchIt** R package (see King et al. [2011]).

³¹Tables generated using the **stargazer** R package (Hlavac [2015]).

³²[Figure OA1](#) in the Online Appendix shows the frequency of individuals by municipality in both raw and matched datasets.

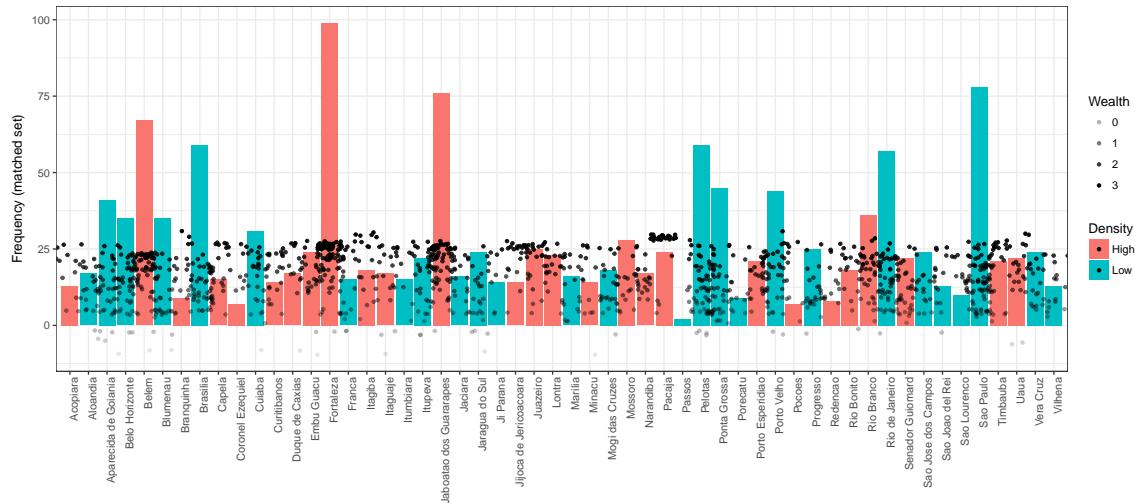


Figure 3: Distribution of Observations by Municipality, Wealth Index and Density of the Poor

regimes for continuous or semi-continuous response doses,³³ algorithms with the ability to match on continuous treatment variables are not common. In order to obtain covariate balance in a non-parametric way (as matching does) but *without* dichotomizing the density of the poor, I also use the original (i.e. *continuous*) density of the poor variable to construct a generalized propensity score (GPS).³⁴ The score is used to *weight* each observation in the model. Besides matching on and weighting by income, I also included the following variables to match on/weighting by: municipal opposition, municipal population and individual involvement in civic associations.

The dependent variable is clientelism. To measure it, I use the question that asks if *a candidate or someone from a political party offered [the respondent] something, like a favor, food, or any other benefit or thing in return for [her/his] vote or support*. Subjects could answer that this had happened *often*, *sometimes* or *never*. Carreras and Irepooglu [2013] and Holland and Palmer-Rubin [2015] use the same dataset and outcome variable. As they explain, the question did not ask whether respondents *took* the offer, hence it should not be an important source of social desirability bias. For statistical and substantive reasons, I dichotomized this variable, combining the alternatives *often* ($n = 91$) and *sometimes* ($n = 150$), leaving *never* ($n = 1196$) unchanged.³⁵

The following control variables were considered. Perception of corruption was included to hold constant the effect of respondents who declared clientelistic activity when in reality they were referring to corruption scandals.³⁶ Brokers usually target civic associations. Following Holland

³³See Imai and van Dyk [2004] and Hirano and Imbens [2004].

³⁴See Imbens [2004], Guardabascio and Ventura [2014] and Imai and Ratkovic [2014]. To generate the weighting vector, I used the CBPS R package (see Fong et al. [2014]).

³⁵These numbers come from the matched dataset.

³⁶I thank Cesar Zucco for this suggestion.

and Palmer-Rubin [2015, 28], who use the same dataset/year, an additive index to measure civic participation (**Political Involvement**) was created.³⁷ Some have also found group size to be important. Using the census data, a variable to measure **population size** at the municipal level was included. I also included an **urban/rural** dummy. A variable to capture party identification (**Political Id.**) was included. Higher levels of democratic support should be negatively associated with clientelism. To control for that, a variable measuring **democratic support** was included. Gonzalez-Ocantos et al. [2014] find that schooling plays a negative role on clientelism; hence, I control for **education** too.

Observations are clustered on a number of important factors such as levels of municipal political competition, municipal poverty and municipal population size. In order to account for these clustering effects, I use a generalized estimating equations approach. GEE were introduced by Liang and Zeger [1986] to fit clustered, repeated (i.e. correlated) and panel data. This method is especially efficient when the data are binary.³⁸ GEE models are similar to random effects models³⁹ in that they allow observations to be nested in hierarchical structures. This method requires 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,”⁴⁰ Hardin and Hilbe [2013, 166] point out that “[i]f the observations are clustered (not collected over time), then [...] the exchangeable correlation structure” is the most appropriate working correlation matrix. Given that the data do not follow a panel but rather a clustered structure, the exchangeable correlation matrix was specified in all models.

While this method is very flexible, GEE estimates remain uninterpretable in practice,⁴¹ making regression tables useless from a substantive standpoint. In this case, the problem is even more severe due to the interactive hypotheses being tested in this paper. The main hypothesis is tested by fitting a parameter for the multiplicative term between the variables **wealth index**, **political competition** and **high density**. Methodologists agree on “not interpret[ing] the coefficients on the constitutive terms,” as they lack substantive meaning.⁴² These problems get more complex when it comes to generalized models as a series of challenges arise. As Ai and Norton [2003] explain, *(1) the interaction effect could be nonzero, even when the estimation says it is zero, (2) the statistical significance of the interaction effect cannot be tested with a simple t-test on the coefficient of the*

³⁷This variable was constructed by adding the frequency of attendance at religious meetings, community improvement meetings and political party meetings (variables cp6, cp8 and cp13, respectively).

³⁸Hanley et al. [2003].

³⁹Gardiner et al. [2009].

⁴⁰Carlin 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.

⁴¹Carlin et al. [2001].

⁴²Brambor et al. [2005, 77].

interaction term, (3) the interaction effect is conditional on the independent variables, [...] and (4) the interaction effect may have different signs for different values of covariates. Brambor et al. [2005, 74] offer the same advice, namely “one cannot determine whether a model should include an interaction term simply by looking at the significance of the coefficient on the interaction term.” Given that cross-partial derivatives are not advisable either, simulation methods are required.⁴³ Particularly, I follow the simulation approach introduced in King et al. [2000]. This procedure samples via simulation from the point estimates, generating a new and larger distribution. That is, taking the single estimated parameters (the regression coefficients), I construct a distribution of estimated values for each coefficient. Relying on the central limit theorem, with enough sampling draws, the new simulated distribution is a transformation that approximates with a great degree of precision the (uninterpretable) coefficients. Subsequently, means and uncertainty measures can be constructed for each of these distributions. From a substantive standpoint, simulation methods also allow for sampling new distributions at different values of the independent variables. This will be important in simulating the expected value of clientelism for different “profiles,” such as *non-poor* individuals nested in *high-poor* dense municipalities in contexts of *high* political competition, etc.

Since it is “impossible to evaluate conditional hypotheses using only the information provided in traditional results tables,”⁴⁴ I focus instead on the substantive results from the simulation methods. However, I still present the raw results in Table A3 in the Appendix.⁴⁵ Analogous to Table 1, in Figure 4 I simulate the predicted probabilities of being targeted using both the matched and weighted/GPS models. The horizontal panel depicts simulations for the upper (“*non-poor*,” 75%) and lower (“*poor*,” 25%) quartiles of the continuous **wealth index** variable. In turn, the vertical panel shows the simulated values for the maximum (100%) and minimum (43%) values of the **municipal opposition** index. Each quadrant shows simulations for individuals nested in poor municipalities (*high density of the poor*) and non-poor municipalities (*low density of the poor*). Each profile shows two simulated probability distributions (with 95% confidence intervals), one for the matched sample and one for the weighted/GPS model.⁴⁶

Figure 4 suggests that brokers engage in *individual* targeting when individuals are identifiable. That is, when individuals are poor *but* nested in low-poor density municipalities (quadrant 4, with a probability of being targeted 22%)⁴⁷ and when individuals are not poor but nested in high-poor

⁴³Zelner [2009].

⁴⁴Brambor et al. [2005, 76].

⁴⁵Table generated via the **texreg** R package. The first column shows the estimates for the matched dataset while the second column shows the results for the GPS weighted model. Virtually all coefficients have the same size and sign.

⁴⁶In the case of the weighted/GPS model which does not use the dichotomized variable, I use the continuous version of the size of the poor variable, where “*low density*” represents the lower quartile while “*high density*” the upper quartile.

⁴⁷Matched sample.

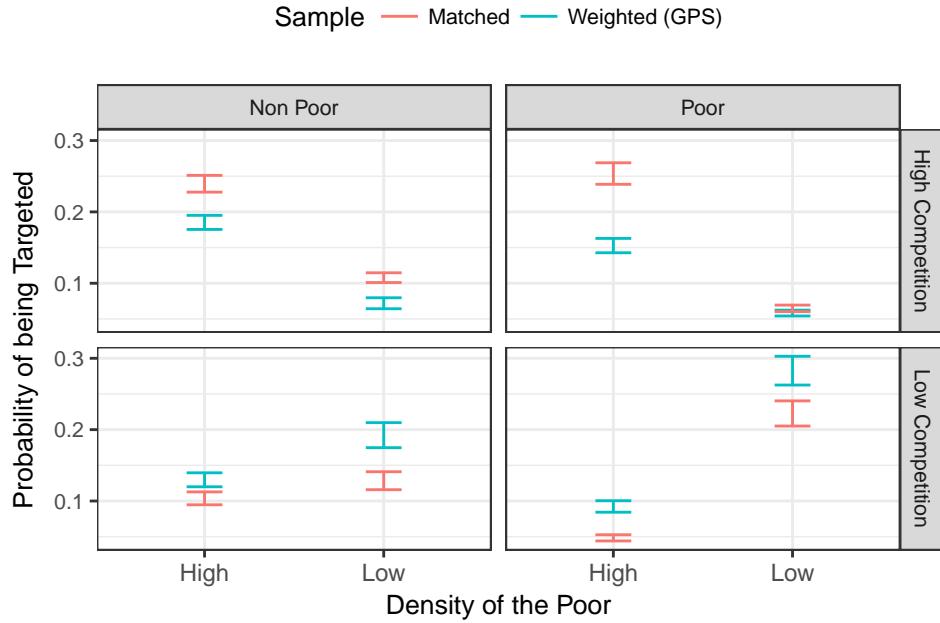


Figure 4: Simulated Expected Values of Clientelism

density municipalities (quadrant 1, with a probability of being targeted 24%). This suggests that political competition incentivizes motivated brokers to engage in vote-buying regardless of personal income when political competition is high. *Group* targeting is more efficient in quadrant 2, supporting the spillover effects hypothesis. When municipal mayors are politically challenged, brokers target *groups* of poor individuals in poor municipalities (quadrant 2, 25%). I argue that brokers take advantage of the spillover effects of clientelism based on the incentives both *potential* and *actual* beneficiaries have to support the broker's candidate. Non-poor individuals nested in low-poor density municipalities but exposed to lower levels of political competition (quadrant 3) are still offered some vote-buying. In these contexts there are less political competition and less checks and balances, having incumbents more "room to move." I argue that even when politicians are not in need of more electoral support, they still engage in this expensive form of vote-buying which is sustained by lowly challenged electoral actors.

Figure 5 shows a plot divided in two panels. Panel a shows the simulated expected probabilities (with 95% confidence intervals) of being targeted at different levels of political involvement. As the blue lines suggests, individuals who participate in civic associations have higher probabilities of being targeted. This is in line with findings in previous research.⁴⁸ However, once I decompose these

⁴⁸Schaffer and Baker [2015], Carreras and Castaneda-Angarita [2014, 7], Calvo and Murillo [2013], Holland and Palmer-Rubin [2015, 16] and Rueda [2015].

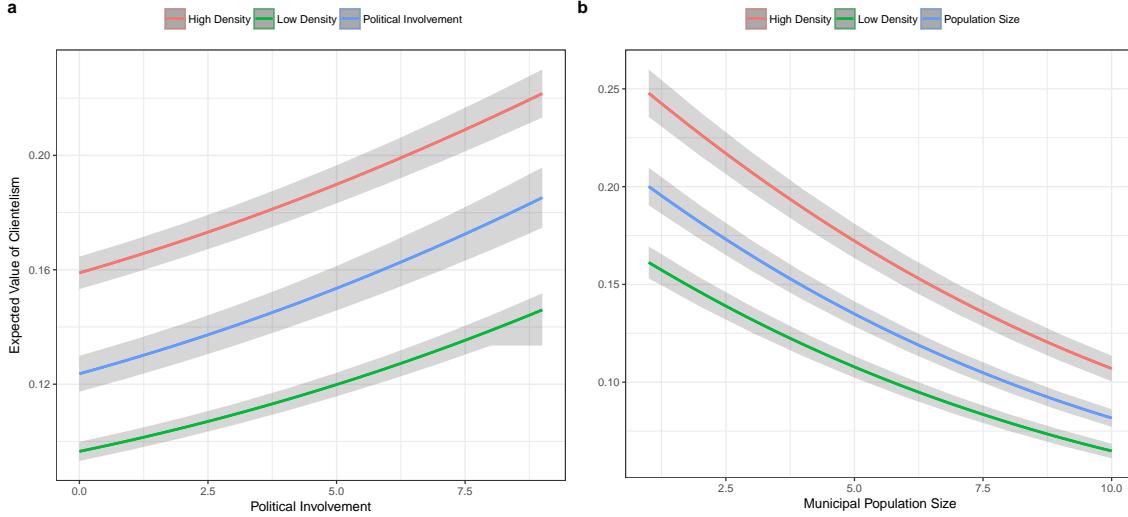


Figure 5: Simulated Expected Probability of being Targeted: Political Involvement and Population Size

effects, being nested in high-poor density areas contributes substantially more to the model. These differences are statistically significant. Panel b shows the probability (with 95% confidence intervals) of being targeted at different increments of the size of the population. In line with the literature, I also see that this relationship is negative.⁴⁹ However, the effect of being nested in high-poor density municipalities outperforms the effect of population size, suggesting spillover effects.

Discussion

Incentives to offer or take clientelistic offerings are not guided by structure or individual factors only. This paper has suggested that both are necessary to better understand how clientelism happens. Clearly, pressures to incur in this expensive and uncertain strategy rise as political competition rises as well. However, the execution of this strategy largely differs depending on whether brokers face homogeneous or heterogeneous groups of individuals. Each one provides a different cost-and-benefit structure to either defect or cooperate. When poor individuals live in poor areas, brokers engage in group targeting relying on the spillover effects of clientelism. Given that the poor are risk-averse, even the ones who do not receive benefits support the broker's candidate, while the ones who did receive benefits, support him to keep receiving more benefits. In this sense, clientelism propagates easily when the poor live among the poor. However, in heterogeneous areas brokers adapt their strategy and execute clientelism in a different way, relying on how identifiable individuals are. Identifiability makes receivers more prone to cooperate, rising the costs of defection. Finally, the paper hopes that

⁴⁹ Stokes [2005, 323], Kitschelt and Wilkinson [2006, 10], Magaloni [2008, 67], Rueda [2016], Bratton [2008] and Gingerich and Medina [2013, 456].

the literature considers that groups and individuals provide different incentives to both brokers and individuals, and hence, this distinction should be incorporated to better understand clientelism.

APPENDIX

Table A1: *Summary Statistics: Raw Sample*

Statistic	N	Mean	St. Dev.	Min	Max
Clientelism	1,483	0.171	0.376	0	1
Wealth Index	1,483	1.543	0.846	-0.899	3.050
Municipal Opposition	1,483	81.761	11.821	43	100
Density of the Poor	1,483	2.435	1.120	1	4
Municipal Population	1,483	5.393	2.841	1	10
Urban	1,483	0.860	0.347	0	1
Political Involvement Index	1,483	1.792	1.619	0	9
Support for Democracy	1,483	5.426	1.682	1	7
Party Id.	1,483	5.939	1.150	1	12
Perception of Corruption	1,483	2.027	1.003	0	3
Years of Education	1,483	9.398	3.857	1	18

Table A2: *Summary Statistics: Matched Sample*

Statistic	N	Mean	St. Dev.	Min	Max
Clientelism	1,437	0.168	0.374	0	1
Wealth Index	1,437	1.557	0.811	-0.899	3.050
Municipal Opposition	1,437	81.912	11.749	43	100
High Density of the Poor	1,437	0.470	0.499	0	1
Municipal Population	1,437	5.384	2.792	1	10
Urban	1,437	0.860	0.347	0	1
Political Involvement Index	1,437	1.784	1.613	0	9
Support for Democracy	1,437	5.417	1.684	1	7
Party Id.	1,437	5.934	1.160	1	12
Perception of Corruption	1,437	2.029	1.000	0	3
Years of Education	1,437	9.359	3.843	1	18

	Matched Data	Weighted Data
(Intercept)	1.404 (1.968)	2.958 (2.691)
Wealth Index	-1.374 (0.990)	-1.320 (1.209)
Municipal Opposition	-0.040 (0.025)	-0.061 (0.032)
High Poor Density	-6.550** (2.399)	
Municipal Population	-0.115* (0.048)	-0.101 (0.053)
Urban	-0.091 (0.401)	-0.077 (0.416)
Political Involvement	0.046 (0.055)	0.047 (0.055)
Support for Democracy	-0.056 (0.046)	-0.051 (0.048)
Party Id.	-0.082 (0.053)	-0.087 (0.052)
Perception of Corruption	0.240** (0.088)	0.267** (0.089)
Years of Education	0.051* (0.021)	0.054** (0.020)
Wealth Index * Municipal Opposition	0.018 (0.013)	0.013 (0.015)
Wealth Index * High Poor Density	2.509 (1.319)	
Municipal Opposition * High Poor Density	0.085** (0.030)	
Wealth Index * Municipal Opposition * High Poor Density	-0.029 (0.016)	
Density of the Poor		-1.992* (0.921)
Wealth Index * Density of the Poor		0.555 (0.372)
Municipal Opposition * Density of the Poor		0.024* (0.011)
Wealth Index * Municipal Opposition * Density of the Poor		-0.005 (0.004)
Num. obs.	1437	1483
Num. clust.	54	54

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Clustered standard errors at the municipality level.

Table A3: Generalized Estimating Logistic Equations: Clientelism

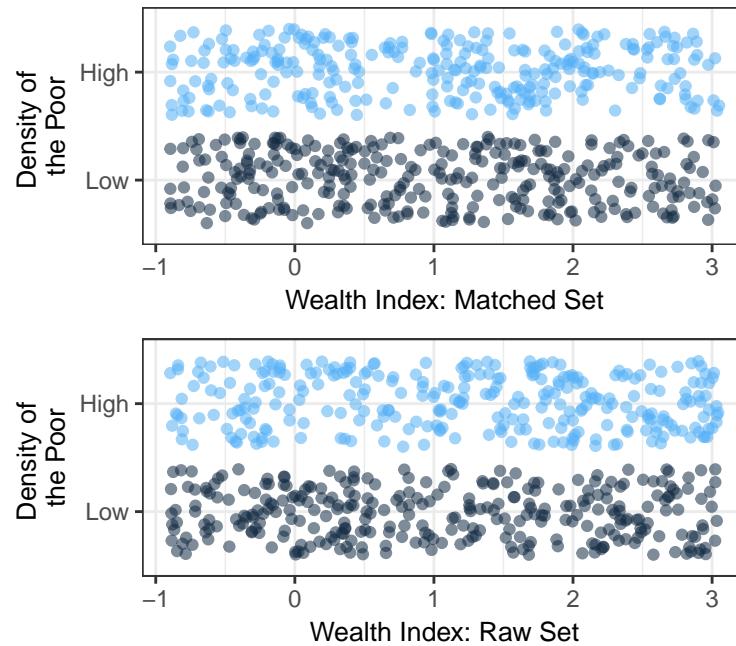


Figure A1: Distribution of Pre and Post Matching Observations by Wealth Index and Density of the Poor

I. ONLINE APPENDIX

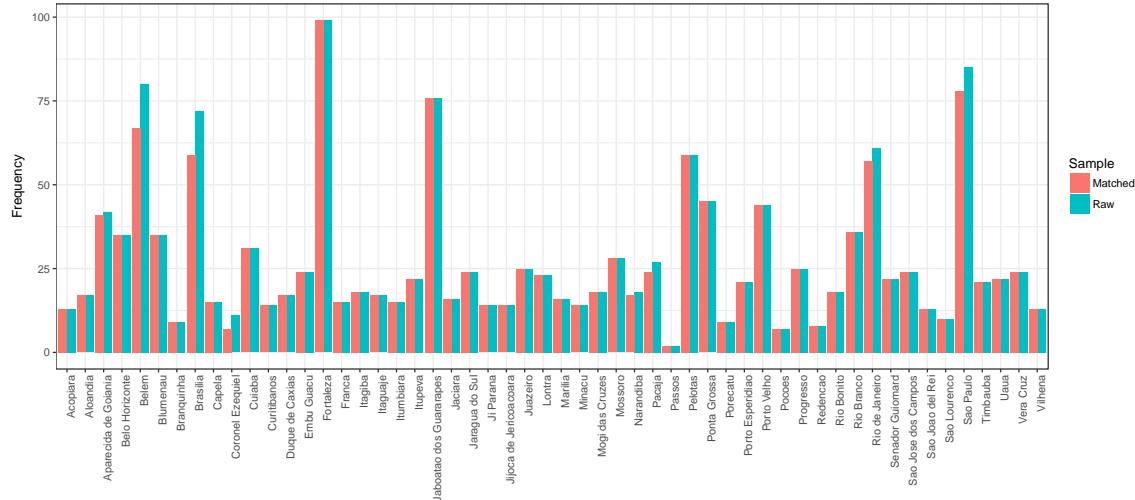


Figure OA1: Frequency of Individuals by Municipality, Pre and Post Matching Deletion

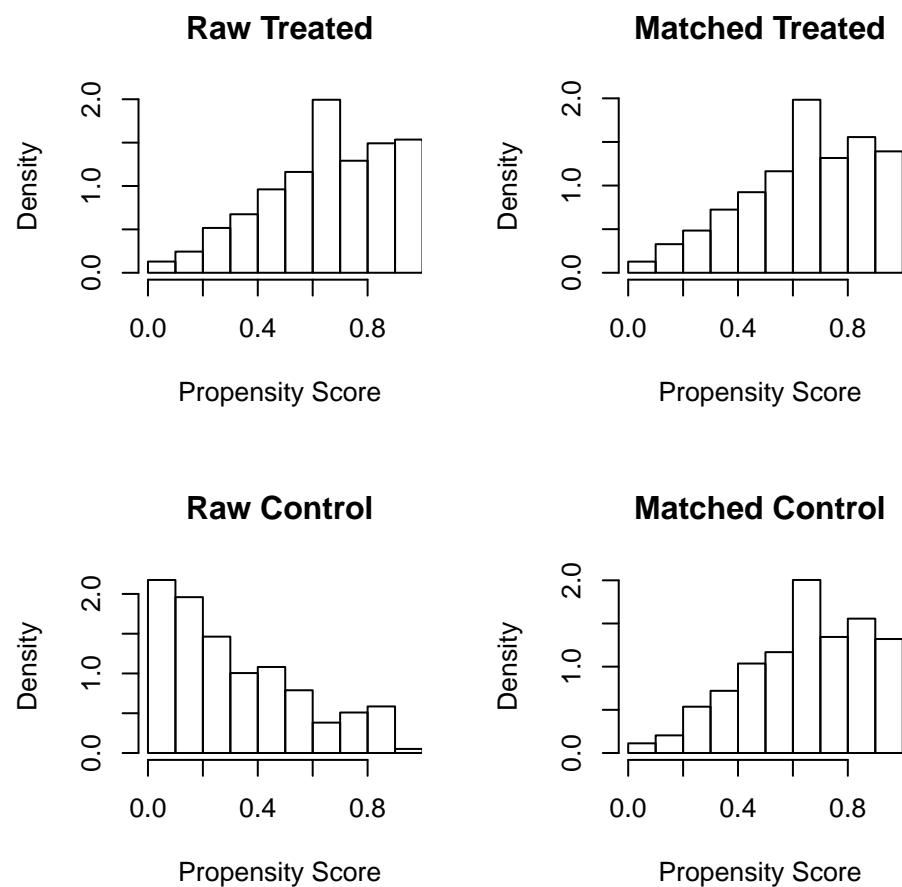


Figure OA2: Pre and Post Matching Balance: Distribution of Propensity Scores

.....Word count: 7,565

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Structural Transformations and State Institutions in Latin America, 1900-2010

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November 1, 2017

Abstract

While virtually all countries in Latin America imposed the income tax, the policy only fostered state development when it was implemented under circumstances of fast industrial expansion. However, when implemented under slow agricultural expansion, income taxation did not produce state-building. I argue that this context in which countries implemented the policy, was a critical juncture. Leveraging the dual sector model of economic growth, and the fiscal sociology paradigm, I explain how balanced inter-sectoral growth, and income taxation, promoted economic growth and state consolidation in the early 20th century Latin America. My empirical strategy leverages economic history data since the 1900s for a number of Latin American countries, time-series analyses, and the Chilean case during the 1920s to contextualize the causal mechanism.

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*I thank Robert Kaufman, Daniel Kelemen, Douglas Blair, Paul Poast, John Landon-Lane, Mark Pickup, Paul Kellstedt, Henry Thomson, Nora Lustig, Quintin Beazer and Ira Gang for all the helpful comments. I also thank the participants of the 75th Annual Conference of the Midwest Political Science Association, the School of Arts and Sciences and the Political Science Department at Rutgers for granting me a Pre-Dissertation Award (2016) that helped me to continue with this project. All errors are my own.

Practically all governments are engaged in promoting one [group]. There are [...] landlord governments against the peasants and the industrialists

Lewis [1965, 410]

The literature on the relationship between political and economic development is vast. Without surveying all of it, there is an agreement in that strong institutions cause better economic performance. Indeed, North [1990, 3] explains that the fact that “institutions affect the performance of economies is hardly controversial.” Unfortunately, however, most explanations of economic success focus on property rights protection.¹ I find that a limitation. For instance, authoritarian regimes with little (or no) respect for property rights, grow at levels that sometimes even surpass democratic countries.² While I still think that institutions matter for economic growth, this paper seeks to contribute to this literature by emphasizing the positive effects of sectoral conflicts between the industrial and agricultural political elites, on economic and political development.

In addition to that, scholars have traditionally focused on socio-economic cleavages between a *homogeneous* ruling elite, and politically excluded segments of the society, traditionally peasants or the bourgeoisie. Moore [1966], Tilly [1992], Boix [2003], Stasavage [2008] and Acemoglu and Robinson [2009] are among the most prominent examples supporting this view.³ Alas, the study of sectoral divisions—e.g., conflicts *among* the elite—and political and economic development, has been overlooked. There are some important exceptions, however. Ansell and Samuels [2014] and Boix [2015] examine the role of economic inequality/equality among the elite on democratization, Saylor [2014, 8] looks at the “coalitional basis of state building,” and Mares and Queralt [2015] examine how income taxation in Europe was associated with inter-elite conflicts, particularly between the landed and industrial elites. While political economists have already studied the role of sectoral conflicts in the context of political development, most of the time the focus has been on democratic development. Using the same sectoral approach, this paper stresses how sectoral conflicts are also associated with state-building and economic development.

Hirschman [1958, 66] explains that “tensions, disproportions and disequilibria” among the industrial and agricultural sectors promote development. Building on that, in this paper I underline the conditions under which higher levels of sectoral contestation between the industrial and agricultural political elites are more likely to foster state development and long-term economic growth. I

¹Johnson and Koyama [2016].

²For an extended criticism, see Clark [2009].

³For example, Acemoglu and Robinson [2009, 293] explain that “all members of the elite have identical endowments so there is no heterogeneity among the elites.” However, later in the book (p. 289) they briefly consider the preferences of industrialists and agriculturalists towards democratization.

theorize from two bodies of literature. First, I build on the fiscal sociology paradigm to argue that fiscal institutions have been the main *engine* of state-making.⁴ Second, borrowing from the dual sector model of economic growth, I document how the secular structural transformation—e.g., the gradual emergence of the industrial sector—fostered the reversal of the backward institutional order implemented during colonial times, causing long-term economic growth. The paper exploits sectoral outputs from 1900 to 2009 for a number of Latin American countries,⁵ vector autoregressive models, Granger-causality tests, impulse response functions, and the Chilean case to illustrate the causal mechanisms. The results amply suggest that when the implementation of the income tax coincided with lower levels of sectoral inequality—e.g., fast industrial expansion—both economic and political development were promoted.

I. STATE-MAKING AND ECONOMIC GROWTH: THE ROLE OF SECTORAL CONTESTATION

I argue that both balanced sectoral growth and income taxation promoted sustained levels of economic growth and state-building as early as the 20th century in Latin America. Economic expansion does not refer to a higher GDP *per capita*, but to a *long-term* growth equilibrium between the industrial and agricultural sectors. Specifically, balanced growth consists of an inter-sectoral synergy where one sector expands in reaction to the other, and vice versa, over time. And since the economic forces alter the balance of political power of the elites invested in each of these two sectors, the theory of (un)balanced economic growth offers also a theory of political (under)development. The mechanism advanced in this paper explains that balanced levels of economic growth had positive—and long-lasting—consequences for political development. Particularly, the argument explains how balanced growth promoted higher levels of sectoral equality, not only precluding sectoral dominance on either sector, but also fostering higher levels of tax compliance among the elites, encouraging inter-elite cooperation and state-making—hence the circular arrows in [Figure 1](#).

On the one hand, the implementation of the income tax generated positive spillover effects for state-making, particularly, rising economies of scale of the operational efficiencies of the bureaucracy. That is, the same bureaucracies that were sent to collect and administer the tax, learned to execute other state(*making*) practices. Particularly, the development of the fiscal system required deploying skilled bureaucrats able to keep up with accounting books of every firm, as well as the employment structure of every factory. It also required knowledge on investments, levels of production and exports, among others. All these tasks shared important *technical complementarities* with other

⁴For a review, see [Martin and Prasad \[2014\]](#).

⁵The actual data availability varies by case.

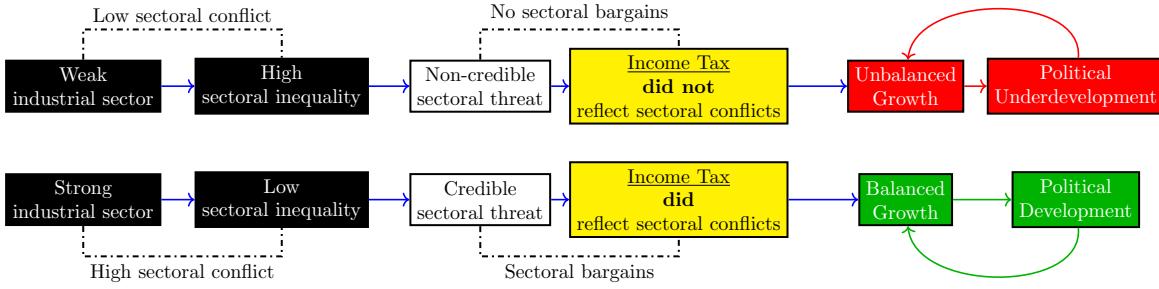


Figure 1: Causal Mechanism

state activities, such as solving land disputes, dispensing justice, providing infrastructure, etc. In other words, the acquired expertise in taxing private incomes, was transferred—at marginally lower costs—to other state institutions.⁶ Hence, the crux of this portion of the argument, is that tax collection rose the capacity utilization of the bureaucracy regarding other state tasks.

On the other hand, the mechanism also contends that the context under which countries implemented the income tax law was an important critical juncture for the foundation of the Latin American states. While virtually all countries in the region imposed the tax, the policy only fostered state development when it was implemented under circumstances of high sectoral conflict. That is, under circumstances where the industrial political elites were strong enough to challenge agricultural political elites, who have dominated the economy and the politics since colonial times. The nature of the conflict had to do with the sectoral losses or gains associated with fiscal expansion. Since taxation has affected landowners and industrialists in different ways,⁷ economic elites have systematically been divided on their preferences towards fiscal policy,⁸ and consequently, state centralization. As land fixity increases the risk premium of their main asset, agriculturalists have typically resisted taxation.⁹ In contrast, industrialists' preferences toward taxation have been more elastic, as capital can be reinvested in nontaxable sectors.¹⁰ This sectoral cleavage was more likely to resolve in favor of direct taxation when income inequality among the elites was low,¹¹ or as I argue here, where sectoral competition was high. That is, when the industrial elites were strong enough to contest agricultural political elites. Importantly, higher dependence on infrastructure made industrial elites to be more willing to “pay” for public infrastructure, by imposing an income tax on themselves.

⁶Hirschman [1958, 67] defines it as “a situation where an increase in the output of [a] commodity [...] lowers the marginal costs of producing [other] commodity.”

⁷Acemoglu and Robinson [2009, 289].

⁸See for example Llavadó and Oxoby [2005].

⁹Robinson [2006, 512].

¹⁰Hirschman [1970] and Ronald Rogowski in Drake and McCubbins [1998, ch. 4]. However, see Bates and Lien [1985, 15].

¹¹Tani [1966, 157] explains that the absence of “wealth groups” makes passing an income tax law easier.

In fact, Beramendi et al. [2016, 18] find that 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.”

Importantly, where both economic sectors were equally developed, both of their corresponding political elites had the same means—and leverage—to voice their strategic preferences about taxation. Conflict, in particular, was an inefficient strategy, as both sorts of elites had access to the same military capacities.¹² Important for this argument is Kurtz [2009, 484]’s assertion in that “the incorporation of upper-class actors into the national political system is crucial to enabling cooperation in state building and public-goods provision activities, despite whatever other cleavages might divide them.” Specifically, my argument stresses the political incorporation of both elites. In other words, higher levels of inter-sectoral equality fostered the political incorporation of both sectors under politically egalitarian conditions. And given that the post-colonial legacies had reproduced the advantages of the landowning sector, the political incorporation of both economic elites was fundamental for state-making.

In sum, the economic structural transformation, characterized by the “secular decline of agriculture and substantial expansion of manufacturing,”¹³ imposed tight constraints on the way politics was run by the incumbent landowning class. Since industrialists had less negative attitudes towards taxation, sectoral incorporation played a big factor in state development, crystallizing a series of reforms that replaced the backwards post-colonial institutional order. However, where the sectoral conflict was too weak to trigger the political incorporation of industrial political elites, institutions kept reproducing the post-colonial order that benefited the landowning class. Even when the income tax law was eventually implemented in practically all Latin American countries, it did not necessarily reflect the sectoral fiscal conflict, which I argue was foundational for state-making. In these cases, the post-colonial institutional order was left unaltered, and the political advantages the landowning elites enjoyed since colonial times were preserved.

For instance, the implementation of the income tax law in Chile responded to endogenous sectoral domestic pressures, securing the political inclusion of both elites. The Chilean internal revenue service is among the finest tax institutions in Latin America. In contrast, Guatemala imposed the income tax law in 1963, and by 1967 the national income tax office employed 194 people, only 9 of whom had graduated from college.¹⁴ While Guatemala did implement the tax, the institution was not product of the inter-sectoral conflict. In fact, the law responded to exogenous factors, being

¹²Boix [2015] makes a similar argument. Richard Salvucci (in Uribe-Uran [2001, 48]) explains that, under these circumstances, war was most likely to exhaust all existent assets without producing positive outcomes for either sector.

¹³Johnston and Mellor [1961, 567].

¹⁴Di John [2006, 5].

imposed by the US-backed dictator Colonel Enrique Peralta Azurdia. As industrialists were too weak to pose any credible threats, landowners were never challenged. There were less pressures to implement an income tax, and the backwards post-colonial institutional order was reinforced. The next section explains the dual sector model of economic growth, focusing on how balanced growth happens, and why it is important for political development.

II. STRUCTURAL TRANSFORMATIONS AND THE DUAL SECTOR ECONOMY MODEL

When by the improvement and cultivation of land [...] the labour of half the society becomes sufficient to provide food for the whole, the other half [...] can be employed [...] in satisfying the other wants and fancies of mankind

Smith [1904, I.11.59]

The “dual sector” or “balanced growth model,” explains the mechanics of modern economic growth,¹⁵ by emphasizing the importance of macro-structural gradual transformations. The theory argues that the economy is divided into two sectors, loosely defined as “advanced or modern sector” or “manufacturing sector,” and “backward or traditional sector,” or “agriculture.”¹⁶ The basic intuition of this paradigm, is that in order for the industrial sector to develop, it needs *first* an efficient and strong agricultural sector. As I explain later, contingent on efficient agricultural productivity, the industrial sector rises its productivity relative to the agricultural sector’s. If the agricultural sector lacks economic efficiency, the industrial sector hardly develops, leading to a stagnant economy. This literature is vast. While this section explains just the core, there are many current theoretical and methodological extensions of the model. Just to name a few, Thirlwall [1986], Mathur [1990], Hatton and Williamson [1991], Blunch and Verner [2006], Tiffin and Dawson [2003], Kanwar [2000] and McArthur and McCord [2017] study sectoral growth, shock persistence, and other related topics using the same theoretical framework and methodology I employ in this paper (or some variation of it). Notably, Ansell and Samuels [2014] use this model in political science to explain democratization.

¹⁵Gollin et al. [2002, 160].

¹⁶Jorgenson [1961, 311]. Importantly, I follow Kuznets [1967, 87] in that “mining is combined with [...] industry because of the large scale of its productive unit, its close connection with manufacturing, and the distinctive trend in its share in product and resources.” Similarly, Debowicz and Segal [2014, 237] includes mining within the industrial sector.

It was Lewis [1965, 151] who popularized the idea that “[t]he secret of most development problems is to maintain a proper balance between sectors.” The dual nature of the economy has been widely accepted and forms part of “a long tradition in development economics.”¹⁷ And while dichotomizing the entire economy in just two sectors might sound as too much of an oversimplification, I follow Dixit [1973, 325] in that the dual economy model provides a significantly better description of the economy because “it reflects several vital social *and* economic distinctions.”¹⁸ Johnston and Nielsen [1966, 280] also explain that “[t]he reality found in most underdeveloped countries approximates this dichotomy [...] sufficiently.” In fact, Lindert and Williamson [1985, 354] explain that the dual-sector model is “the dominant paradigm used by Third World observers.” However, “balanced growth is almost axiomatic as a desirable objective, for both developed *and* under-developed countries.”¹⁹ For example, Bergquist [1986, 8] explains that “Colombia’s two traditional political parties crystallized in the 1840’s and reflected in many respects the dual nature of the Colombian economy.” While this is a stylized model, Dixit [1973, 326] is right in that a “major drawback of dualistic theories [...] is the total neglect of the service sector.” However, the literature is consistent in that the third sector necessarily develops *after* the industrial sector is developed.²⁰

Economic development depends on the emergence of the industrial sector, which in turn depends on the development of a productive agricultural sector.²¹ As Kuznets [1961, 59] puts it, “economic growth is *impossible* unless there is a substantial rise in product per worker in the agricultural sector.”²² Similarly, Hayami and Yamada [1969, 105] argue that “[i]ndustrialization and modern economic growth are basically *conditioned* by the level of agricultural productivity.”²³ There are two main reasons for why agricultural development is a prerequisite of industrial development: efficient agricultures are more likely to supply the industrial sector with cheap foodstuff and cheap labor. In Johnston [1951, 498]’s words, “[e]xpanded agricultural productivity releases people from the land for employment in industry [*and*] provides food for the growing population.” If the expansion of the agricultural sector is compromised, it will necessarily compromise the expansion of the industrial sector as well.²⁴

The political correlate is that a weak inter-sectoral structure—e.g., a lack of structural complementarity between the two sectors—will truncate the emergence of a strong political challenger—the

¹⁷Kelley et al. [1972, 8].

¹⁸Emphasis is mine.

¹⁹Streeten [1959, 169]. Emphasis is mine.

²⁰Galenson [1963, 506-507, 513] and Baer and Herve [1966, 95-96].

²¹Johnston and Mellor [1961, 567] argue that this process “seems to be a necessary condition for cumulative and self-sustaining growth.”

²²Emphasis is mine.

²³Emphasis is mine.

²⁴In fact Landon-Lane and Robertson [2003, 2] find that an important source of growth in developing economies is “derived through the reallocation of resources [particularly] by drawing labour moving out of traditional sector employment into the modern sector.”

industrial class—able to contest the landed elites. However, under cases of balanced growth, each sector’s corresponding political arm had the same military resources and access to other bargaining assets, fostering inter-elite cooperation. I contend that higher levels of inter-elite contestation promoted political development. As Hechter and Brustein [1980, 1085] explain, “state formation will be more likely to the degree that powerful individual actors form two groups on the basis of divergent economic and political interests.” Here I explain how these sectoral dynamics, helped to form the Latin American state, fostering economic growth as well. In simple, political development is more likely to be sustained under sectoral balanced economic growth because it fosters a *level* “playing” political field.

The first reason for why a productive agricultural sector is key to industrial development is that more efficient agricultural techniques make agricultural production less labor intensive, allowing landowners to free workers, which the industrial sector can rely on. The need for an improvement in agricultural production as a necessary step prior to industrialization “has been termed the ‘prerequisite’ hypothesis.”²⁵ Technologies such as “crop rotation, pest control, seed breeding [and] fertilizer use [represent] the major potential source of agricultural labor productivity,”²⁶ increasing also “non-agricultural value added per worker.”²⁷ Nicholls [1961, 339-340] shows that advanced industrial countries initially had relatively more developed and productive agricultural sectors. In fact, Gallo [1991, 57] finds that in Bolivia, *a primarily agricultural economy*, “[t]he tools employed in production were few and rudimentary, the use of fertilizers was minimal, and methods for conservation of the soil were practically unknown until the beginning of the 1950s.” However, highly industrialized countries such as Japan, the U.K., the U.S.S.R. and Taiwan adopted—*prior industrialization*—very efficient *agricultural* technologies such as higher-yielding varieties, fertilizers, and other activities that improved farm practices.²⁸

Surplus of labor naturally leads to a reallocation of redundant workers into the industrial sector, which is the crux of economic development.²⁹ Nurkse [1953] in fact argues that development *means* to employ the surplus labor.³⁰ The literature coincides in that the “natural” role of the agricultural sector is to provide labor to the industrial sector.³¹ For example, Dixit [1973, 326] argues that the “agricultural sector *must* fulfill [...] its dual role of supplier of labour to industry and of food for

²⁵Kelley et al. [1972, 133].

²⁶Ranis and Fei [1964, 62].

²⁷McArthur and McCord [2017].

²⁸Johnston and Mellor [1961, 571] and Johnston [1951, 507-508]. Similarly Caselli [2005, 723] explains that poorer economies have inefficient agricultural sectors which at the same time are the major source of employment.

²⁹Ranis and Fei [1964, 7] and Leibenstein [1957b, 51].

³⁰Similarly, Matsuyama [1991, 621-622] points out that “[i]ndustrialization [*consists of*] a shift of resources from agriculture to manufacturing.”

³¹Ranis and Fei [1964, 114] argue that “labor reallocation [...] is the *inevitable* and *natural* consequence of the continuous expansion of agricultural labor productivity.” Emphases are mine.

the industrial labour force.”³² While Lewis [1954] in his canonical work argued that there existed an “unlimited” supply of agricultural labor, a word of caution is in order. The meaning of the supposedly “unlimitedness” of labor, should *not* be taken literally, as in reality it means *redundant labor force*.³³ In fact, Nurske [1961, 225] points out that the concept “is commonly used to denote all types of rural unemployment.”³⁴

The second reason for why a productive agricultural sector is key to industrial development is because efficient techniques in agricultural production are able to supply cheaper foodstuff.³⁵ “It is *self-evident* that without increasing food output, the capitalist sector must remain in a stationary state.”³⁶ Food surplus is a direct consequence of efficiency, and it is just as important as labor reallocation. In sum, as Kuznets [1961, 60] explains it, if “output per worker in agriculture does not rise substantially, economic growth in the first case will be stopped by scarcity of agricultural products, and in the second case by scarcity of labour.”

III. DUALISM IN CHILE: A BRIEF ILLUSTRATIVE CASE

Historically, agriculturalists in Chile had been a hegemonic group protected by norms and institutions that originated in colonial times. Those norms had survived due to institutional inertia, perpetuating the advantaged position of the landed elites.³⁷ Collier and Collier [2002, 106] argue that the “national government was dominated by [...] owners of large agricultural holdings.”³⁸ Similarly, while Zeitlin [1984, 13] explains that “landowners controlled both the vote and the labor power of the agrarian tenants [and] peasants [...] and this was the *sine qua non* of their continuing political hegemony,” Baland and Robinson [2008, 1748] explain that “[c]ongressional representation was heavily weighted in favor of rural districts.” In the presidency also, landowners were the single most represented group.³⁹

Historians still debate whether agriculturalists and industrialists comprised two *different* elites.

³²Emphasis is mine.

³³See Ranis and Fei [1964, 203] and Jorgenson [1967, 289].

³⁴Or as Leibenstein [1957a, 102-103] puts it, “where the existing labor supply could cultivate more land without loss of efficiency.” In any case, Sen [1966] explains that a number of important predictions made by the dual sector model do not need this assumption to hold for the model to work. On a separate note, Ranis and Fei [1964, 99], Skott and Larudee [1998, 280] and Fields [2004, 730] argue that a pool of *redundant* agricultural workers (a “reserve army”) is what prevents a rise in industrial wages.

³⁵See Jorgenson [1961, 312] and Ranis and Fei [1964, 157].

³⁶Ohkawa [1961, 21]. Emphasis is mine.

³⁷This idea also applies to Mexico. “The principal source of [Mexico’s] wealth was not its mines, Humboldt noted, but agriculture.” Amaral and Doringo, in Uribe-Uran [2001, 13].

³⁸See also McBride [1936, 15] who argues 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.”

³⁹Bauer [2008, 45].

Some claim that this dualism is incorrect.⁴⁰ They argue that since landowners also invested in industry,⁴¹ there was a blurry class division between the mining, banking, and agricultural sectors.⁴² Perhaps the most cited reference regarding this issue is [Veliz \[1963, 231-247\]](#). I contend that there are a series 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.”⁴³ In fact, this practice shows how the credit system was oriented to give unfair advantage to the landed elites. Similarly, [Zeitlin \[1984, 174\]](#) finds “the combined ownership of capital and landed property was a distinctive quality of *certain* [elites] actors,”⁴⁴ 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. Similarly, 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.”⁴⁵ In fact, [Freeman and Quinn \[2012\]](#) explains that asset diversification constitutes a later development “in international markets [roughly after 1980].” I contend that the nature of the main factors of production of agriculturalists and industrialists (land v. capital), in addition to their preferences over fiscal policy, produced a strong sectoral cleavage. I find little evidence in this paper in favor of the conventional wisdom, e.g. elites in Chile had one single fracture, particularly, regarding the role of the state versus the catholic church on society.

Agricultural economic hegemony initially promoted political biases, such as biased public investments.⁴⁶ However, lower levels of inter-elite inequality—granted by industrial expansion—posed credible threats to Chilean agricultural elites. Initially, both elites confronted each other

⁴⁰See for example [Mamalakis \[1976, 125\]](#).

⁴¹[Kirsch \[1977, 57, 95\]](#) who cites [Bauer \[2008\]](#). See also [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.” In the same vein, [Bauer \[2008, 180\]](#) argues that “[m]iners and merchants bought haciendas but landowners in turn invested in banks, insurance companies, commercial firms and the incipient industrial sector.”

⁴²[Bauer \[2008, 30, 44, 94, 108\]](#).

⁴³Emphases are mine.

⁴⁴Emphasis is mine.

⁴⁵Emphasis is mine.

⁴⁶For example, [Zeitlin \[1984, 41\]](#) explains that “the Montt regime did invest in the construction of Chile’s railways but only in the Central Valley and south-central zones [b]ut there was no public investment [...] in railroads built in the Norte Chico mining provinces.”

in two civil wars. [Zeitlin \[1984, 23\]](#) argues that the civil wars challenged a “large landed property [elite against a] productive capital [elite].” Importantly, lower levels of inequality allowed both sets of elites access to similar military capacities. While *Balmacedistas* managed to secure the support of the army, *congresistas* (the anti-Balmaceda group) gathered support from the navy. However, war was not sustainable over time. There were a number of *aborted* coups in 1907, 1912, 1915 and 1919,⁴⁷ suggesting an equilibrium where no type of elite had more capacities than the other. The requirement of better public investments for Chilean industrialists forced both the agricultural and industrial elites to reach political compromises. The keystone of these inter-elite compromises was the implementation of the income tax. In 1924, 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.”⁴⁸ This is why the expansion of political rights *among the elite*, and the rise of the industrial sector, share the same timing. As [Collier \[1977, 683\]](#) has pointed out, “the real story of Chilean industrialization belongs to the Parliamentary period” (1891-1925).

The tax was not only important because of the new revenue it collected, however. While [Humud \(1969, p. 154\)](#) explains that the income tax generated considerable resources for the Chilean treasury,⁴⁹ the tax was important because it fostered state-making. [Musgrave \[1992, 99\]](#) argues that since taxation (especially on incomes) requires such a high degree of state penetration, public finances offer the key for a theory of state-building. Indirect taxes are easier to levy, and hence this kind of revenue is generally considered “unearned income”⁵⁰ or “easy-to-collect source of revenues.”⁵¹ Given the relatively lower costs states have to incur to collect them, indirect taxes have a very low impact on state-building.⁵² 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.⁵³ Since customs administrations have always been concentrated in a few critical locations; especially ports, tariffs, and customs duties did not require an elaborate fiscal structure.⁵⁴

⁴⁷[Collier and Collier \[2002, 109\].](#)

⁴⁸Carmenza Gallo, in [Brautigam et al. \[2008, 165\]](#). Emphases are mine.

⁴⁹[Bowman and Wallerstein \[1982, 451-452\].](#)

⁵⁰[Moore \[2004b, 304\].](#)

⁵¹[Coatsworth and Williamson \[2002, 10\].](#)

⁵²[Moore \[2004a, 14\].](#)

⁵³[Campbell \[1993, 177\].](#)

⁵⁴[Bertola and Ocampo \[2012, 132\].](#)

The very implementation of the income tax produced a secular accumulation of know-how, particularly, of better technologies able to monitor individual incomes. Unlike “regular” institutions, income taxation infiltrates the state’s coercive sovereignty unto the individual itself. Not only observing individual economies, but transforming them into public property, is what fostered state expansion.⁵⁵ This argument goes in line with Besley et al. [2013], who explain that implementing the income tax law has been “associated with investments in public administrative structures that support tax collection” in a number of countries, including Chile. The expertise the state accumulated was transferred to other state institutions via spillovers. 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. For instance, Strayer [2005] explains how official state delegations traveled the territory dispensing judicial decisions, fostering state centralization. Also, Dincecco [2015] explains that states became effective organisms upon centralizing a system of direct taxation. Others find that the *introduction* of the income tax is associated with state expansion too. For instance, 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.” Analytically, the effectiveness of income taxation on fiscal capacities, increased due to the nature of the implementation of the income tax. Aghion et al. [2004, 566] explain how optimal institutional choices result from political settings where all involved actors “had a voice in the choice of institutions,” essentially contributing to an equilibrium of quasi-voluntary compliance.⁵⁶ The Chilean example suggests that inter-elite agreements helped to sustain these state-making policies over time.

IV. TIME SERIES ANALYSES: VECTOR AUTOREGRESSIVE MODELS AND GRANGER CAUSALITY TESTS

*what a sector does is not fully attributable
or credited to it but is contingent upon
what happens in the other sectors*

Kuznets [1961, 41]

⁵⁵Musgrave [1992, 98] and Moore [2004b, 298]. While Kurtz [2009, 2013], Soifer [2015] situate the relevant state-building critical juncture at the end of the colonial period, before the class compromises I identify in this paper, I argue that the implementation of the income tax was an important building block in this process.

⁵⁶Levi [1989].

Structural change is clearly an endogenous process, driven by a variety of economic forces [...] also in the statistical sense

Temple and Wößmann [2006, 212]

Granger-causality Tests Due to institutional inertia, where industrial expansion was slow relative to agriculture, the landowning elites kept enjoying the advantages of the post-colonial institutional order, which had generated economic growth in a way that mostly benefited their own sector. Even when the income tax was implemented in these countries, the policy did not reflect the sectoral cleavage. That is, industrial elites were too weak to trigger the implementation of the income tax law, causing no major changes to the political order. However, in cases where industrial elites were strong enough to pose credible threats, the income tax was implemented due to the emergence of a strong industrial sector. In the first set of cases, we should see that the income tax was *not* associated with the reversal of the institutions that permitted balanced growth, perpetuating unbalanced growth. However, in the second set of cases, we should see that the income tax was associated with the reversal of backward institutions, permitting balanced growth. Empirically, we should see in the first set of cases that the agricultural sector grew *at the expense* of the industrial sector, *both before and after* of the implementation of the income tax. In the second set of cases, however, we should see that *after* the income tax was implemented, there was a *reversal* of the flow of inputs, generating growth *from* the agricultural sector *to* the industrial sector (balanced growth). Importantly, the industrial sector did *not* grow *at the expense of* agricultural development, but *because of* agricultural development. In econometric terms we should see that the income tax reversed the way in which one sector “Granger-caused” the other.⁵⁷

I utilize the MOxLAD data, particularly the *agriculture value-added* and *manufacturing value-added* variables.⁵⁸ The dataset spans from as early as 1900 to as late as 2009.⁵⁹ Table A1 specifies the country-specific available time spans. Using secondary sources, the table also states *when* the income tax was implemented, what the law was, and its corresponding source(s).⁶⁰ Following Mahoney

⁵⁷Lutkepohl [2006, 42] explains that if some variable *X* forecasts variable *Y* (and not vice versa), *X* is said to ‘Granger-cause’ *Y*. According to Granger [1980, 349], this concept of ‘causation’ is based on the idea “that the future cannot cause the past.” See also Durr [1992, 197] for a similar definition. Both Beck [1992, 241] and Angrist and Pischke [2008, 237] Granger-causality is not really *causal*.

⁵⁸The former measures “the output of the sector net of intermediate inputs and includes the cultivation of crops, livestock production, hunting, forestry and fishing.” The latter “[r]eports the output of the sector net of intermediate inputs.”

⁵⁹According to Astorga et al. [2005, 790], this dataset provides extended *comparable* sectoral value-added series in constant purchasing power parity prices.

⁶⁰Some countries implemented some kind of income tax before, however these laws lacked enforcement, they were weak or not at all followed. In Table A1 in the Appendix section I establish the year that the literature seems to agree for when the law was implemented and properly enforced.

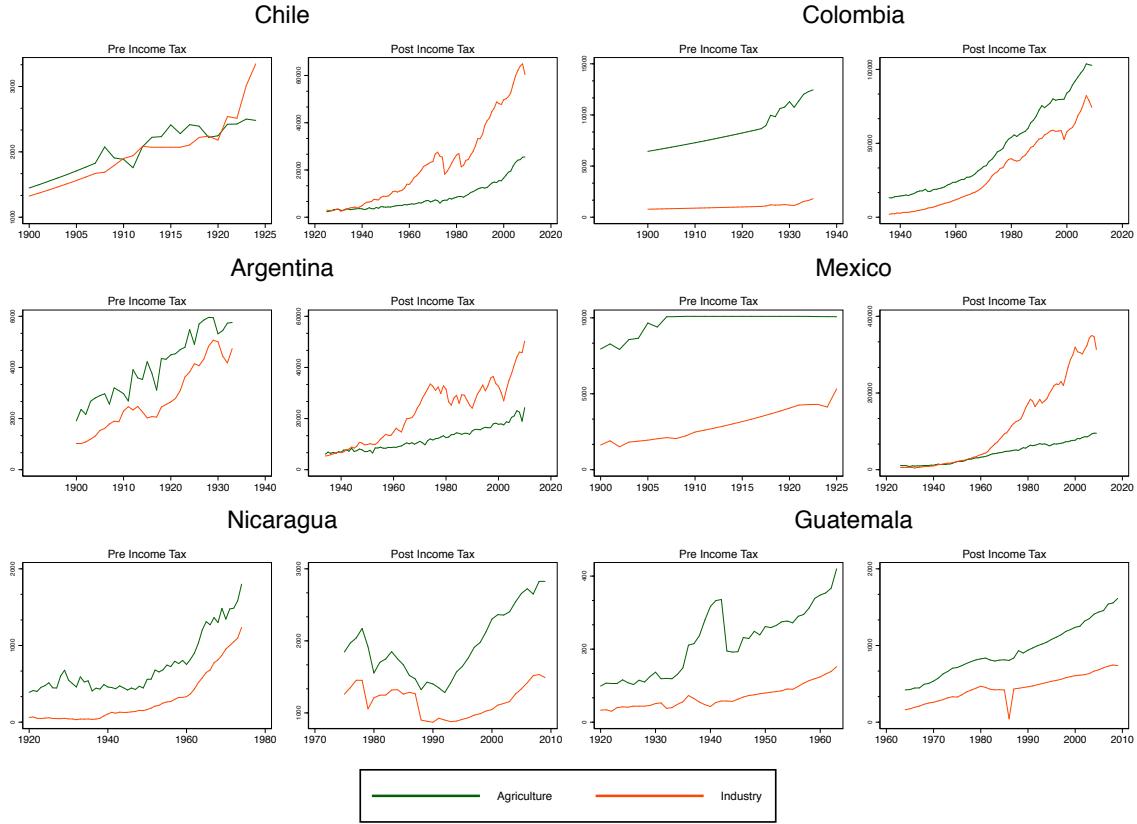


Figure 2: Sectoral Outputs Before and After the Implementation of the Income Tax Law

[2010, 5] I consider two “advanced” economy countries (Chile and Argentina), two “intermediate” countries (Mexico and Colombia) and two “less advanced” countries (Guatemala and Nicaragua). Figure 2 shows the sectoral outputs for each country, both before and after the income tax law was implemented. The econometric analyses in this section intend to recover Mahoney’s typology, linking the mechanics of economic development with fiscal expansion. To simplify, I expect *advanced* countries to have *unbalanced* growth *before* the implementation of the income tax, but *balanced* economic growth *after* the implementation of the tax. I also expect *less advanced* countries to have *unbalanced* economic growth *both* before and after the implementation of the tax—e.g., null results in favor of a reversal in sectoral Granger-causation.

In Table 1 I test for Granger-causality both prior to and after the implementation of the income tax law.⁶¹ The results strongly suggest that in *advanced* countries, particularly Chile, Colombia and Mexico, the implementation of the income tax was associated with the reversal of economically backwards institutions that promoted unbalanced economic growth. In these cases, before the

⁶¹Specifically, the tests were computed after estimating the reduced form VAR specified in Equation 1.

income tax law, industrial growth Granger-caused agricultural growth, but after the income tax law, the agricultural sector Granger-caused industrial development (all p-values are significant at the .05 level).⁶² These results suggest that the implementation of the income tax was associated with the reversal of the economic structure, going from an economic backwardness equilibrium, to a balanced growth equilibrium. I interpret this change in the mechanics of economic growth as the overthrowing of the political institutions and practices that permitted agricultural expansion at the expense of the modern sector. This reversal was possible due to the incorporation of political outsiders—the industrialists—and how they were able to shape the institutional order in a way that also benefited their own sector. Following the fiscal sociology literature, I contend that when the income tax was implemented under contexts of sectoral contestation, this institution fostered the expansion of state institutions. In turn, these kinds of institutions set in motion a path of long-term economic development (Figure 1).⁶³ In Nicaragua and Guatemala, however, the tests suggest the exact opposite (all p-values are significant at the .05 level).⁶⁴ The implementation of the income tax did *not* reverse the initial economic backwardness equilibrium. I contend that when implemented, the tax did not reflect the inter-sectoral economic cleavage. The industrial sector never had enough economic leverage to politically confront the landowning elite, and hence, industrialists never posed credible threats to the status quo, relaxing the endogenous incentives to invest in state-making institutions—e.g. the income tax law. The Argentinian case is different. The Granger tests are inconclusive, and no significant results were found, suggesting a weak inter-sectoral cleavage structure.

Vector Autoregressive Models (VAR) and Impulse Response Analysis (IRF) Once we have determined the directionality of economic growth changes upon the implementation of the income tax law, but only in countries where the industrial sector was strong enough to challenge the agricultural status quo, it is necessary to establish the inter-sectoral long-run equilibrium. This section tests whether the implementation of the income tax is associated with long-run economic development. Given that the implementation of the income tax had positive spillovers on other state institutions, I expect income taxation to be associated with long-run economic growth. In non-advanced cases, the tests should show null results. For instance, and following Mahoney [2010, 5] again, the implementation of the income tax law should *not* cause long-term economic growth in Guatemala and Nicaragua.

The link between industrial and agricultural growth is an endogenous one.⁶⁵ If this endogeneity

⁶²Except for the Mexico after the implementation of the income tax (p-value = .06).

⁶³See especially next section.

⁶⁴Except for the pre income tax period test of Guatemala, which is significant at the .1 level.

⁶⁵Tiffin and Dawson [2003, 33].

Country	Pre/Post Income Tax	Sample	Directionality	chi2	P-value
Chile	Pre	1905 - 1924	Agriculture → Industry	3.55	0.47
			Industry → Agriculture	12.13	0.02
	Post	1928 - 2009	Agriculture → Industry	11.92	0.00
			Industry → Agriculture	5.37	0.07
Colombia	Pre	1902 - 1935	Agriculture → Industry	4.96	0.03
			Industry → Agriculture	10.44	0.00
	Post	1938 - 2009	Agriculture → Industry	4.32	0.04
			Industry → Agriculture	1.63	0.20
Argentina	Pre	1903 - 1933	Agriculture → Industry	4.19	0.12
			Industry → Agriculture	.42	0.81
	Post	1937 - 2010	Agriculture → Industry	.18	0.91
			Industry → Agriculture	1.37	0.50
Mexico	Pre	1902 - 1925	Agriculture → Industry	.438	0.508
			Industry → Agriculture	2.86	0.090
	Post	1925 - 2009	Agriculture → Industry	4.86	0.08
			Industry → Agriculture	4.18	0.12
Nicaragua	Pre	1923 - 1974	Agriculture → Industry	.48	0.79
			Industry → Agriculture	6.83	0.03
	Post	1977 - 2009	Agriculture → Industry	.014	0.91
			Industry → Agriculture	4.96	0.03
Guatemala	Pre	1924 - 1963	Agriculture → Industry	2.18	0.54
			Industry → Agriculture	6.72	0.08
	Post	1966 - 2009	Agriculture → Industry	.58	0.45
			Industry → Agriculture	6.05	0.01

Table 1: Granger Causality Wald Tests

is not accounted for, the error term and the regressors will be correlated, and so OLS will be inconsistent. Additionally, growth rates are usually integrated. Integrated series are processes whose deviations from the mean tend to persist, cumulating or growing in time. In addition to that, integrated vectors that are mutually endogenous imply a “cointegrated” CI(1) relationship, imposing additional statistical restrictions. While the economic literature generally coincides in that economic growth is an I(1) process and that sectoral development is a CI(1) process, these are assumptions that should be tested. The first step is to find strong evidence of integration in each of the series. Table A2 shows several unit root tests.⁶⁶ The table indicates that all variables,

periods, sectors, and countries have I(1) processes, satisfying one important assumption of CI(1) vectors. The second step is to find evidence of cointegration.⁶⁷ Substantively, cointegration means that there is a long-lasting mutual inter-sectoral economic *dependence*, allowing *both* sectors to grow in a balanced fashion. Lack of evidence in favor of cointegration, implies economic backwardness between the two sectors. Consequently, I expect to find evidence of cointegration only in “developed” and “semi-developed” cases, as specified in Mahoney [2010, 5].⁶⁸

Following Johansen [1988], Table 2 indicates that all “developed” and “semi-developed” countries have cointegrated series, while “less developed” countries do not have cointegrated series,⁶⁹ suggesting that industrialists in “developed” and “semi-developed” countries were strong enough to pose credible threats to agricultural incumbents, challenging the post-colonial institutional order. These higher levels of sectoral contestation, in turn, fostered long-term economic growth via the reversal of backward political institutions. However, in “less developed” countries, industrialization was slow, and as a consequence, their corresponding political elites were too weak to represent any major threat to the *status quo*. Consequently, the political order beneficial for the landed elites remained unchallenged, compromising long-term economic growth.

Following Johansen [1988], I estimate the long-run sectoral relationship using a vector-autoregressive (VAR) approach. One important advantage of this method is that VARs are estimated via MLE, not requiring being specific about the number of cointegrated vectors (as opposed to error correction models).⁷⁰ Formally, I fit Equation 1 in differences, one per country, both before and after the income tax law was passed.⁷¹

$$\begin{aligned}\Delta M_{t_m} &= \alpha_m + \beta_m \Delta M_{t-l} + \beta_m \Delta A_{t-l} + \epsilon_{t_m} \\ \Delta A_{t_a} &= \alpha_a + \beta_a \Delta M_{t-l} + \beta_a \Delta A_{t-l} + \epsilon_{t_a}\end{aligned}\tag{1}$$

Notice that in both lines, the different dependent variables are expressed as a function of the *same* set of lagged independent variables. Since the number of lags l varies by country *and* time-span (i.e. before/after the income tax law), Equation 1 is in standard form. Table A3 describes the optimal lag structure per each country regression.⁷²

⁶⁶I show the test statistic and its associated MacKinnon approximate p-value in parenthesis for the ADF and Phillips-Perron tests. Both trend and drift were tested in all tests, when applicable. As I did not find any differences, I show the test statistic with no trend nor drift and one lag. The lags in the KPSS test were selected via an automatic procedure. “†” indicates that the test is barely significant or non-significant.

⁶⁷I use VAR regressions, which do not necessarily need cointegrated vectors (see Box-Steffensmeier et al. [2014, 161, 164]). Cointegration, however, is important from a substantive standpoint in this paper.

⁶⁸Given that the maximum number of cointegrated vectors in bivariate cointegrated series is 1, I only test for the minimum number of cointegrated relationships. See Box-Steffensmeier et al. [2014, 165].

⁶⁹Since I am interested in the long-run equilibrium, I do not split the sample before and after the implementation of the income tax.

⁷⁰Box-Steffensmeier et al. [2014, 164].

⁷¹For simplicity, the VAR equation is in reduced form.

⁷²The next information criteria were used to determine the appropriate lag length: final prediction error, AIC,

Country	Number of Cointegrated Vectors (rank)	Restrictions	Lags	Log-Likelihood	Trace
Chile	at least 1	Restricted Constant	5	-1665.9736	0.3799
Argentina	at least 1	Restricted Constant	3	-1802.292	4.7657
Colombia	at least 1	Restricted Trend	2	-1805.6773	10.0076
Mexico	at least 1	Restricted Constant	4	-1978.1322	1.0274
Nicaragua	0	Restricted Constant	2	-1020.221	11.5297
Guatemala	0	Trend	3	-859.2802	16.5493

Table 2: Johansen Tests for Cointegration: Complete Series

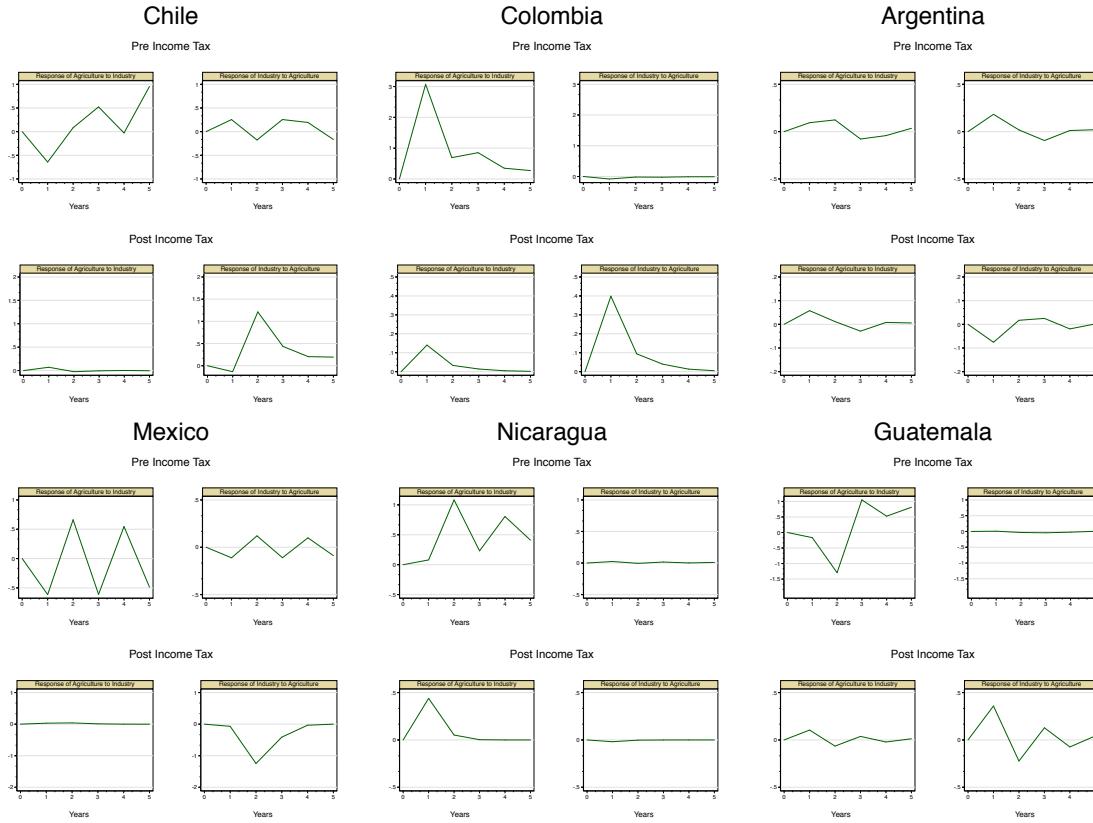


Figure 3: VAR Impulse Response Functions: Sectoral Responses to Each Other's Growths

Given that “it is often difficult to draw any conclusions from the large number of coefficient estimates in a VAR system,”⁷³ econometricians usually turn to the analyses of *impulse response functions* (IRFs), which are derived from VAR analyses.⁷⁴ “Impulse responses trace out the response of current and future values of each of the variables to a one-unit increase in the current value of one of the VAR errors.”⁷⁵ Figure 3 shows four panels for each of the six countries, one for the response of agriculture to industrial growth (left column), one for the response of industrial

growth to agricultural growth (right column), both before (top row) and after (bottom row) the implementation of the income tax. Following the same typology described in Mahoney [2010, 5], I expect the income tax to reverse the traditional institutional order—and be associated with a path of long-run economic growth—only in politically “developed” countries. Lack of sustained balanced economic growth upon the implementation of the income tax indicates that this institution did not emerge out of the sectoral cleavage, leaving the colonial backwards economic order unaltered. The X-axis is expressed in years. The Y-axis is *not* growth, but response to equilibrium. That is, the reaction of one sector once the other one is shocked.⁷⁶

Figure 3 suggests that all “developed” countries switched from unbalanced to balanced growth after implementing the income tax law. For example, a shock to industrial growth in Chile, before the implementation of the tax law, had a positive and increasing effect on agriculture. However, after the income tax is adopted, a shock on industry has a negligible effect on agricultural output. This suggests that political institutions before the tax was implemented were oriented to channel most economic resources in a way that advantaged the agricultural sector (and the landed elites). This equilibrium is reversed after the income tax law is implemented, one of long-term balanced economic growth. Colombia and Mexico show similar patterns. While the analyses on the Argentinean case suggest that there is a long-term inter-sectoral relationship (Table 2), according to Figure 3 and Table 1, this relationship is weak, indicating weak inter-sectoral complementarity. Nicaragua and Guatemala are the prototypical backward cases. Their economies were designed to develop the agricultural sector completely at expenses of the industrial sector. This goes in line with the null findings of cointegration in Table 2, and Granger-causality tests in Table 1. In these cases, the effect of a shock to agricultural output on industrial output is zero, both before and after the implementation of the income tax law, suggesting a situation of unbalanced economic growth, unbalancing also the development of agricultural political elites relative to the development of industrial elites. In both cases, the implementation of the income tax did not reverse the institutional order that was permitting unbalanced growth. The lack of sectoral challenges left the traditional institutional order unaltered, preserving the political advantages the landowning elites had enjoyed since colonial times.

Schwarz's Bayesian information criterion, Hannan and Quinn criterion as well as the corresponding likelihood-ratio test statistics. The same criteria are used to compute the optimal lag length in Table 2. The table also shows a summary of different post-estimation tests when the optimum lag length specified in the table was used. A check mark indicates that the tests was passed successfully, a check-minus mark indicates that the test was passed somewhat successfully, and a cross mark denotes failure to reject specification problems. Detailed results are available upon request.

⁷³Lütkepohl and Krätsig [2004, 159].

⁷⁴The raw VAR regression tables are available upon requests.

⁷⁵Stock and Watson [2001, 106]. See also Lütkepohl [2005, 51].

⁷⁶That is why the “shape of the [IRFs] indicate [...] the dynamic responses of the variables [and since the variables] are I(0) the impulse responses [...] should converge to zero” (Enders [2014, 364]).

V. DISCUSSION

Since colonial times, agriculturalists had been the hegemonic group protected by persistent backwards institutions. However, the emergence of the industrial sector imposed tight constraints on the way politics was run by the incumbent landowning class. The emergence of the industrial sector lowered the levels of inter-sectoral inequality, making possible higher levels of inter-sectoral contestation, forcing industrial and agricultural political elites to make institutional agreements. I identify one such compromise, the implementation of the income tax. Leveraging the Chilean case, I explain how, and why, the tax was relevant for industrial expansion. The crux of the argument explains how the context in which countries implemented the income tax law was a critical juncture promoting or undermining long-term economic and political development. When the implementation of the income tax reflected the foundational sectoral economic cleavage, the tax expanded the overall state capacities, crystallizing a series of reforms that replaced the backwards institutional order, and fostering long-term balanced economic growth. In turn, balanced growth reinforced sectoral inter-dependence, precluding sectoral dominance of either political elite. Using time-series econometric methods, I find that when the sectoral cleavage was strong (cointegration), the income tax law promoted long-term economic growth (VAR models and IRF analyses).

..... **Word Count:** 10,226

VI. APPENDIX

Country	Available Data	Year Income Tax	Law	Source
Chile	1900 - 2009	1924	<i>Ley</i> 3996	Mamalakis [1976, 20] and LeyChile.Cl (official)
Colombia	1900 - 2009	1935	<i>Ley</i> 78	Figueroa [2008, 9]
Argentina	1900 - 2010	1933	<i>Ley</i> 11682	Infoleg.Gob.Ar (official)
Mexico	1900 - 2009	1925	<i>Ley de Impuesto sobre la Renta</i>	Unda [2017, 8]
Nicaragua	1920 - 2009	1974	<i>Ley</i> 662	Legislacion.Asamblea.Gob.Ni (official)
Guatemala	1920 - 2009	1963	<i>Decreto</i> 1559	Instituto Centroamericano de Estudios Fiscales [2007, 165]

Table A1: *Sample, Data Available and Year the Income Tax was Implemented*

Country	Time Frame	Sector	Augmented Dickey-Fuller	Phillips-Perron	KPSS	Conclusion
Chile	Pre	Agriculture	-1.185 (0.68)	-1.241 (0.66)	.107†	I(1)
		Industry	2.310 (0.99)	2.556 (0.99)	.113†	I(1)
	Post	Agriculture	4.557 (1.00)	5.40 (1.00)	.289	I(1)
		Industry	0.908 (0.99)	1.458 (0.99)	.249	I(1)
	All	Agriculture	5.521 (1.00)	6.722 (1.00)	.31	I(1)
		Industry	1.582 (0.99)	2.305 (0.99)	.314	I(1)
Colombia	Pre	Agriculture	2.709 (0.99)	2.414 (0.99)	.204	I(1)
		Industry	2.103 (0.99)	3.257 (1.00)	.183	I(1)
	Post	Agriculture	2.392 (0.99)	3.156 (1.00)	.282	I(1)
		Industry	0.520 (0.98)	1.044 (0.99)	.241	I(1)
	All	Agriculture	4.256 (1.00)	5.893 (1.00)	.372	I(1)
		Industry	1.674 (0.99)	2.707 (0.99)	.374	I(1)
Argentina	Pre	Agriculture	-0.849 (0.80)	-1.201 (0.67)	.0801†	I(1)
		Industry	-0.495 (0.89)	-0.378 (0.91)	.115†	I(1)
	Post	Agriculture	1.197 (0.99)	1.093 (0.99)	.277	I(1)
		Industry	0.228 (0.97)	0.381 (0.98)	.0901†	I(1)
	All	Agriculture	1.484 (0.99)	1.401 (0.99)	.332	I(1)
		Industry	1.007 (0.99)	1.237 (0.99)	.183	I(1)
Mexico	Pre	Agriculture	-3.073 (0.03)	-3.146 (0.02)	.156†	Stationary
		Industry	1.575 (0.99)	1.422 (0.99)	.171†	I(1)
	Post	Agriculture	1.961 (0.99)	2.064 (0.99)	.161†	I(1)
		Industry	0.169 (0.97)	1.120 (0.99)	.313†	I(1)
	All	Agriculture	3.431 (1.00)	3.607 (1.00)	.341	I(1)
		Industry	0.672 (0.98)	2.020 (0.99)	.367	I(1)
Nicaragua	Pre	Agriculture	2.473 (0.99)	2.355 (0.99)	.25	I(1)
		Industry	4.958 (1.00)	9.100 (1.00)	.244	I(1)
	Post	Agriculture	-0.154 (0.94)	0.154 (0.97)	.2	I(1)
		Industry	-1.237 (0.6577)	-1.176 (0.68)	.189	I(1)
	All	Agriculture	0.636 (0.99)	0.759 (0.99)	.116†	I(1)
		Industry	-0.164 (0.94)	-0.090 (0.95)	.123	I(1)
Guatemala	Pre	Agriculture	-0.393 (0.91)	-0.343 (0.92)	.0639†	I(1)
		Industry	1.358 (0.99)	1.704 (0.99)	.199	I(1)
	Post	Agriculture	1.786 (0.99)	1.965 (0.99)	.162	I(1)
		Industry	-0.998 (0.75)	-1.352 (0.61)	.0915†	I(1)
	All	Agriculture	3.349 (1.00)	3.714 (1.00)	.321	I(1)
		Industry	0.413 (0.98)	0.017 (0.96)	.288	I(1)

Table A2: Unit Root Tests for Agricultural and Industrial Growth

Country	Time Frame	Number of Lags	LM	Normally Tests			Stability Condition
				Jarque-Bera	Skewness	Kurtosis	
Chile	Pre	4	✓	✓	✓	✓	✓
	Post	2	✓	✓-	✓-	✓-	✓
Colombia	Pre	1	✓-	✗	✗	✗	✓
	Post	1	✓	✓-	✓-	✓-	✓
Argentina	Pre	2	✓	✓	✓	✓	✓
	Post	2	✓	✓-	✓	✓-	✓
Mexico	Pre	1	✓	✓-	✓-	✓-	✓
	Post	2	✓	✓	✓	✓	✓
Nicaragua	Pre	2	✓	✓-	✓-	✓-	✓
	Post	1	✓	✓-	✓-	✓-	✓
Guatemala	Pre	3	✓	✗	✓-	✓-	✓
	Post	1	✓-	✓-	✓-	✓-	✓

Table A3: Lag Length and Post-Estimation Results

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